# **Standard Method of Test for**

# Air Content of Freshly Mixed Concrete by the Pressure Method

AASHTO Designation: T 152-19 Technical Subcommittee: 3b, Fresh Concrete Release: Group 1 (April) ASTM Designation: C231/C231M-14

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## 1. SCOPE

- 1.1. This method covers determination of the air content of freshly mixed concrete from observation of the change in volume of concrete with a change in pressure.
- 1.2. This method is intended for use with concretes and mortars made with relatively dense aggregates for which the aggregate correction factor can be satisfactorily determined by the technique described in Section 7. It is not applicable to concretes made with lightweight aggregates, air-cooled blast-furnace slag, or aggregates of high porosity. In these cases, T 196M/T 196 should be used. This test method is also not applicable to nonplastic concrete such as is commonly used in the manufacture of pipe and concrete masonry units.
- **1.3.** The text of this standard references notes and footnotes that provide explanatory information. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements for this standard.
- 1.4. The values stated in inch-pound units are to be regarded as the standard.
- **1.5.** This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

**Warning**—Fresh hydraulic cementitious mixtures are caustic and may cause chemical burns to skin and tissue upon prolonged exposure.

## 2. REFERENCED DOCUMENTS

#### 2.1. *AASHTO Standards*:

- R 18, Establishing and Implementing a Quality Management System for Construction Materials Testing Laboratories
- R 39, Making and Curing Concrete Test Specimens in the Laboratory
- R 60, Sampling Freshly Mixed Concrete
- R 61, Establishing Requirements for Equipment Calibrations, Standardizations, and Checks
- T 23, Making and Curing Concrete Test Specimens in the Field
- T 119M/T 119, Slump of Hydraulic Cement Concrete

- T 121M/T 121, Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete
- T 196M/T 196, Air Content of Freshly Mixed Concrete by the Volumetric Method

#### 2.2. *ASTM Standards*:

- C670, Standard Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials
- E177, Standard Practice for Use of the Terms Precision and Bias in ASTM Test Methods<sup>1</sup>

## 3. SIGNIFICANCE AND USE

- 3.1. This test method covers the determination of the air content of freshly mixed concrete. The test determines the air content of freshly mixed concrete exclusive of any air that exists inside voids within aggregate particles. For this reason, it is applicable to concrete made with relatively dense aggregate particles and requires determination of the aggregate correction factor. (See Sections 7.1 and 10.1.)
- **3.2.** This test method and T 121M/T 121 and T 196M/T 196 provide pressure, gravimetric, and volumetric procedures, respectively, for determining the air content of freshly mixed concrete. The pressure procedure of this test method gives substantially the same air content as the other two test methods for concrete made with dense aggregates.
- 3.3. The air content of hardened concrete may be either higher or lower than that determined by this test method. This depends on the methods and amount of consolidation effort applied to the concrete from which the hardened concrete specimen is taken; uniformity and stability of the air bubbles in the fresh and hardened concrete; accuracy of the microscopic examination, if used; time of comparison; environmental exposure; stage in the delivery, placement, and consolidation processes at which the air is determined, that is, before or after the concrete goes through a pump; and other factors.

#### 4. APPARATUS

- 4.1. *Air Meters*—There are available satisfactory apparatus of two basic operational designs employing the principle of Boyle's Law. For purposes of reference herein these are designated Meter Type A and Meter Type B.
- 4.1.1. *Meter Type A*—An air meter consisting of a measuring bowl and cover assembly (Figure 1) conforming to the requirements of Sections 4.2 and 4.3. The operational principle of this meter consists of introducing water to a predetermined height above a sample of concrete of known volume and the application of a predetermined air pressure over the water. The determination consists of the reduction in volume of the air in the concrete sample by observing the amount the water level is lowered under the applied pressure, the latter amount being standardized in terms of percent of air in the concrete sample.

**Note 1**—Standardization is a critical step to ensure accurate test results when using this apparatus. Failure to perform the standardization procedures as described herein will produce inaccurate or unreliable test results.

4.1.2. *Meter Type B*—An air meter consisting of a measuring bowl and cover assembly (Figure 2) conforming to the requirements of Sections 4.2 and 4.3. The operational principle of this meter consists of equalizing a known volume of air at a known pressure in a sealed air chamber with the unknown volume of air in the concrete sample, the dial on the pressure gauge being standardized in terms of percent air for the observed pressure at which equalization takes place. Working pressures of 7.5 to 30.0 psi (51 to 207 kPa) have been used satisfactorily.