



Standard Practice for Accreditation of Testing Agencies for Masonry¹

This standard is issued under the fixed designation C1093; 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 (ε) indicates an editorial change since the last revision or reapproval.

^{ε1} NOTE—Editorially corrected 7.2 in July 2016.

1. Scope*

1.1 This practice covers the minimum requirements for laboratory personnel, for establishing and maintaining a quality system, and it establishes minimum qualifications for agencies engaged in the testing of masonry materials.

1.2 Criteria are provided for evaluating the capability of an agency to properly perform designated tests on masonry materials, and for establishing guidelines pertaining to an agency's organization, personnel, facilities, and quality system. This practice may be supplemented by more specific criteria and requirements for particular projects.

1.3 This practice can be used as a basis to evaluate testing agencies, and it is intended for use for the qualifying or accrediting of testing agencies, or both, public or private, engaged in the testing of masonry materials.

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:²

- C67 Test Methods for Sampling and Testing Brick and Structural Clay Tile
- C109/C109M Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens)
- C117 Test Method for Materials Finer than 75-μm (No. 200) Sieve in Mineral Aggregates by Washing
- C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
- C140 Test Methods for Sampling and Testing Concrete Masonry Units and Related Units
- C143/C143M Test Method for Slump of Hydraulic-Cement Concrete
- C173/C173M Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method
- C185 Test Method for Air Content of Hydraulic Cement Mortar
- C230/C230M Specification for Flow Table for Use in Tests of Hydraulic Cement
- C231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method
- C270 Specification for Mortar for Unit Masonry
- C305 Practice for Mechanical Mixing of Hydraulic Cement Pastes and Mortars of Plastic Consistency
- C470/C470M Specification for Molds for Forming Concrete Test Cylinders Vertically
- C780 Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry
- C1072 Test Methods for Measurement of Masonry Flexural Bond Strength
- C1232 Terminology of Masonry
- C1506 Test Method for Water Retention of Hydraulic Cement-Based Mortars and Plasters
- E4 Practices for Force Verification of Testing Machines
- E11 Specification for Woven Wire Test Sieve Cloth and Test Sieves

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² 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.

3. Terminology

3.1 Definitions:

3.1.1 *quality system*—the organizational structure, responsibilities, procedures, processes, capabilities, and resources for implementing quality management.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *agency*—the organization engaged to test masonry materials as required by a specification or contract.

3.2.2 *quality system manual (QSM)*—a manual describing and documenting an agency's quality system.

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

3.2.3 *user*—the person or organization engaging the agency to provide tests; or using this practice to evaluate or accredit the agency.

3.3 For additional terms used in this standard, refer to Terminology C1232.

4. Significance and Use

4.1 This practice provides the basic minimum criteria for use in evaluating the qualifications of testing agencies for masonry materials. The criteria may be supplemented by more specific criteria and requirements. It can be used as a guide for internal audits by individual users.

4.2 The intent of this practice is to provide a consensus basis for evaluating a testing agency, with respect to that agency's capability to objectively and competently provide the specific services needed by the user.

4.3 This practice may be used as a basis for accreditation.

5. Responsibilities and Duties

5.1 The agency shall ensure that only tests for which it is adequately equipped and staffed are performed.

5.2 The agency shall ensure that personnel perform only tests for which they are adequately trained, qualified, and certified in accordance with applicable specifications.

5.3 The agency shall ensure that all equipment is properly maintained in good operating condition and is calibrated or verified as applicable.

5.4 The agency shall perform all testing in accordance with appropriate standards and quality control criteria. Documents unique to the user shall be furnished to the agency.

6. General Capabilities

6.1 *Laboratory Testing*—The laboratory testing services of the masonry materials testing agency shall include some or all of the following capabilities:

- 6.1.1 Testing of masonry units in the laboratory,
- 6.1.2 Testing of masonry mortars in the laboratory, and
- 6.1.3 Testing of aggregates for compliance with specification requirements.

NOTE 1—Since the requirements for construction control can vary from project to project depending upon the nature of the type, location, and intended use of the masonry in the project, the capability of the agency for testing should be that necessary to accomplish construction control for the user's specific project or special requirements.

7. Personnel Qualifications

7.1 *Management and Supervision*—All relevant testing services shall be provided under the Full-Time technical direction of a registered professional Engineer, with at least five years of experience in inspecting and testing masonry materials or a person of equivalent science-oriented education and experience.

7.2 It is satisfactory for a person to fill one or more positions in an agency providing that person is qualified for each position.

