

EXPERIMENT NO.- 11

EXPPERIMENT NAME:

**DETERMINATION OF COMPRESSIVE
STRENGTH AND ABSORPTION
CAPACITY OF BRICK**

INTRODUCTION

- This method covers procedures for the sampling and testing of brick for compressive strength and absorption.
- According to the characteristics of good brick, they should be uniform in color, size and shape and also should be sound, compact and free from crack or other flaws such as air bubbles, stone nodules etc.
- The minimum compressive strength of 1st class bricks should not be less than 3500 psi and they should not absorb water more than 10 % of its own dry weight after immersion of 24 hours in cold water (BDS, 2002).
- The strength of a brick decreases by about 25% when soaked in water.
- The weight of each brick should be in the range of 6 to 7 lbs.

STANDARD REFERENCE

ASTM C 67.

SAMPLING OF BRICK

Selection of test specimen

- For the purpose of these tests, full-size bricks shall be selected which are representative of the whole lot of units from which they are selected and shall include specimens representative of the complete range of colors, textures and sizes in the shipment.

Number of Specimens

- For the compressive strength and absorption determinations, at least ten bricks shall be selected from each lot of 250,000 bricks or fraction thereof.
- For larger lots, five individual bricks shall be selected from each 500,000 bricks or fraction thereof contained in the lot.
- In no case shall less than ten bricks be taken.
- Additional specimens may be taken at the discretion of the purchaser.

Identification

- Each specimen shall be marked so that it may be identified at any time.
- Markings shall cover not more than 5% of the superficial area of the specimen.

Weight Determination

Drying:

- Dry the test specimens in a ventilated oven at 230 to 239°F (110 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% of the last previously determined weight of the specimen.

Cooling:

- After drying, cool the specimens in a drying room maintained at a temperature of with a relative humidity between 30 and 70%. Store the units free from drafts, un-stacked with separate placement, for a period of at least 4 hours.
- Do not use specimens noticeably warm to the touch for any test requiring dry units.

Calculate:

- Calculate the weight per unit area of a specimen by dividing the total weight in pounds by the average area in square feet of the two faces of the unit as normally laid in a wall.

Report:

Report results separately for each unit with the average for five units or more.

COMPRESSIVE STRENGTH DETERMINATION

Test Specimens

- The test specimens shall consist of dry half brick (as described above), the full height and width of the unit, with a length equal to one half of the full length of the unit (25.4 mm).
- Test specimens shall be obtained by any method that will produce without shattering or cracking specimen with approximately plane and parallel ends.
- Five specimens shall be tested.

Capping

- All specimens shall be dry and cool (as described above during weight determination) before any portion of the capping procedure is carried out.
- If the surface which will become bearing surfaces during the compression test are recessed or paneled, fill the depressions with a mortar composed of 1 part by weight of quick hardening cement and 2 parts by weight of sand.
- Age the specimens at least 48 hours before capping them.
- Where the recess exceeds $\frac{1}{2}$ in. (12.7 mm), use a brick or tile slab section or metal plate as a core fill.
- Cap the test specimens using one of the two procedures described below.

Gypsum Capping

- Coat the two opposite bearing surfaces of each specimen with shellac and allow to dry thoroughly.
- Bed one of the dry shellacked surfaces of the specimen in a thin coat of neat paste of calcined gypsum (plaster of paris) that has been spread on an oiled nonabsorbent plate, such as glass or machined metal.
- The casting surface plate shall be plane within 0.003 in. (0.076 mm) in 16 in. (406.4 mm) and sufficiently rigid; and so supported that it will not be measurably deflected during the capping operation.
- Lightly coat it with oil or other suitable material.
- Repeat this procedure with the other shellacked surface.
- Take care that the opposite bearing surfaces so formed will be approximately parallel and perpendicular to the vertical axis of the specimen and the thickness of the gaps will be approximately the same and not exceeding 1/8 in. (3.18 mm).
- Age the caps at 24 hours, before testing the specimens.

