



# 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 C 511; 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 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:

C 911 Specification for Quicklime, Hydrated Lime, and Limestone for Chemical Uses<sup>2</sup>

E 77 Test Methods for the Inspection and Verification of Thermometers<sup>3</sup>

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI): The Modern Metric System<sup>4</sup>

## 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.

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  $23.0 \pm 4.0^\circ\text{C}$  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  $23.0 \pm 2.0^\circ\text{C}$ .

## 5. Requirements for Moist Cabinets and Moist Rooms

5.1 *General*—The atmosphere in a moist cabinet or moist room shall have a temperature of  $23.0 \pm 2.0^\circ\text{C}$  and a relative humidity of not less than 95 %. The moisture in the atmosphere shall be saturated to the degree needed to ensure that the exposed surfaces of all specimens in storage will both look moist and feel moist at all times. All moist cabinets and moist rooms shall be equipped with recording thermometers. The recording thermometer shall be calibrated at least every six months or whenever there is a question of accuracy. Perform the verification of the recording thermometer by comparing the temperature reading of the recording thermometer with the temperature reading of a reference thermometer during the normal operation of the moist cabinet or moist room. The thermometer used as the reference thermometer must be accurate and readable to  $0.5^\circ\text{C}$ . A copy of the certificate or report which verifies the accuracy shall be available in the laboratory (Note 1). Position the reference thermometer in a readable position in air as near as is practical to the recording temperature probe. Keep the door to the moist cabinet or moist room closed for at least 5 min prior to taking readings. Record the temperatures of both the recording thermometer and the reference thermometer. When taking these readings, the reference thermometer shall remain in the moist cabinet or moist room and be read immediately upon opening the door. If the difference between the two temperatures is greater than  $1^\circ\text{C}$ , the recording thermometer shall be adjusted to within  $0.5^\circ\text{C}$  of

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<sup>2</sup> *Annual Book of ASTM Standards*, Vol 04.01.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 14.03.

<sup>4</sup> *Annual Book of ASTM Standards*, Vol 14.02.

the reference thermometer. The use of humidity recording devices is optional. Shelves on which fresh specimens are placed shall be level.

NOTE 1—The ice-point method describe in Test Method E 77 may be used to ensure that no damage to the reference thermometer has occurred during shipping.

5.1.1 The air in a moist cabinet or moist room must be nearly saturated with moisture in order to provide specified storage conditions. In many cases, saturation is below optimum during periods when specimens are being placed in or removed from storage. Measurements of relative humidity should not be made at such obviously inopportune times.

5.1.2 The recordings from the recording thermometers shall be audited in order to ascertain the adequacy of the mechanisms used to control the moist cabinet or moist room air temperature.

5.1.3 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:

5.1.3.1 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.

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

5.1.4 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. Charts from the recording thermometer that indicate that the temperatures are within the temperature limits specified in 5.1 shall be required as evidence of this ability.

5.2 *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.

5.3 *Moist Rooms:*

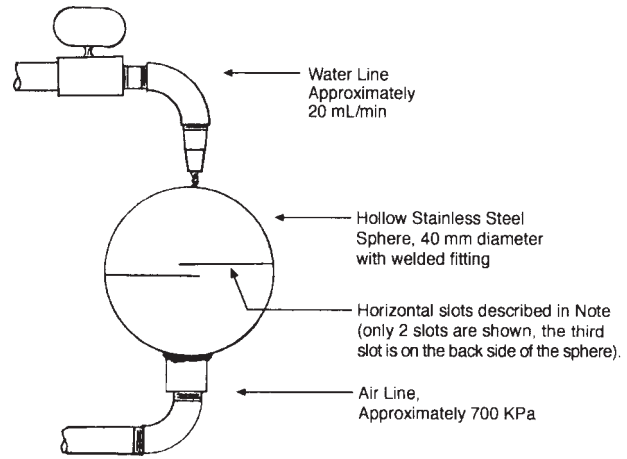
5.3.1 *General*—The walls of a moist room shall be constructed of durable materials, and all openings shall be provided with tight-fitting doors or windows (Note 2). The specified relative humidity may be maintained in any convenient and suitable manner (Note 3).

NOTE 2—Well insulated walls will substantially help maintain necessary conditions.

NOTE 3—A fog spray found suitable for this purpose is shown in Fig. 1.

5.3.2 *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.

5.3.3 *Moist Rooms Used in Concrete Testing*—Atmospheric conditions within each moist room shall be such that test specimens in storage shall have free water maintained on their



NOTE 1—Cut three horizontal air slots around circumference of hollow sphere using a 0.20 mm thick diamond lapidary saw covering 120° to 150° 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)

entire surface area at all times. Specimens shall not be exposed to dripping or running water.

6. Requirements for Water Storage Tanks

6.1 *General*—Tanks shall be constructed of noncorroding materials. Provision for automatic control of water temperature at  $23.0 \pm 2.0^\circ\text{C}$  shall be made where a tank is located in a room not having temperature controlled within that 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 recording thermometer 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  $1.0^\circ\text{C}$  when checked and recorded weekly. Water storage recording thermometers shall be checked for accuracy at least every six months by comparing their output with that of a reference thermometer placed in the water adjacent to the probe of the recording thermometer. Record the temperatures of both the recording thermometers and the reference thermometer. Adjustments shall be made to the recording thermometer if the difference in the observed readings exceed  $1^\circ\text{C}$ . The adjusted reading of the recording thermometer shall be within  $0.5^\circ\text{C}$  of the reference thermometer. The requirements for the reference thermometer are listed earlier in the *General* Section of this specification. The water in a storage tank shall be saturated with calcium hydroxide to prevent leaching of calcium hydroxide from the specimens (Note 4). 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 calcium hydroxide only (hydrated lime, such as Type CH, meeting the requirements of Specification C 911), not calcium carbonate. 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 5).

NOTE 4—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 5—The 3 g/L level is intended to provide a quantity of calcium hydroxide approximately two times that required for initial saturation.

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

## 7. Keywords

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

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