



## Designation: C511 – 13

# Standard Specification for Mixing Rooms, Moist Cabinets, Moist Rooms, and Water Storage Tanks Used in the Testing of Hydraulic Cements and Concretes<sup>1</sup>

This standard is issued under the fixed designation C511; 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 specification includes requirements for mixing rooms where paste and mortar specimens are prepared; and for moist cabinets, moist rooms, and water storage tanks where paste, mortar, and concrete specimens are stored.

1.2 The values stated in SI units are to be regarded as standard. No other units of measurement are included in this standard. Values in SI units shall be obtained by measurement in SI units or by appropriate conversion, using the Rules for Conversion and rounding given in Standard [IEEE/ASTM SI 10](#), of measurements made in other units.

1.3 *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>

[C51 Terminology Relating to Lime and Limestone \(as used by the Industry\)](#)

[E77 Test Method for Inspection and Verification of Thermometers](#)

[IEEE/ASTM SI 10 Standard for Use of the International System of Units \(SI\): The Modern Metric System](#)

## 3. Terminology

3.1 *Definitions:*

3.1.1 *mixing room, n*—a room with controlled temperature and relative humidity where cement paste and mortar specimens are prepared.

<sup>1</sup> This specification is under the jurisdiction of ASTM Committee [C01](#) on Cement and is the direct responsibility of Subcommittee [C01.95](#) on Coordination of Standards.

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

3.1.2 *moist cabinet, n*—a compartmented storage facility of moderate dimensions with controlled temperature and relative humidity.

3.1.3 *moist room, n*—a “walk-in” storage facility with controlled temperature and relative humidity, commonly called a fog room when the prescribed relative humidity is achieved by the atomization of water.

## 4. Requirements for Cement Mixing Rooms

4.1 The temperature of the air in the vicinity of the mixing slab, molds, and base plates shall be maintained at  $23.0 \pm 4.0$  °C and at a relative humidity of not less than 50 %.

4.2 The temperature of the mixing water used to prepare cement paste and mortar specimens shall be  $23.0 \pm 2.0$  °C.

## 5. Temperature Measuring Devices

5.1 *Reference Temperature Measuring Device*—used to verify the temperature recorder, must be accurate and readable to 0.5 °C. A copy of the certificate or report which verifies the accuracy shall be available in the laboratory.

NOTE 1—The ice-point method described in Test Method [E77](#) may be used to ensure that no damage to the reference thermometer has occurred during shipping.

5.2 *Temperature Recorder*—shall record temperatures every 15 min or less and shall be accurate and readable to 1 °C. The data from the recorder shall be evaluated at a minimum of once each week. A record of this evaluation documenting the date checked, a confirmation that the data is within the required temperature range, and the name of the individual performing this evaluation shall be maintained in the laboratory. ([Note 2](#))

NOTE 2—This requirement may be satisfied by an initialed and dated temperature recorder chart. Brief changes in the temperature due to door openings should be ignored.

5.2.1 The temperature recorder shall be verified at least every six months or whenever there is a question of accuracy.

5.2.1.1 For moist cabinets and rooms, position the reference temperature measuring device in a readable position in air as near as practical to the temperature recorder probe. Keep the door closed for at least 5 min prior to taking readings. Record the temperature readings of both the temperature recorder and

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

the reference temperature measuring device. When taking these readings, the reference temperature measuring device shall remain in the moist cabinet or room and read immediately upon opening the door.

5.2.1.2 For water storage tanks, position the reference temperature measuring device in a readable position in water as near as practical to the temperature recorder probe. Without removing the reference temperature measuring device from the water, record the temperature readings of both the temperature recorder and the reference temperature measuring device after the temperatures have stabilized.

5.2.1.3 Verify the accuracy of the temperature recorder by comparing the reading of the temperature recorder with that of the reference temperature measuring device during the normal operation of the moist cabinet, moist room or water storage tanks. If the difference between the temperature readings is greater than  $1^{\circ}\text{C}$ , the temperature recorder shall be adjusted to within  $0.5^{\circ}\text{C}$  of the reference temperature measuring device.

## 6. Requirements for Moist Cabinets and Moist Rooms

6.1 *General*—Except during those times when specimens are being placed into or removed from storage, maintain the atmosphere in a moist cabinet or moist room at a temperature of  $23.0 \pm 2.0^{\circ}\text{C}$  and a relative humidity of not less than 95 %. Maintain atmospheric conditions within a moist cabinet or moist room such that test specimens in storage are saturated with moisture to the degree needed to ensure that the exposed surfaces of all specimens in storage both look moist and feel moist (See Note 5). Equip all moist cabinets and moist rooms with a temperature recorder. The use of humidity recording devices is optional. Keep shelves on which fresh specimens are placed level.

6.1.1 The air temperature inside the moist cabinet or moist room shall be controlled with provisions made for heating or cooling, or both, as may be necessary. This shall be accomplished in one of two ways:

6.1.1.1 Thermostatically control the air temperature within the moist cabinet or moist room when surrounding space is not conditioned. In this case the sensing element for the controls shall be located inside the moist cabinet or moist room.

6.1.1.2 Thermostatically control the space surrounding the moist cabinet or moist room and manually control the temperature within the moist cabinet or moist room.

6.1.2 In either of the preceding cases, the laboratory shall demonstrate the ability of the controls to maintain the required temperature in the moist cabinet or moist room over an extended period of time. Data from the temperature recorder that indicates that the temperatures are within the temperature limits specified in 6.1 shall be required as evidence of this ability.