7.3 *Supervising Laboratory Technician*—The supervising laboratory technician shall have at least five years experience performing tests on materials, with at least two years testing masonry materials. This person shall be able to demonstrate, either by oral or written examination, or both, the ability to perform the tests normally required in the manner stipulated under ASTM or other governing procedures and shall be capable of evaluating the test results in terms of specification compliance.

8. Quality System Criteria

8.1 The agency shall establish and implement a quality system that meets the criteria in subsections 8.2 to 8.14.

8.2 *Quality System Manual (QSM)*—The agency shall establish and maintain a QSM that conforms to the requirements in Section 9. Each document in the QSM shall indicate its preparation *date*. If a document is revised, the *date* of revision shall be indicated on the document. The QSM shall be available for use by laboratory staff.

8.3 *Quality System Management*—The agency shall designate a person(s) having responsibility for the quality system and its implementation. The quality manager ensures that activities are being conducted by agency staff in the manner specified in the agency's quality system manual and has responsibility for maintaining and revising it. This individual(s) shall have direct access to top management (see Note 2).

NOTE 2—This individual(s) may have other responsibilities (for example, laboratory manager).

8.4 *Laboratory Procedure Manual*—A written laboratory procedure manual outlining the method or inspection procedure for each test or service performed by the laboratory.

NOTE 3—Inspection and testing procedures may reference published standards.

8.5 *Equipment*—The agency shall calibrate or verify all significant testing equipment associated with tests covered by the scope of this standard which the agency performs. As a minimum, the equipment listed in 8.5.2 shall be included if it is associated with tests performed by the agency. Applicable equipment shall be calibrated or verified at the intervals specified in the agency's QSM. The intervals specified in the QSM shall be no greater than those indicated in 8.5.2 (see Note 4). Newly acquired equipment without manufacturer's certification and equipment that has not been calibrated or verified because it has been removed from service shall be calibrated or verified before being placed in service. The agency shall have detailed written procedures for all in-house calibration and verification activities not addressed in standards. These procedures shall indicate the equipment required to perform the calibration or verification. In addition to standard test method requirements, the conditions listed in 8.5.2 shall be met.

8.5.1 *Calibration and Verification Records*—The agency shall maintain calibration and verification records for all equipment specified in the QSM. Such records shall include:

8.5.1.1 Description of the equipment calibrated or verified, including identification of the specific piece of equipment using the equipment serial number or other unique identifying designator provided by the agency (see Note 5),



- 8.5.1.2 Date the work was done,
- 8.5.1.3 Identification of individual performing work,
- 8.5.1.4 Identification of calibration or verification procedure used,
- 8.5.1.5 The previous calibration or verification date and next due date,
- 8.5.1.6 Identification of any calibration or verification device used, and
- 8.5.1.7 Specific criteria required for each piece of equipment listed in 8.5.2.

8.5.2 *Masonry Test Equipment:*

8.5.2.1 *Balances and Weights*—Calibrate balances and weights at intervals not exceeding 12 months. Record shall include test points and corresponding percentage of error.

8.5.2.2 *Cube Molds and Tampers*—Verify cube molds and tampers for conformance to the design and dimensional requirements of Test Method C109/C109M. Verification shall be performed at intervals not exceeding 30 months.

8.5.2.3 *Compression Test Machine*—Compression test machine shall conform to the applicable requirements of Test Methods C67, C109/C109M, or C140 and have a capacity, loading range, and the appropriate heads and bearing plates for the specimens tested. Calibrate compression testing machines in accordance with Practices E4. Record shall include test points and corresponding percentage of error. Calibration shall be performed at intervals not exceeding 12 months.

8.5.2.4 *Flexural Bond Apparatus*—Flexural bond apparatus shall conform to the applicable requirements of Test Method C1072. Calibrate the load measuring apparatus in accordance with Practices E4. Record shall include test points and corresponding percentage of error. Calibration shall be performed at intervals not exceeding 12 months.

8.5.2.5 *Mechanical Shakers*—Verify the period of mechanical agitation of mechanical shakers for adequacy of sieving as described in Test Method C136. Record shall include length of time for the proper efficiency of sieving. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.6 *Mixers (for Specification C270)*—Inspect and verify mixers for conformance to the requirements of Practice C305. Verification shall be performed at intervals not exceeding 30 months.

