



## Standard Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete<sup>1</sup>

This standard is issued under the fixed designation C 457; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

### 1. Scope

1.1 This test method describes procedures for microscopical determinations of the air content of hardened concrete and of the specific surface, void frequency, spacing factor, and paste-air ratio of the air-void system in hardened concrete (1).<sup>2</sup> Two procedures are described:

1.1.1 *Procedure A*, the linear-traverse method (2, 3).

1.1.2 *Procedure B*, the modified point-count method (3, 4, 5, 6).

1.2 This test method is based on prescribed procedures that are applied to sawed and lapped sections of specimens of concrete from the field or laboratory.

1.3 It is intended to outline the principles of this test method and to establish standards for its adequate performance but not to describe in detail all the possible variations that might be used to accomplish the objectives of this test method.

1.4 The values stated in SI units are to be regarded as the standard. The values in parentheses are provided for information purposes only.

1.5 *This standard does not purport to address all of the safety concerns 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. For specific hazard statements see Note 3 and Note 6.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

C 42 Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete<sup>3</sup>

C 138 Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete<sup>3</sup>

C 173 Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method<sup>3</sup>

C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method<sup>3</sup>

C 670 Practice for Preparing Precision and Bias Statements for Test Methods for Construction Materials<sup>3</sup>

C 823 Practice for Examination and Sampling of Hardened Concrete in Constructions<sup>3</sup>

C 856 Practice for Petrographic Examination of Hardened Concrete<sup>3</sup>

D 92 Test Method for Flash and Fire Points by Cleveland Open Cup<sup>4</sup>

#### 2.2 American Concrete Institute Standards:

201.2R Guide to Durable Concrete<sup>5</sup>

211.1 Recommended Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete<sup>5</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *air content (A)*—The proportion of the total volume of the concrete that is air voids; expressed as percentage by volume.

3.1.2 *air void*—A space enclosed by the cement paste and that was filled with air or other gas prior to the setting of the paste.

3.1.2.1 *Discussion*—This term does not refer to voids of submicroscopical dimensions, such as the porosity inherent to the hardened-cement paste. Air voids are usually larger than a few micrometers in diameter. The term includes both entrapped and entrained voids.

3.1.3 *average chord length ( $\bar{l}$ )*—The average length of the chords formed by the transection of the voids by the line of traverse; the unit is a length.

3.1.4 *paste-air ratio ( $p/A$ )*—The ratio of the volume of hardened cement paste to the volume of the air voids in the concrete.

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee C-9 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.65 on Petrography.

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<sup>2</sup> The boldface numbers in parentheses refer to the list of references at the end of this test method.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 04.02.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 05.01.

<sup>5</sup> American Concrete Institute of Concrete Practice, issued annually, available from ACI, 38800 Country Club Drive, Farmington Hills, MI 48331.