

# Testing of Concrete Blocks

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## INTRODUCTION

Concrete can be converted into precast masonry units such as Hollow and Solid normal and light weight concrete blocks of suitable size to be used for load and non-load bearing units for wallings. Use of such concrete blocks are more appropriate in region where soil bricks are costly, poor in strength and are not available. Depending upon the structural requirements of masonry unit, concrete mixes can be designed using ingredients available locally or if not found suitable then with in the most economical distance. The concrete mix used for normal hollow and solid blocks shall not be richer than one part by volume of cement to 6 parts by volume of combined room dry aggregates before mixing. Hollow concrete blocks for normal work used in masonry when reinforced is used shall not be leaner than 1 part cement to 8 parts room dry sand by volume. The mixes are designed with the available materials to give overall economy and the required properties of the products. The hollow load bearing concrete blocks of the standard size 400 x 200 x 200 mm will weight between 17 and 26 kg (1063 to 1625 kg/m<sup>3</sup>) when made with normal weight aggregates. Normal weight blocks are made with cement, sand, gravel, crushed stone and air-cooled slag. The grading for sand used in Hollow concrete block shall be as given below:

I.S. Sieve Size	Percentage Passing
4.75 mm	98-100
2.36 mm	80-100
1.18 mm	60-80
600 Micron	40-65
300 Micron	10-40

150 Micron	0-10
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The aggregates for solid blocks shall be sand as per IS : 383-1970 and well graded aggregate of suitable maximum size as per the dimensions of the block. The mixes are properly designed as per standard practice. Concrete admixtures may be used in both Hollow and Solid concrete blocks.

### **SPECIMENS**

20 full size units shall be measured for length, width and height. Cored units shall also be measured for minimum thickness of face, shells and webs. From these 3 blocks are to be tested for block density, 8 blocks for compressive strength, 3 blocks for water absorption and 3 blocks for drying shrinkage and moisture movement.

### **DETERMINATION OF BLOCK DENSITY**

Three blocks shall be dried to constant mass in a suitable oven heated to approximately 100°C. After cooling the blocks to room temperature, the dimensions of each block shall be measured in centimeters to the nearest millimeter and the overall volume computed in cubic centimeters. The blocks shall then be weighed in kilograms to the nearest 10 gm. The density of each block calculated as follows:

$$\text{Density in kg/m}^3 = \text{Mass of block in kg} / \text{Mass of block in cm}^3 * 10^6$$

### **DETERMINATION OF WATER ABSORPTION**

Three full size blocks shall be completely immersed in clean water at room temperature for 24 hours. The blocks shall then be removed from the water and allowed to drain for one minute by placing them on a 10 mm or coarser wire mesh, visible surface water being removed with a damp cloth, the saturated and surface dry blocks immediately weighed. After weighing all blocks shall be dried in a ventilated oven at 100 to 115°C for not less than 24 hours and until two successive weighing at intervals of 2 hours show an increment of loss not greater than 0.2 percent of the last previously determined mass of the specimen. The water absorption calculates as given below:

$$\text{Absorption, percent} = (A-B)/B * 100$$

Where,

A = wet mass of unit in kg.

B = dry mass of unit in kg.

### **TESTING BLOCKS FOR COMPRESSIVE STRENGTH**

#### **COMPRESSIN TESTING MACHINE (CTM)**

The compression testing machine should be as per IS : 516-1959 and I.S : 14858-2000.

The load capacity, platens sizes, vertical space between platens and horizontal space between machine columns shall be as per the requirements of the specimens to be tested. However, IS : 2185 (part-I) – 1979 specified that when the bearing area of the steel blocks is not sufficient to cover the bearing area of the blocks, steel bearing plates shall be placed between the bearing blocks and the capped specimen after the centroid of the masonry bearing surface has been aligned with the centre of thrust of the bearing blocks. It is desirable that the bearing faces of blocks and plates used for compression testing of concrete masonry have hardness of not less than 60 (HRC).

When steel plates are employed between the steel bearing blocks and the masonry specimen, the plates shall have thickness equal to at least one-third of the distance from the edge of the bearing block to the most distant corner of the specimen. In no case shall the plate thickness be less than 12 mm.

ASTM : C 140-03 specified that when the bearing area of the upper platen or lower platen is not sufficient to cover the area of the specimen, a single steel bearing plate with a thickness equal to at least the distance from the edge of the platen to the most distant corner of the specimen shall be placed between the platen and the capped specimen. The length and width of the steel plate shall be at least 6.3 mm greater than the length and width of the unit. The surface of the platen or plate hardness shall be not less than HRC 60 (BHN 620).

Thickness of bearing plates has a significant effect on the tested compressive strength of masonry units when the bearing area of the platen is not sufficient to cover the area of the specimen. Tested compressive strength will typically increase with increased plate thickness and with reduce distance to the further corner of the specimen. Accordingly the CTM platens shall have the required dimensions with respect to the specimens to be tested on it.

### **TEST SPECIMENS**

Eight full size units shall be tested within 72 hours after delivery to the laboratory, during which time they shall be stored continuously in normal room air.

For the purpose of acceptance, age of testing the specimens shall be 28 days. The age shall be reckoned from the time of the addition of water to the dry ingredients.

### **CAPPING TEST SPECIMENS**

The bearing surfaces of units shall be capped by gypsum. The gypsum and water paste shall be spread evenly on a non-absorbent surface that has been lightly coated with oil. The

surface of the unit to be capped shall be brought into contact with the capping paste. The average thickness of the cap shall be not more than 3 mm. The caps shall be aged for at least 2 hours before the specimens are tested.

### **PROCEDURE**

Specimens shall be tested with the centroid of their bearing surfaces aligned vertically with the centre of thrust of the spherically seated steel bearing blocks of the testing machine. The load up to one-half of the expected maximum load may be applied at any convenient rate, after which the control of the machine shall be adjusted as required to give a uniform rate of travel of the moving head such that the remaining load is applied in not less than one nor more than two minutes.

The compressive strength of a concrete masonry unit shall be taken as the maximum load in Newtones divided by the gross cross sectional area of the unit in square millimeters. Report to the nearest 0.1 N/mm<sup>2</sup> separately for each unit and the average for the 8 full units.

Note:- The Gross area is : The total area occupied by a block on its bedding face, including areas of the cavities and end recesses.

### **REFERENCES**

1. IS : 2185 (part-I) 1979 1987 1998 – Specifications for concrete masonry. Units part-I Hollow and Solid Concrete Blocks (Second Revision).
2. IS : 2185 (part-II)- 1985  
Super seeding IS : 3590-1966 Specifications for concrete masonry units part-II Hollow and Solid light weight concrete blocks (First Revision)
3. IS : 2572-1963 Reaffirmed 1997 Code of practice for construction of hollow concrete block masonry.
4. IS : 383-1970 Specification for coarse and fine aggregates from natural sources for concrete (Second Revision)
5. ASTM : C 140-03 Standard test methods for sampling and testing concrete masonry units and related units.

*We are thankful to Sir Kaushal Kishore for publishing his unpublished research paper here on the website. This would be of great use to all the civil engineers who work are looking for information regarding Testing of Concrete Blocks .*

Source: <http://www.engineeringcivil.com/testing-of-concrete-blocks.html>