8.5.2.7 *Cylindrical Molds*—Cylindrical molds shall comply with the requirements of Specification C470/C470M. Record shall include dimensions and results of water-tightness test. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.8 *Ovens*—Verify oven settings with a verified reference temperature measuring device. Record shall include oven settings, temperature reading at each oven setting, and adjustments if necessary. Verification shall be performed at intervals not exceeding twelve months.

8.5.2.9 *Sieve Accuracy*—Verify sieve accuracy at least annually on each sieve used for sieve analysis (Test Methods C117 and C136). Use any of the following methods of verification:

Method (1) Verification of each sieve in accordance with the procedures prescribed in the Annex of Specification E11.

Method (2) A comparison of the results of a split sample sieved on different sieve sets. Results shall be verified that a single operator precision is within the acceptable range of two results stated in the test method.

Method (3) Participation in a sieve analysis test in an aggregate proficiency sample program. Results shall be verified for multi-laboratory precision to be within the acceptable range of two results stated in the test method.

Each method of sieve verification shall include an inspection of the sieve cloth for punctures or obvious defects.

8.5.2.10 *Temperature Measuring Device*—Verify temperature measuring devices using a NIST-traceable reference temperature measuring device. Record shall include test points and readings at test points. Verification shall be performed at intervals not exceeding twelve months.

8.5.2.11 *Timers*—Verify timers for accuracy. Record shall include test points, readings at test points. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.12 *Water Retention*—Verify water retention apparatus for conformance to the applicable requirements of Test Method C1506. Verification shall be performed at intervals not exceeding 30 months.

8.5.2.13 *Air Content Measure*—Verify air content measure following the procedures described in Test Method C185. Verification shall be performed at intervals not exceeding 30 months.

8.5.2.14 *Flow Table*—Verify flow table using the calibration material described in Specification C230/C230M. Verification shall be performed at intervals not exceeding 30 months, and when table is moved.

8.5.2.15 *Cone Penetrometer*—Verify cone penetrometer for the applicable requirements of Test Method C780. Record shall include measured dimensions and masses. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.16 *Slump Cone and Tamping Rod*—Verify slump cone and tamping rod for the applicable requirements of Test Method C143/C143M. Record shall include measured dimensions. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.17 *Pressure Meter*—Calibrate pressure meter using the procedure found in Test Method C231. Record shall include determination of expansion factor; size of the calibration vessel used; and the reading of the meter at the calibration test point(s). Calibration shall be performed at intervals not exceeding 3 months.

8.5.2.18 *Volumetric Air Meter*—Verify volumetric air meter using the procedure found in Test Method C173/C173M. Record shall include dimensions and volume of meter and calibration cup. Verification shall be performed at intervals not exceeding 12 months.

8.5.2.19 *Measuring Devices*—Devices used to measure dimensions shall be verified to be accurate and readable to the precision required by the test methods where they are used. Verification record shall include test points used during verification, and readings at test points. Verification shall be performed at intervals not exceeding 12 months.

NOTE 4—When a maximum calibration or verification interval for a specific piece of test equipment is specified in a standard, the maximum



interval specified by this practice is intended to be the same as the maximum interval specified by the standard.

NOTE 5—When standard calibration procedures are used, the standard shall be referenced. When the procedure used has been prepared by the agency, the in-house designation shall be referenced. It shall be indicated if the work is performed by an outside agency.

NOTE 6—For calibration records for cube molds and tampers, mixers, water retention apparatus, air content measure, and flow table, documentation of equipment inspection by an evaluation authority is acceptable.

8.6 Inspection of Facilities—The agency shall have its laboratory procedures and equipment evaluated at intervals of approximately two years by an evaluation authority as evidence of its competence to perform the required test. Within 30 days of the receipt of the evaluation authority's written report, the agency shall address or correct any deficiencies cited in the report. The laboratory shall report corrections made to the evaluation authority or include a plan of action to implement the corrections in response to the on-site inspection report.

8.7 Agency Accreditation—The agency shall possess a certificate of accreditation, from a national authority as evidence that it meets the requirement of this practice.

8.8 Proficiency Sample Testing—The agency shall participate in applicable proficiency sample programs.

8.9 Test Records—The agency shall maintain test records that contain sufficient information to permit verification of any test reports. Records pertaining to testing shall include traceability of sample from source to agency, original observations, calculations, derived data, and an identification of personnel involved in sampling and testing. The agency shall prepare test reports that clearly, accurately, and unambiguously present the information specified in **Table 1**. The procedure for amending reports shall require that the previously existing report be clearly referenced when an amendment is made. The references shall establish a clear audit trail from the latest issuance or deletion to the original report and its supporting data.

