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METHODS OF TEST FOR AUTOCLAVED CELLULAR CONCRETE PRODUCTS

PART V DETERMINATION OF COMPRESSIVE STRENGTH

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

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Indian Standard

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PART V DETERMINATION OF COMPRESSIVE STRENGTH

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(*Continued on page* 8)

Indian Standard

METHODS OF TEST FOR AUTOCLAVED CELLULAR CONCRETE PRODUCTS

PART V DETERMINATION OF COMPRESSIVE STRENGTH

0. FOREWORD

0.1 This Indian Standard (Part V) was adopted by the Indian Standards Institution on 21 February 1972, after the draft finalized by the Cement and Concrete Sectional Committee had been approved by the Civil Engineering Division Council.

0.2 Autoclaved cellular concrete is a class of material, which has been developed commercially abroad and is in the process of development in this country also. A series of Indian Standards on cellular concrete is being formulated so as to provide guidance in obtaining reliable products in autoclaved cellular concrete. The Sectional Committee has considered it desirable to issue a standard for the methods of test for autoclaved cellular concrete products for the guidance of manufacturers and users.

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 For convenience of reference, 'Indian Standard methods of test for autoclaved cellular concrete products' has been grouped into the following nine parts:

Part I	Determination of unit weight or bulk density and moisture content
Part II	Determination of drying shrinkage
Part III	Determination of thermal conductivity
Part IV	Corrosion protection of steel reinforcement in autoclaved cellular concrete
Part V	Determination of compressive strength
Part VI	Strength, deformation and cracking of flexural members subject to bending-short duration loading test
Part VII	Strength, deformation and cracking of flexural members subject to bending-sustained loading test

Part VIII Loading tests for flexural members in diagonal tension
Part IX Jointing of autoclaved cellular concrete elements

0.5 In reporting the result of a test 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 (Part V) covers the method for determining the compressive strength of autoclaved cellular concrete products using cubes.

2. TEST SPECIMENS

2.1 Size of Specimens — Compressive strength shall be determined on cubes with an edge length of 15 cm. When the specimens are taken from samples of smaller thickness, cubes may be built up, without gluing, of two or three plane, ground square slices of thickness 7·5 cm and 5 cm respectively. In such cases, the direction of compression during testing shall be perpendicular to the broad faces (plane surfaces) of these slices.

2.1.1 Specimens may be prepared from items which have previously been used for other tests, provided the specimens are cut at least 15 cm from an area where visible damage or changes to the normal structure and appearance have occurred.

2.2 Number of Specimens — For every sample that is to be tested for compressive strength, three cubes shall be taken and these shall form a test series. Wherever possible, one cube shall be prepared from the upper third of the sample, one from the middle and one from the lower section determined in the direction of rise of the concrete mass during manufacture.

2.3 Preparation of Specimens — The specimens shall be cut by means of rotating blades of steel or carborundum, or similar devices. The pieces shall not contain reinforcement rods. All surfaces shall be clean cut and plane. Particular care shall be taken that the pressure faces of the cubes, that is, the faces which are in contact with the platens of the test machine do not deviate from planeness by more than 0·1 mm. The same accuracy shall apply to the joint faces if the cubes are made up of several slices as mentioned in **2.1**. Planeness shall be checked across the two diagonals using a straight-edge. Deviations shall be corrected by means of dry grinding, milling or a similar process.

2.3.1 *Grinding the Specimen* — For plane-grinding of the cubes, slab of sandstone or carborundum shall be used as a grinding medium. While

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

grinding, the slab is kept horizontal and is continuously flushed with water. The grinding operation consists of continuous and uniform circular movements of the test cube on the grinding slab. It shall be ensured that all the surfaces of the slab are used in order to avoid an uneven wearing of the same. The cube shall be pressed hard against the slab to ensure even grinding. The operation is continued until the cube, after checking by a steel ruler against light, appears to be even. The best results are obtained by dragging the ruler slowly, along the cube surface, first parallel to one diagonal and then to the other. Before checking, all the dust from the surface of the cube shall be wiped out, otherwise a thin layer may conceal unevenness of the surface. Having ground one series of cubes, grinding of another will be started. By the time the second lot is ground the surfaces of the cubes of first lot shall have dried out and flaws, if any, in the exactness of the grinding, which were invisible, as long as the cube remained wet can be detected. Such cubes shall be repaired by regrinding.

