

State of Nevada
Department of Highways
Materials and Testing Division

METHOD OF TEST FOR AIR CONTENT OF FRESHLY
MIXED CONCRETE BY THE VOLUMETRIC METHOD

SCOPE

This test method describes the equipment and procedure used for determining the air content of freshly mixed concrete. This method is to be used whenever any type of aggregate, whether it be dense, circular, or lightweight is used in the concrete mix. It can be used for all classes of concrete. Nevada Test Method T432 is normally used for normal weight concrete.

A. APPARATUS

The following items are necessary for performing this test method:

1. Air Meter: (Fig. I) The meter shall consist of a bowl for containing the fresh concrete, and a top section, both conforming to the requirements listed below.
2. Bowl: The bowl shall be sufficiently rigid to withstand normal field use and of such construction as to resist attack from the cement paste. The diameter of the bowl shall be 1 to 1.25 times the height. The bowl shall have a capacity of not less than 0.075 (0.002 m³) of a cubic foot and be constructed with a flange at or near the top surface.
3. Top Section: The top section shall be sufficiently rigid to withstand normal field use and be resistant to chemical attack from the cement paste. The capacity of the top section should be approximately the same as the bowl. It shall be equipped with hooks or lugs and a flexible gasket which will form a watertight connection with the flanged end of the bowl. The top section shall be equipped with a glass lined neck which has been graduated in increments not greater than 0.5 percent from 0 at the top to 9 percent or more of the volume of the bowl. The upper end shall be stoppered with a screw cap which forms a watertight connection.
4. Funnel: A metal funnel which when inserted through the neck of the top section will extend to a point just above the top of the bowl. The discharge end of the spout shall distribute the water added to the meter so as to cause a minimum of disturbance to the concrete in the bowl.
5. Tamping Rod: A round, straight steel rod, 5/8 inch (15.88 mm) in diameter and approximately 24 inches (609.6 mm) in length, having the tamping end rounded to a hemispherical tip the diameter of which is 5/8 inch (15.88 mm).

6. **Strike-off Bar:** A steel bar approximately 1/4 inch by 1 inch by 18 inches long (6.35 mm x 25.4 mm x 457.2 mm).
7. **Measuring Cup:** A metal cup having a capacity equal to 1.0 percent of the volume of the bowl of the air meter.
8. **Syringe:** A small rubber bulb syringe having a capacity of at least that of the measuring cup.
9. **Pouring Vessel:** A metal or glass container of approximately 1 quart (0.95 litres) capacity.
10. **Trowel:** A blunt-nosed brick mason's trowel.
11. **Scoop:** A small metal scoop.

B. CALIBRATION OF METER

1. The volume of the bowl of the air meter, in cubic feet, shall be determined by accurately weighing the amount of water at 70° F (21.1° C) required to fill it, and dividing this weight by the weight of water at 70° F (21.1° C) namely 62.34 lbs. (998.59 kg/m³) per cubic foot. A glass plate shall be used to cover the bowl to remove excess water and to insure that the container is full.
2. The accuracy of the graduations on the neck of the top section of the air meter shall be determined by filling the assembled measuring bowl and top section with water to the level of the mark for any air content. A quantity of water at 70° F (21.1° C) equal to 1.0 percent of the volume of the bowl, shall be added to the water already in the neck. The height of the water column shall increase by an amount equivalent to 1.0 percent of the air.
3. The volume of the measuring cup shall be checked by adding one cupful of water to the meter in the manner described in paragraph 2. Such additions shall increase the height of the water column by an amount equivalent to 1.0 percent of air.

C. SAMPLE

1. A representative sample of concrete to be tested shall be obtained in accordance with Nevada Test Method T425.

D. PROCEDURE

1. **Rodding and tapping:** Using the scoop fill the bowl with concrete in three equal layers. Rod each layer 25 times with the tamping rod. After each rodding, tap the sides of the bowl 10 times to close the voids left by the tamping rod.
2. **Striking-off after the top layer has been placed, tamped, and the rodding voids closed:** Strike-off the excess concrete until a smooth surface is obtained. Clean with a damp sponge, the rim and flange of the bowl.

3. Adding water: Clamp the top section into position on the bowl, insert the funnel, and add water until it appears in the neck. Remove the funnel and adjust the water level, using the rubber syringe until the bottom of the meniscus is level with the zero mark. Attach and tighten the screw cap.
4. Agitating and rolling: Invert and agitate the meter until the concrete dislodges from the bowl. The process of agitation is accomplished by lightly striking the brass 1/4 inch (6.4 mm) square nut on the top of the meter against a firm surface on the ground. When the concrete comes free from the bowl, place the meter on a firm surface on its side. With the neck of the meter elevated, roll and rock the meter until all the air appears to have been removed from the concrete. Set the meter upright, jar it lightly, and allow it to stand until the air rises to the top. Repeat the rolling operation until no further drop in the water column is observed.
5. Dispelling foam: When all the air has been removed from the concrete and allowed to rise to the top of the neck section, remove the screw cap. Add, in one-cup increments using the syringe, sufficient Isopropyl Alcohol to dispel the foamy mass on the surface of the water. (One cup of alcohol is equivalent to 1.0 percent of air).
6. Reading: Make a direct reading of the liquid in the neck, reading to the bottom of the meniscus, and estimating to the nearest 0.1 percent.

E. CALCULATION

1. Compute the air content of the concrete in percent by adding to the reading (under paragraph 6 above) the amount of alcohol used in accordance with paragraph 5 above.

REFERENCE

ASTM Designation C173

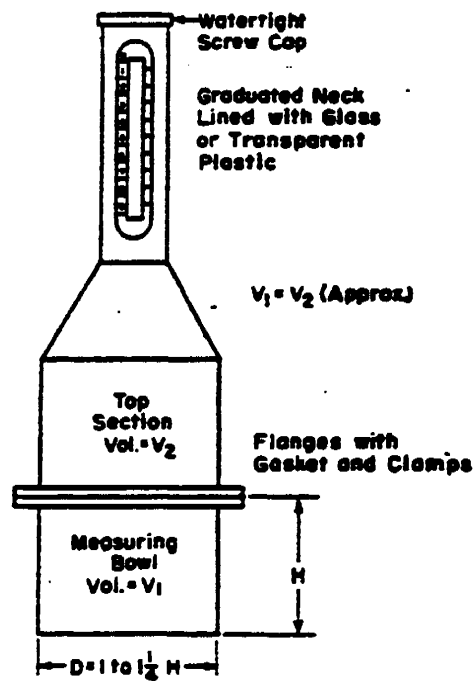


FIG. 1.—Apparatus for Measuring Air Content of Fresh Concrete by Volumetric Method.