NOTE 7—The requirements in **Table 1** apply to the report that is used to present the laboratory's test results in their final form. In some cases, a test report or test data sheet is the final form of the data.

8.10 Record Retention—Records pertaining to testing, equipment calibration and verification, test reports, internal quality system reviews, proficiency sample testing, test technician training and evaluation, and personnel shall be retained by the laboratory in a secure location for a minimum of one year.

NOTE 8—Although a one-year retention schedule is adequate in some instances, there are many circumstances when a longer retention may be advantageous to the agency. Records concerning the calibration and verification of equipment are an example. Retention schedules of this type

usually require such records to be held throughout the useful life of the equipment.

8.11 Traceability of Calibrations—The agency shall demonstrate conclusively that a particular instrument or artifact either has been calibrated by NIST or has been calibrated against another standard or physical constant through an unbroken chain of comparisons.

8.12 External Audit Records—The agency shall maintain records of any external audits and documentation describing how the deficiencies were corrected.

8.13 Proficiency Sample Records—The agency shall retain results of participation in proficiency sample programs including data sheets, summary reports, and documentation describing steps taken to determine the cause of poor results and corrective actions taken.

8.14 Test Methods and Procedures—The agency shall maintain copies of standard and nonstandard procedures for testing performed that is covered by the scope of the service offered by the laboratory and shall ensure that the procedures are the most current and are readily accessible to employees performing the work.

9. Quality System Manual (QSM) Requirements

9.1 The agency shall establish and maintain a QSM meeting the following requirements:

9.1.1 Organization and Organizational Policies:

9.1.1.1 The QSM shall contain the legal name and address of the agency and that of the main office or company, if different, and any other information needed to identify the organization.

9.1.1.2 The QSM shall contain the ownership and management structure of the agency. Names, affiliations, and positions of principal and directors shall be listed.

9.1.1.3 The QSM shall contain an organization chart showing relevant internal organizational components.

9.1.1.4 The QSM shall contain a list showing relevant technical services offered.

9.1.1.5 The QSM shall contain a list showing applicable dates of the qualifications, accreditations, and recognition of the agency by others.

9.2 Staff:

9.2.1 The QSM shall contain an outline or chart showing operational personnel positions and their lines of authority and responsibility.

9.2.2 The QSM shall contain position descriptions for each technical operational position shown on the agency's organization chart in testing areas covered by the scope of this practice. These descriptions shall identify the position and include a description of the duties associated with the position, required skills, education and experience, and supervision exercised and received. A reference to where the required position descriptions may be found is acceptable if they are not included in the QSM.

9.2.3 The QSM shall contain a brief biographical sketch, noting the education, work experience, licensure, and certifications of technical staff involved in testing areas covered by

TABLE 1 Test Report Requirements (see Note 7)

—Name and address of the testing laboratory
—Identification of the report and the date issued
—Name and address of the client or identification of the project
—Description and identification of the test sample
—Date of receipt of the test sample
—Date(s) of test performance
—Identification of the standard test method used and a notation of any known deviations from the test method
—Test results and other pertinent data required by the standard test method
—Name of the person(s) accepting technical responsibility for the test report

the scope of this practice. Alternatively, the QSM may contain a reference to the location of the biographical sketches.

9.2.4 The QSM shall contain a document that describes the method(s) used to ensure that all agency technical staff are trained and qualified to perform tests covered by the scope of this practice. In addition to the description of training methods, the document shall indicate which position(s) or employee(s) is responsible for the agency training program and maintenance of training records.

NOTE 9—There may be several methods employed for differing conditions of staff experience and background, including on-the-job apprentice training (one on one) for new employees with little or no experience in laboratory or inspection work; formal in-house training sessions for certification, rating, or competency evaluation; and training by external organizations. An individual with prior experience performing a specific test need only have competency confirmed by the agency.

9.2.5 The QSM shall contain a document describing the method(s) used to evaluate staff competency to ensure that each test covered by the scope of this practice is performed in accordance with standard procedures. This description shall include the frequency of evaluations for each technician and indicate which position(s) or employee(s) is responsible for evaluating staff competency and maintaining records. These procedures shall ensure that each technician performing the test method is evaluated.

NOTE 10—Proficiency sample testing may be useful in evaluating staff competency, however, it should be used in conjunction with observation with actual testing performed.