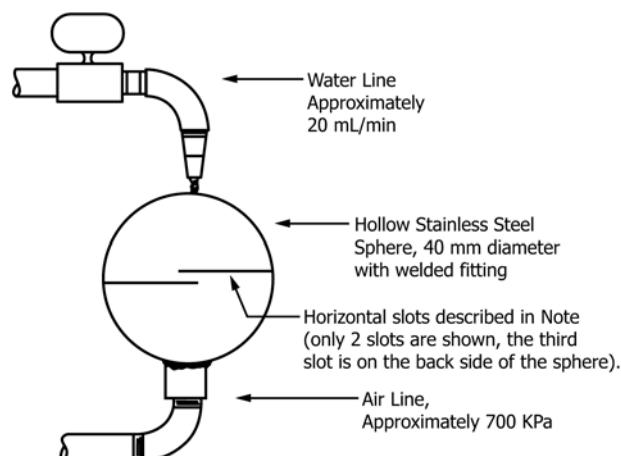
6.2 *Moist Cabinets*—A moist cabinet shall be constructed of durable materials and the doors shall be tight-fitting. The specified relative humidity shall be maintained by the use of one or more fog sprays, water sprays, or curtains of water on the inner walls that are so directed that the discharge will collect in a pool at or near the bottom of the moist storage section.

### 6.3 *Moist Rooms*:

6.3.1 *General*—The walls of a moist room shall be constructed of durable materials, and all openings shall be provided with tight-fitting doors or windows (Note 3). The specified relative humidity may be maintained in any convenient and suitable manner (Note 4).

NOTE 3—Well insulated walls will substantially help maintain necessary conditions.

NOTE 4—A fog spray found suitable for this purpose is shown in Fig. 1.



NOTE 1—Cut three horizontal air slots around circumference of hollow sphere using a 0.20 mm thick diamond lapidary saw covering  $120^{\circ}$  to  $150^{\circ}$  each and spaced approximately 5 mm apart. Air passing through these slots strikes the water (which is flowing over the outer surface of the sphere) to produce a spray.

**FIG. 1 Example of a Fog Spray for Maintaining Relative Humidity in Moist Rooms (Full Scale)**

6.3.2 *Moist Rooms Used in Cement Testing*—Durable shelving that is properly shielded to prevent droplets of water from falling on the surfaces of freshly molded specimens shall be available within each moist room.

6.3.3 *Moist Rooms Used in Concrete Testing*—Maintain atmospheric conditions within each moist room such that test specimens in storage both look moist and feel moist (See Note 5). Do not expose specimens to dripping or running water.

NOTE 5—Maintenance of adequate water spray(s) and adequate spray distribution in the moist room will result in stored specimens looking and feeling moist and will maintain the required humidity. Inadequate numbers of spray nozzles, partially obstructed spray nozzles, or disturbances in the moist air system such as open doors, air-conditioning or heating drafts, or overly crowded shelf space may result in relative dry spots. Specimen surface texture and age can influence the surface appearance and should be considered when specimens in localized areas do not look and feel moist.

## 7. Requirements for Water Storage Tanks

7.1 *General*—Tanks shall be constructed of non-corroding materials. Maintain storage water temperature at  $23.0 \pm 2.0^{\circ}\text{C}$ , except for those times when specimens are being placed into or removed from storage, or tank maintenance is being performed.

**7.1.1 Tank Temperature Controls**—Provision for automatic control of water temperature at  $23.0 \pm 2.0$  °C shall be made where a tank is located in a room not having temperature controlled within the specified range and in any other instance where difficulty in maintaining temperatures within the specified range is encountered. With the exception of water storage tanks located in a moist room or moist cabinet, all water storage tanks shall be equipped with a temperature recorder with its sensing element in the storage water. For the purpose of temperature recording, a group of water storage tanks may be considered one tank if the following three conditions are met: (1) all the tanks are interconnected with tubing that allows the water to flow between the tanks, (2) some means of circulation is provided between tanks, and (3) temperature variation between the tanks must not exceed 1.0 °C when checked and recorded weekly.

**7.2 Tank Storage Water**—The water in a storage tank shall be saturated with calcium hydroxide to prevent leaching of calcium hydroxide from the specimens (**Note 6**). Water not saturated with calcium hydroxide (high-calcium hydrated lime) may affect test results due to leaching of lime from the test specimens and shall not be used in storage tanks. To maintain

saturation with calcium hydroxide, excess calcium hydroxide shall be present. For the purposes of lime saturation to prevent leaching, lime means high-calcium hydrated lime, not calcium carbonate (limestone)—see Terminology **C51**. The water in the storage tank shall be thoroughly stirred at intervals not to exceed one month to help replace calcium ions that have depleted. Tanks shall be cleaned and refilled with water containing 3 g/L of calcium hydroxide at intervals not to exceed 24 months (**Note 7**).

**NOTE 6**—pH is not a reliable indicator of lime saturation in storage tank water since severe reductions in dissolved calcium ions can occur before pH values are significantly reduced.

**NOTE 7**—The 3 g/L level is intended to provide a quantity of calcium hydroxide approximately two times that required for initial saturation.

**7.2.1** Do not use continuously running fresh water or demineralized water in storage tanks because it may affect test results due to excessive leaching. A closed system, circulating the saturated lime water between or among storage tanks, may be used.

## 8. Keywords

cement paste; concrete; mixing room; moist cabinets; moist rooms; mortar; water storage tanks

## SUMMARY OF CHANGES

Committee C01 has identified the location of selected changes to this standard since the last issue (C511–09) that may impact the use of this standard. (Approved Dec. 1, 2013.)

### (1) Revised Section **7**.

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