2.4 Conditioning — Prior to testing, the specimens shall be conditioned to a moisture content between 10 ± 2 percent by weight as average of three cubes and not less than 7 percent for any one of the cubes, calculated on dry weight at 105°C. If drying is necessary, it shall be conducted at a temperature not exceeding 50°C. After drying and prior to testing the specimens shall be stored at room temperature until temperature equilibrium has been reached.

NOTE — Five hours storage at room temperature is generally sufficient if the drying temperature applied has been 50°C.

3. TESTING EQUIPMENT

3.1 Compression Testing Machine — shall preferably be hydraulically operated and shall permit reading of ultimate load with a maximum error of $\pm 2{\cdot}0$ percent. The machine shall be equipped with suitable controls to comply with **4.2**.

3.2 Calliper — shall be capable of readings with an accuracy of 0·1 mm. The measuring faces shall have an area of at least 50 mm^2.

3.3 Straight-Edge

3.4 Balance — shall have a weighing accuracy of 0·5 g.

3.5 Drying Oven — shall be capable of maintaining temperatures at 105 ± 5°C and 50 ± 5°C.

4. PROCEDURE

4.1 Determination of Density of Specimens Under Test Conditions — The specimens shall be weighed and measured according to the

procedure described in IS : 6441 (Part I)-1972*. Dimensions of the pressure surfaces shall be measured with an accuracy of ± 0·1 mm.

4.2 Testing Under Compression Load — The cubes shall be placed in the compression machine and load applied perpendicular to the direction of the slices from which the cube thickness has been built up. For cubes which have been prepared in one piece, the direction of load shall be perpendicular to the direction of rise of the mass during production.

4.2.1 The specimens shall be loaded at the rate of 0·5 to 2 kgf/cm² in such a way that failure occurs within 30 seconds.

4.3 Moisture Content at Testing — After loading, the specimens shall be weighed and dried out at 105 ± 5°C until constant weight is obtained as described in the procedure for determining the bulk density of aerated concrete [*see* IS : 6441 (Part I)-1972*].

5. CALCULATIONS

5.1 The moisture content F of the dry material shall be determined according to the following equation:

$$F = \frac{\Delta W}{W} \times 100 \text{ percent}$$

where

ΔW = weight loss during drying in g, and

W = weight of the dried out sample in g.

5.2 The compressive strength σ_{cu} follows from:

$$\sigma_{cu} = \frac{L}{A} \text{ kgf / cm}^2$$

where

L = breaking load in kgf, and

A = area in cm² over which load L was applied.

5.3 The bulk density γV (of dry material) shall be calculated from the following equation:

$$\gamma V = \frac{W_1}{1 \pm 0{\cdot}01\,F} / V \text{ g/cm}^3$$

where

W_1 = weight of the cube in g prior to testing,

F = moisture content in percent at the time of testing, and

V = volume in cm³ at the time of testing.

*Methods of test for autoclaved cellular concrete products: Part I Determination of unit weight or bulk density and moisture content.

5.4 Moisture content of each specimen shall be stated in whole percent, the compressive strength in whole kgf/cm^2 and the bulk density with three decimals. The mean values shall be stated in whole percent, moisture content in whole kg/cm^2 and the bulk density with two decimals.

6. REPORT

6.1 The report shall include the following:

a) Code designation;

b) Identification of product and its size;

c) Date of manufacture or other code;

d) Place, method and time of sampling;

e) Compressive strength, bulk density and moisture content of individual cubes and average; and

f) Drying temperature prior to test, if drying at elevated temperatures has been applied.

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