

**OHD L-17  
METHOD OF TEST FOR  
WATER RETENTION EFFICIENCY OF LIQUID  
MEMBRANE-FORMING COMPOUNDS FOR CURING CONCRETE**

1. **SCOPE.** This method is intended for laboratory use in determining the efficiency of liquid membrane-forming compounds for curing concrete as measured by their ability to prevent moisture loss during the early hardening period.
2. **APPARATUS.** The apparatus shall consist of the following:
  - a. **Molds:** The molds shall be Number 209 (23 cm.) Pyrex pie plates. They shall be thoroughly cleaned before each use.
  - b. **Curing Cabinet:** A cabinet for curing the specimens at a temperature of  $100^{\circ}\text{F} \pm 2^{\circ}\text{F}$  ( $37.8^{\circ}\text{C} \pm 1^{\circ}\text{C}$ ) and a relative humidity of  $32.5 \pm 2.5$  percent.
  - c. **Balance:** A balance capable of weighing 2 kilograms to the nearest 0.1 gram.
  - d. **Mortar-Mixing Machine:** A suitable mortar-mixing machine and its auxiliary equipment meeting the requirements of AASHTO T 162.
3. **MORTAR.**
  - a. **Proportioning.** The proportions of cement (Note 1) and sand (Note 2) shall be determined by adding dry sand to a cement paste having a water-cement ratio of 0.40 to produce a flow of  $35 \pm 5$ . The flow test shall be done as described in AASHTO T 137.

**NOTE 1:** Portland cement shall conform to the requirements for Type I of the Standard Specifications for Portland Cement (AASHTO M 85).

**NOTE 2:** The sand for making test specimens shall conform to AASHTO T 106.
  - b. **Mixing.** The mortar shall be mixed at room temperature, preferably  $70^{\circ}$  to  $80^{\circ}\text{F}$  ( $21^{\circ}$  to  $27^{\circ}\text{C}$ ) and at a humidity of 40 to 60 percent. The materials for the mix will be at room temperature. The water and cement shall be placed in a non-absorbent mixing bowl and allowed to set for one (1) minute, then blended at a low speed for one (1) minute. The sand portion is then blended as follows:
    - i. Add  $\frac{1}{3}$  of sand and blend for one (1) minute.
    - ii. Add  $\frac{1}{3}$  of sand and blend for one (1) minute.
    - iii. Add the remainder of the sand and blend for one (1) minute. Allow the mixture to set for one (1) minute, scrape the mortar from the sides of the bowl with a rubber spatula, then blend for one (1) minute.
  - c. The mix used to determine the proportion of sand to cement to produce the specified consistency shall be discarded and not used in making the test specimens.
4. **MOLDING SPECIMENS.** A layer of mortar shall be placed in a greased (Note 3), tared mold (TW) to a depth of  $\frac{1}{2}$  inch (13 mm) and puddled with the fingers until distributed, then the mold is filled, puddled with the fingers and struck off with one pass of the strike off tool using a sawing motion. Clean edge of mold with dry towel, forming a groove for the sealer. Weigh the mold and mortar to the nearest 0.1 gram ( $W_1$ ). The specimen will remain in the mold during the entire period of test.

**NOTE 3:** A heavy-bodied grease, such as wheel bearing grease, has been found satisfactory for this purpose.

5. **NUMBER OF SPECIMENS.** A set of two (2) specimens shall be made in order to constitute a test of a given curing material.
6. **STORAGE OF SPECIMENS.** Immediately after molding, the specimens shall be placed in the curing cabinet where they shall remain until the surface water has disappeared.  
 The specimens shall be level and not subject to vibration. Spacing of the specimens shall be so arranged that movement of the conditioned air within the cabinet will readily evaporate the surface water.

7. **COMPOUND APPLICATION.**

- a. The specimens shall be removed from the curing cabinet immediately upon disappearance of surface water. Brush the specimen with a stiff bristle, one inch brush.
- b. Weigh the previously heated sealer (Note 4) and container ( $C_1$ ), then seal the specimen around the edge to prevent moisture loss. Weigh the sealer and container at the end of this operation ( $C_2$ ). Weigh the sealed specimen ( $C_1 - C_2$ ) +  $W_1$ .

**NOTE 4:** A paraffin, such as that used in home canning, has been found satisfactory for this purpose.

- c. Application of curing compound shall be at the rate of 200 square feet per gallon (4.9 m<sup>2</sup> per Liter).
- d. The mortar surface to be sprayed shall have neither surface water on it nor be dry below the surface. The specimen shall be placed on a balance and weighed ( $W_2$ ). An additional weight, equal to the amount of curing compound to be applied ( $W_3$ ), will be placed on the balance. A uniform coating of the curing compound being tested will be sprayed on the specimen, while on the balance, by means of an air-gun until the correct amount has been applied.
- e. The foregoing operations shall be performed promptly and the specimens returned to the curing cabinet for a period of 72 hours. The cabinet must be ventilated during the first 24 hours to permit the solvent vapors to be eliminated from the cabinet. At the end of the 72 hour period, the sample will be removed from the cabinet and weighed ( $W_4$ ).
8. **CALCULATIONS.** All weights are determined to the nearest 0.1 gram unless otherwise noted. The percent water loss at the end of 72 hours shall be calculated by the following formula:

$$\% \text{ Water Loss} = \frac{W_1 + (C_1 - C_2) + (W_3 \times NV) - W_4}{M (W_1 - TW) - (W_1 + (C_1 - C_2) - W_2)} \times 100$$

Where:

- |             |   |  |
|-------------|---|--|
| TW          | = | Tare Weight of mold + lubricant.   |
| M           | = | Initial Water Content (decimal form)   |
| NV          | = | Non-Volatile Membrane (3 hours @ 230° F (110° C)) - weighed to nearest 0.01 gram |
| $W_1$       | = | Weight of wet mortar and mold  |
| $W_2$       | = | Sealed, surface dry mortar and mold  |
| $C_1 - C_2$ | = | Quantity of sealer used to seal specimen and mold                                |
| $W_3$       | = | Weight of curing compound tested   |
| $W_4$       | = | Weight of specimen and mold after 72-hour test period                            |