



Designation: C 1077 – 05a

# Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation<sup>1</sup>

This standard is issued under the fixed designation C 1077; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

*This standard has been approved for use by agencies of the Department of Defense.*

## 1. Scope\*

1.1 This practice identifies and defines the duties, responsibilities, and minimum technical requirements of testing laboratory personnel and the minimum technical requirements for laboratory equipment utilized in testing concrete and concrete aggregates for use in construction.

1.2 This practice provides criteria for the evaluation of the capability of a testing laboratory to perform designated ASTM test methods on concrete and concrete aggregates. It can be used by an accrediting agency in the accreditation of a laboratory or by other parties to determine if the laboratory is qualified to conduct the specified tests.

1.3 If the laboratory requires external technical services to conduct tests, the external agency shall be subject to separate evaluation.

1.4 *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.*

## 2. Referenced Documents

### 2.1 ASTM Standards:<sup>2</sup>

**C 29/C 29M** Test Method for Bulk Density (“Unit Weight”) and Voids in Aggregate

**C 31/C 31M** Practice for Making and Curing Concrete Test

### Specimens in the Field

**C 39/C 39M** Test Method for Compressive Strength of Cylindrical Concrete Specimens

**C 40** Test Method for Organic Impurities in Fine Aggregates for Concrete

**C 42/C 42M** Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete

**C 70** Test Method for Surface Moisture in Fine Aggregate

**C 78** Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)

**C 87** Test Method for Effect of Organic Impurities in Fine Aggregate on Strength of Mortar

**C 88** Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate

**C 117** Test Method for Material Finer than 75- $\mu$ m (No. 200) Sieve in Mineral Aggregates by Washing

**C 123** Test Method for Lightweight Particles in Aggregate

**C 125** Terminology Relating to Concrete and Concrete Aggregates

**C 127** Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

**C 128** Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate

**C 131** Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine

**C 136** Test Method for Sieve Analysis of Fine and Coarse Aggregates

**C 138/C 138M** Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete

**C 142** Test Method for Clay Lumps and Friable Particles in Aggregates

**C 143/C 143M** Test Method for Slump of Hydraulic Cement Concrete

<sup>1</sup> This practice is under the jurisdiction of ASTM Committee C09 on Concrete and Concrete Aggregates and is the direct responsibility of Subcommittee C09.98 on Evaluation of Laboratories.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard’s Document Summary page on the ASTM website.

\*A Summary of Changes section appears at the end of this standard.