9.2.6 The QSM shall contain a form(s) for recording training and competency evaluations activities summarized under 9.2.4 and 9.2.5 including the name of the trainee, name of the evaluator, test method evaluated, the date, and results. The manual shall require that the agency maintain these forms and other information for a sufficient period to permit verification of any training and competency evaluations. Performance evaluation forms shall be maintained at the frequency required in the QSM.

9.3 Facilities and Equipment:

9.3.1 *Inventory*—The QSM shall contain an inventory of major sampling, testing, calibration, and verification equipment associated with the test methods covered by the scope of this practice. A reference to where the inventory is located is acceptable if it is not included in the QSM. The inventory shall include, for each piece of major equipment, the name, manufacturer, and model, serial number or any unique identifying designator defined by the agency, as applicable.

NOTE 11—An identification number assigned by the agency or other unique identifying information may be substituted for the model and serial number if this is the practice normally followed by the agency.

NOTE 12—Major equipment includes equipment such as shakers, physical or chemical analysis instruments, balances, baths, ovens, microscopes, molds, and computing equipment dedicated to testing. Equipment such as chairs, desks, and file cabinets may be excluded. Major equipment does not usually include expendable items such as miscellaneous glassware, sieves, scrapers, and tampers.

9.3.2 Equipment Calibration and Verification:

9.3.2.1 The QSM shall contain a list(s) giving a general description of equipment for performing tests covered by the scope of this practice that require calibration or verification.

For each item listed the list shall include the interval of calibration or verification, a reference to the calibration or verification procedures used (see Note 12) and the location of calibration and verification records.

NOTE 13—In addition to being in the QSM, this information may also be included in the calibration and verification records on each piece of equipment.

9.3.2.2 The QSM shall contain a document that describes the agency's method for ensuring that the calibration and verification procedures are performed for all required equipment at the specified intervals. This document shall include the position of the individual(s) responsible for ensuring that calibration and verification activities are carried out and procedures for handling equipment that is new, removed from service, out of calibration, or defective.

9.3.2.3 The QSM shall contain in-house equipment calibration and verification procedures, when they cannot be referenced in applicable standards or have a reference to their location.

9.3.2.4 The QSM shall contain certificates or other documents that establish the traceability of in-house equipment or reference standards used for calibration or verification or have a reference to their location in the agency.

9.4 Test Records and Reports:

9.4.1 The QSM shall contain a document that describes methods used by the agency to produce test results and to prepare, check, and amend test reports.

9.4.2 The QSM shall contain typical test report forms that illustrate the manner in which test results and supporting information (see 8.9) are documented.

NOTE 14—A printout showing a typical test record is acceptable if the agency uses electronic media for report storage.

9.5 *Sample Management*—The QSM shall contain a document describing procedure(s) for sample identification, storage, retention, and disposal of samples.

NOTE 15—In this context, the term “storage” refers to what is done before testing. The term “retention” refers to what is done after testing.

9.6 Diagnostic and Corrective Action:

9.6.1 The QSM shall contain a document(s) describing participation in proficiency sample and on-site inspection programs, method used to identify poor results, and procedures followed when poor results occur or deficiencies occur.

9.6.2 The QSM shall contain a document outlining the method(s) used in responding to external technical complaints.

9.7 *Internal Quality System Review*—The QSM shall contain a document describing the scope of internal quality system reviews, establishing the frequency of these reviews, identifying individuals responsible for the review, describing the distribution of reports to managements, and identifying the location of resulting records.

9.8 *Subcontracting*—The QSM shall contain a document describing the policies that the agency follows relative to subcontracting, if it engages in such activities. A reference to where the policies may be found is acceptable if they are not included in the QSM. These policies shall include procedure followed by the agency in selecting competent subcontractors

who meet the requirements of this practice and reporting the results of testing performed by subcontractors. If the agency does not engage in such activities, the QSM shall contain a statement to that effect.

10. Keywords

10.1 evaluation; human resources; masonry material testing; organization; physical resources; qualifications and minimum requirements; quality control; quality system manual; quality systems; records

SUMMARY OF CHANGES

Committee C15 has identified the location of selected changes to this standard since the last issue (C1093 – 15) that may impact the use of this standard. (December 15, 2015)

(1) Revised 7.2 to provide clarification of experience requirements.

Committee C15 has identified the location of selected changes to this standard since the last issue (C1093 – 13a^{e1}) that may impact the use of this standard. (June 1, 2015)

(1) Section 7 was revised to provide clarification of experience requirements.

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