

**DEPARTMENT OF TRANSPORTATION**  
ENGINEERING SERVICE CENTER  
Transportation Laboratory  
P. O. Box 19128  
Sacramento, California 95819



## METHOD OF TEST FOR WATER RETENTION EFFICIENCY OF LIQUID MEMBRANE-FORMING CONCRETE CURING COMPOUNDS

**CAUTION:** Prior to handling test materials, performing equipment setups, and/or conducting this method, testers are required to read “**SAFETY AND HEALTH**” in Section J of this method. It is the responsibility of the user of this method to consult and use departmental safety and health practices and determine the applicability of regulatory limitations before any testing is performed.

### A. OVERVIEW

This test method, which is a modification of AASHTO Designation: T 155 and ASTM Designation: C 156, describes the laboratory procedure for determining the efficiency of liquid membrane-forming curing compounds in preventing moisture loss from concrete during the early hardening period.

### B. APPARATUS

1. **Molds**—Molds shall be rigid water-tight pans 150 by 300 mm at the top, 145 by 295 mm at the bottom, within 6 mm, and  $50 \pm 3$  mm in depth on the inside. Molds shall have a flat rim at the top on all sides, approximately 6 mm in width. It is recommended that this rim be reinforced by welding a 6-mm rod around the outside perimeter of the pan, just beneath the rim.
2. **Metal Plates:** Metal plates shall be 150 by 300 mm with edges raised slightly to retain sprayed compound.
3. **Curing Cabinet:** The cabinet for curing the specimens shall be maintained at  $37.8 \pm 1.1^\circ\text{C}$  and a relative humidity of

$32 \pm 2$  %. Air flow shall be sufficient to remove the solvent vapors quickly, but no detectable air current shall strike directly on the surface of any test specimen stored in the cabinet.

### C. MATERIALS

1. Graded standard sand conforming to the requirements of ASTM Designation: C 778.
2. Portland Cement, Type II. *DO NOT USE CONCRETE ADMIXTURES OR AIR-ENTRAINING CEMENT IN THIS TEST.*

### D. PREPARATION OF SPECIMEN MOLDS

Thoroughly clean the molds before each use and apply a thin coating of a suitable mold release compound.

### E. PREPARATION OF MORTAR TEST SPECIMENS

Machine mix all batches of mortar at room temperature ( $23 \pm 2^\circ\text{C}$ ) following the schedule given for mixing mortars in ASTM Designation: C 156.

1. Number of Test Specimens

- a. The test shall consist of two specimens. Prepare each specimen from a separate batch of mortar.
2. Proportioning and Mixing Mortar
  - a. Trial Batch. Whenever a new lot of cement or sand is to be used, prepare a trial batch of mortar having a water-cement ratio of 0.4 with sufficient sand to produce a flow of  $35 \pm 5$ , as measured in ASTM Designation: C 87. Use these proportions in preparing subsequent test batches.
  - b. Mortar for Test Specimens. Using the mix proportion determined by the trial batch, prepare sufficient mortar to fill a 300 by 50 by 150-mm pan.
3. Molding Specimens. Place the mortar in the mold in two approximately equal layers. Consolidate each layer by tamping or with a mechanical vibrator. Avoid over vibration. Strike off the excess mortar and finish the surface with a wooden screed having a flat, 50-mm wide screeding surface. Advance the screed along the long axis of the specimen using a circular motion. Do not work the surface more than necessary to produce a reasonably even finish.
4. Storage of Specimens
  - a. After molding, place the specimens in the curing cabinet in a level position. Space the specimens uniformly on the shelf with a clear space of from 50 to 350 mm on all sides of each specimen. Use dummy specimens to replace test specimens when a shelf is not filled with test specimens.
  - b. Remove test specimen from the cabinet  $1\frac{1}{4}$  to  $1\frac{3}{4}$  h after molding. Use a putty knife or paint scraper to form a "V" shape groove approximately 3-mm deep and not over 1.5-mm wide between the edge of the mortar and the mold. (Mortar should be dry enough that the groove

will not collapse or fill with water). Fill the groove with a sealant which will remain pliable at 38°C and which is resistant to the solvents in the curing compound. Return the specimen to the cabinet for approximately  $\frac{1}{2}$  h.

- c. Test the mortar surface condition by rubbing a small area with the finger tip. The specimen shall be ready for brushing when rubbing produces only a few fine bubbles. Brush the entire surface of the mortar lightly in the longitudinal direction with a 50-mm brush. (Brushing shall be just sufficient to remove the sheen from the surface).

#### F. APPLICATION OF CURING COMPOUND

1. Mortar Specimens: Immediately after brushing, weigh the mortar specimen to the nearest 1 g. With a suitable spray gun, and, unless otherwise specified, apply 10 g of curing compound in a uniform coating on the mortar specimen. Keep overspray to a minimum. Wipe off any drops of compound which may adhere to the under surface of the rim, but do not attempt to remove compound from upper surface of the rim of the pan. Determine the actual rate of application by reweighing the mortar specimen immediately after applying the curing compound.
2. Metal Plate: Weigh the metal plate to the nearest 1 g. Apply 10 g of curing compound in the same manner used for the mortar specimen. Determine the actual rate of application by reweighing the plate immediately after applying the curing compound.

#### G. TESTING OF TREATED SPECIMENS

After applying the compound and reweighing the samples, place the mortar specimens and the metal plate in the curing cabinet. Cure for 24 h at  $37.8 \pm 1.1^\circ$  C and  $32 \pm 2$  % relative humidity. Then remove the specimens from

the curing cabinet and weigh the container to the nearest 1 g.

#### H. CALCULATION

1. Calculate the total mass lost by each mortar specimen as the mass of the specimen immediately after applying the curing compound, less the mass of the specimen after the 24-h curing period.
2. Calculate the volatile loss of the curing compound, in g, as the mass of the metal plate immediately after applying the compound, less the mass of the plate after 24 h in the curing cabinet.
3. Calculate the water loss, in g, from each mortar specimen as the total mass lost by the specimen less the volatile loss of the curing compound.

#### I. REPORTING OF RESULTS

Record all masses, calculations and results of this test on Form TL-6054A.

#### J. SAFETY AND HEALTH

This method involves procedures that require handling of various materials

personnel thoroughly trained in safety precautions associated with their use. Personnel shall comply with the requirements for Safe Laboratory Practices contained in the Caltrans Laboratory Safety Manual. Specific safety precautions will at the minimum require use of proper lifting techniques, suitable protective clothing, safety glasses and gloves. Curing compounds may vary between batches and manufacturers. It should never be assumed that the specific hazards of each type compound from different manufacturers are the same. Prior to handling any curing compound, personnel are required to consult the manufacturer's Material Safety Data Sheet (MSDS) for the material and follow all precautions that are outlined.

#### REFERENCES:

AASHTO Designation: T 155  
ASTM Designations: C 87, C 109, C 156 and C 305

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that have physical and chemical hazards and shall only be performed by