- C 157/C 157M** Test Method for Length Change of Hardened Hydraulic-Cement, Mortar, and Concrete
- C 172** Practice for Sampling Freshly Mixed Concrete
- C 173/C 173M** Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C 174/C 174M** Test Method for Measuring Thickness of Concrete Elements Using Drilled Concrete Cores
- C 192/C 192M** Practice for Making and Curing Concrete Test Specimens in the Laboratory
- C 215** Test Method for Fundamental Transverse, Longitudinal and Torsional Frequencies of Concrete Specimens
- C 227** Test Method for Potential Alkali Reactivity of Cement–Aggregate Combinations (Mortar-Bar Method)
- C 231** Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C 232** Test Methods for Bleeding of Concrete
- C 233** Test Method for Air-Entraining Admixtures for Concrete
- C 289** Test Method for Potential Alkali-Silica Reactivity of Aggregates (Chemical Method)
- C 293** Test Method for Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)
- C 295** Guide for Petrographic Examination of Aggregates for Concrete
- C 341/C 341M** Practice for Length Change of Cast, Drilled, or Sawed Specimens of Hydraulic-Cement Mortar and Concrete
- C 403/C 403M** Test Method for Time of Setting of Concrete Mixtures by Penetration Resistance
- C 418** Test Method for Abrasion Resistance of Concrete by Sandblasting
- C 441** Test Method for Effectiveness of Pozzolans or Ground Blast-Furnace Slag in Preventing Excessive Expansion of Concrete Due to the Alkali-Silica Reaction
- C 457** Test Method for Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete
- C 469** Test Method for Static Modulus of Elasticity and Poisson’s Ratio of Concrete in Compression
- C 470/C 470M** Specification for Molds for Forming Concrete Test Cylinders Vertically
- C 495** Test Method for Compressive Strength of Lightweight Insulating Concrete
- C 496/C 496M** Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens
- C 511** Specification for Mixing Rooms, Moist Cabinets, Moist Rooms and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes
- C 512** Test Method for Creep of Concrete in Compression
- C 535** Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
- C 566** Test Method for Total Evaporable Moisture Content of Aggregate by Drying
- C 567** Test Method for Determining Density of Structural Lightweight Concrete
- C 586** Test Method for Potential Alkali Reactivity of Carbonate Rocks as Concrete Aggregates (Rock Cylinder Method)
- C 597** Test Method for Pulse Velocity Through Concrete
- C 617** Practice for Capping Cylindrical Concrete Specimens
- C 641** Test Method for Staining Materials in Lightweight Concrete Aggregates
- C 642** Test Method for Density, Absorption, and Voids in Hardened Concrete
- C 666/C 666M** Test Method for Resistance of Concrete to Rapid Freezing and Thawing
- C 672/C 672M** Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals
- C 684** Test Method of Making, Accelerated Curing, and Testing Concrete Compression Test Specimens
- C 702** Practice for Reducing Samples of Aggregate to Testing Size
- C 779/C 779M** Test Method for Abrasion Resistance of Horizontal Concrete Surfaces
- C 802** Practice for Conducting an Interlaboratory Test Program to Determine the Precision of Test Methods for Construction Materials
- C 803/C 803M** Test Method for Penetration Resistance of Hardened Concrete
- C 805** Test Method for Rebound Number of Hardened Concrete
- C 823** Practice for Examination and Sampling of Hardened Concrete in Constructions
- C 856** Practice for Petrographic Examination of Hardened Concrete
- C 873** Test Method for Compressive Strength of Concrete Cylinders Cast in Place in Cylindrical Molds
- C 876** Test Method for Half-Cell Potentials of Uncoated Reinforcing Steel in Concrete
- C 900** Test Method for Pullout Strength of Hardened Concrete
- C 918** Test Method for Measuring Early-Age Compressive Strength and Projecting Later-Age Strength
- C 944** Test Method for Abrasion Resistance of Concrete or Mortar Surfaces by the Rotating–Cutter Method
- C 1040** Test Methods for Density of Unhardened and Hardened Concrete In Place by Nuclear Methods
- C 1064/C 1064M** Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete
- C 1074** Practice for Estimating Concrete Strength by the Maturity Method
- C 1084** Test Method for Portland–Cement Content of Hardened Hydraulic–Cement Concrete
- C 1105** Test Method for Length Change of Concrete Due to Alkali-Carbonate Rock Reaction
- C 1137** Test Method for Degradation of Fine Aggregate Due to Attrition
- C 1138** Test Method for Abrasion Resistance of Concrete (Underwater Method)
- C 1152/C 1152M** Test Method for Acid-Soluble Chloride in Mortar and Concrete
- C 1170** Test Methods for Determining Consistency and Density of Roller-Compacted Concrete Using a Vibrating Table

- C 1176** Practice for Making Roller-Compacted Concrete in Cylinder Molds Using a Vibrating Table
- C 1202** Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration
- C 1218/C 1218M** Test Method for Water-Soluble Chloride in Mortar and Concrete
- C 1231/C 1231M** Practice for Use of Unbonded Caps in Determination of Compressive Strength of Hardened Concrete Cylinders
- C 1383** Test Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method
- C 1399** Test Method for Obtaining Average Residual-Strength of Fiber-Reinforced Concrete
- C 1404/C 1404M** Test Method for Bond Strength of Adhesive Systems Used with Concrete as Measured by Direct Tension
- D 75** Practice for Sampling Aggregates
- D 2419** Test Method for Sand Equivalent Value of Soils and Fine Aggregate
- E 4** Practices for Force Verification of Testing Machines
- E 11** Specification for Wire Cloth and Sieves for Testing Purposes
- 2.2 *ACI Standards:*
- ACI 214-77** Recommended Practice for Evaluation of Strength Test Results of Concrete<sup>3</sup>
- SP-19** (116R) Cement and Concrete Terminology<sup>3</sup>

### 3. Terminology

#### 3.1 Definitions:

3.1.1 *evaluation authority, n*—an independent entity, apart from the organization being evaluated, that can provide an unbiased evaluation of that organization. The entity must have the capability to assess the professional and technical activities of concrete and concrete aggregate testing laboratories.