Sulfur – Filler Capping

- Use a mixture containing 40 to 60 weight % sulfur the remainder being ground fire clay or other suitable inert material passing a No. 100 sieve with or without plasticizer.
- The casting surface flat requirements shall be as described above.
- Place four 1 in. (25.4 mm) square steel bars on the surface plate to form a rectangular mold approximately $\frac{1}{2}$ in. (12.7 mm) greater in either inside dimension than the specimen.
- Heat the sulfur mixture in a thermostatically controlled heating pot to a temperature sufficient to maintain fluidity for a reasonable period of time after contact with the surface being capped.

Sulfur – Filler Capping (Contd..)

- Take care to prevent overheating and stir liquid in the pot just before use.
- Fill the mold to a depth of $\frac{1}{4}$ in. (6.35 mm) with molten sulfur material.
- Place the surface of the unit to be capped quickly in the liquid and hold the specimen so that its vertical axis is at right angles to the capping surface.
- The thickness of the caps shall be approximately the same.
- Allow the unit to remain undisturbed until solidification is complete.
- Allow the caps to cool for a minimum of 2 hours before testing the specimens.

PROCEDURE

- Test brick specimens flatwise (that is the load shall be applied in the direction of the depth of the brick).
- Center the specimens under the spherical upper bearing within 1/16 in. (1.59 mm).
- The upper bearing shall be a spherically seated hardened metal block firmly attached at the center of the machine.
- The center of the sphere shall lie at the center of the surface of the block in contact with the specimen.
- The block shall be closely held in its spherical seat, but shall be free to turn in any direction, and its perimeter shall have at least $\frac{1}{4}$ in. (6.35 mm) clearance from the head to allow for specimens whose bearing surfaces are not exactly parallel.

PROCEDURE (Contd..)

- The diameter of the bearing surface shall be at least 5 in. (127 mm).
- use a hardened metal bearing block surface intended for contact with the specimen, having a hardness not less than HRC 60 (HB 620).
- These surfaces shall not depart from plane surfaces by more than 0.001 in. (0.03 mm).
- When the bearing area plate with surfaces machined to true planes within 0.001 in. (0.03 mm) and with a thickness equal to at least one third of the distance from the edge of the spherical bearing to the most distant corner between the spherical bearing block and the capped specimen.
- Apply the load up to one half of the expected maximum load, at any convenient rate, after which, adjust the controls of the machine so that the remaining load is applied at a uniform rate not less than 1 nor more than 2 min.

CALCULATIONS AND RESULT

- Calculate the compressive strength of each specimen as follows:

$$\text{Compressive strength, } C = \frac{W}{A}$$

Where,

C = compressive strength of the specimen (psi or MPa)

W = maximum load (lb or N) indicated by the testing machine

A = average of the gross areas of the upper and lower bearing surfaces of the specimen
(sq. in. or sq. cm.)

Report the result to the nearest 10 psi or 0.1 MPa.

ABSORPTION

- The scale or balance used shall have a capacity of not less than 2000 gm and shall be sensitive to 0.5 gm.

TEST SPECIMENS

- The test specimens shall consist of half brick conforming to the requirements same as for compressive strength.
- Five specimens shall be tested.

PROCEDURE

- Dry and cool the test specimens in accordance with weight determination in sampling and weigh each one.
- ***Saturation:*** submerge the dry, cooled specimen, without preliminary partial immersion, in clean water (soft, distilled or rain water at 60 to 86°F (15.5 to 30°C)) for the specified time.
- Remove the specimen, wipe off the surface water with a damp cloth and weigh the specimen.
- Complete weighing of each specimen within 5 minutes after removing the specimen from the bath.

CALCULATION AND RESULT

- Calculate the absorption of each specimen as follows:

$$\text{Absorption (\%)} = \frac{100 (W_s - W_d)}{W_d}$$

Where,

W_d = dry weight of the specimen

W_s = saturated weight of the specimen after submersion in cold water.

Report the average absorption of all the specimens tested as the absorption of the lot.

EXPERIMENT 11

Data Sheet

Determination of Compressive Strength and Absorption Capacity of Brick

| Sl. No. | Frog Mark | Specimen Area | Maximum Load | Crushing Strength | Average Crushing Strength | Absorption Capacity (%) | Average Absorption Capacity (%) |
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Student No. :

Group :

Date :

Signature of Course Teacher