3.1.1.1 *Discussion*—Laboratory inspection services are provided by the Cement and Concrete Reference Laboratory (CCRL).<sup>4</sup> Laboratory inspection is broadened into accreditation programs by such independent authorities as the National Voluntary Laboratory Accreditation Program (NVLAP),<sup>5</sup> American Association for Laboratory Accreditation (A2LA)<sup>6</sup>, Construction Materials Engineering Council (CMEC)<sup>7</sup> AASHTO Accreditation Program (AAP)<sup>8</sup> and other recognized agencies as may be established.

3.1.2 *external technical services, n*—those services required by a testing laboratory that are provided by another organization.

<sup>3</sup> Available from American Concrete Institute, P.O. Box 9094, Farmington Hills, MI 48333.

<sup>4</sup> CCRL, National Institute of Standards and Technology, Bldg. 226, Rm. A365, Gaithersburg, MD 20899.

<sup>5</sup> NVLAP, National Institute of Standards and Technology, Bldg. 820, Rm. 282, Gaithersburg, MD 20899.

<sup>6</sup> American Association for Laboratory Accreditation, Quince Orchard, Gaithersburg, MD 20878.

<sup>7</sup> Construction Materials Engineering Council, 649 Vassar St., Orlando, FL 32804.

<sup>8</sup> American Association of State Highway and Transportation Officials (AASHTO), 444 N. Capital St. NW, Suite 225, Washington, DC 20001.

3.1.3 *field technician, n*—an employee of the laboratory who is assigned to perform sampling and testing functions outside the laboratory.

3.1.4 *laboratory technician, n*—an employee of the laboratory who is assigned to perform the actual testing operations primarily conducted in the laboratory.

3.1.5 *quality systems, n*—those internal procedures and practices that a laboratory utilizes to ensure continued compliance with applicable testing standards for concrete and concrete aggregates.

3.1.6 *testing laboratory, n*—an organization that measures, examines, performs tests, or otherwise determines the characteristics or performance of materials or products. This may include organizations that offer commercial testing services, an in-house quality control function, an academic institution, or any other organization providing the required testing services.

3.1.7 Additional definitions can be found in Terminology **C 125**, Practices **E 4**, and **ACI SP-19**.

### 4. Significance and Use

4.1 The testing and inspection of concrete and concrete aggregates are important elements in obtaining quality construction. A testing laboratory specializing in these services must be selected with care.

4.2 A testing laboratory shall be deemed qualified to perform and report the results of its tests if the laboratory meets the requirements of this practice. The testing laboratory services shall be provided under the technical direction of a registered professional engineer.

4.3 This practice establishes essential characteristics pertaining to the organization, personnel, facilities, and quality systems of the laboratory. This practice may be supplemented by more specific criteria and requirements for particular projects.

### 5. Organization

5.1 The following information shall be readily available for review:

5.1.1 Description of the organization, including:

5.1.1.1 Complete legal name and address of the main office and each laboratory location,

5.1.1.2 Names and positions of the principal officers and the responsible, registered professional engineer in charge, and

5.1.1.3 Description of the organization management structure.

5.1.2 Listing of the relevant technical services offered, and

5.1.3 All external technical services normally utilized.

5.2 The laboratory shall designate an individual with access to management who has the responsibility of seeing that procedures required in this document are being carried out.

### 6. Human Resources

6.1 Information shall be made available to substantiate personnel qualifications as follows:

6.1.1 All relevant testing services are provided under the full-time technical direction of a registered professional engineer with at least 5 years experience in construction materials testing.