



**SECTION 03 39 00**  
**CONCRETE CURING**

**PART 1 GENERAL**

1.01 SECTION INCLUDES

- A. CONTRACTOR shall furnish all labor, tools, and equipment for curing plain, reinforced, and post-tensioned, and cast-in-place concrete.

1.02 RELATED WORK

- A. The following is a list of SPECIFICATIONS which may be related to this section:
  - 1. Section 03 15 00, Construction Joints.
  - 2. Section 03 31 00, Structural Concrete.
  - 3. Section 03 35 00, Concrete Finishing.

1.03 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
  - 1. American Concrete Institute (ACI):
    - a. 305.1, Specification for Hot Weather Concreting.
    - b. 306.1, Specification for Cold Weather Concreting.
    - c. 308.1, Standard Practice for Curing Concrete.
  - 2. ASTM International (ASTM):
    - a. C171, Standard Specification for Sheet Materials for Curing Concrete.
    - b. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - c. D2103, Standard Specification for Polyethylene Film and Sheeting.

1.04 SUBMITTALS

- A. Provide data on curing compounds, sheet materials, and methods of securing sheet materials in place.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver curing materials in manufacturer's original packaging including applicable instructions and manufacturer's safety data sheets (MSDS).



## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Sheet Materials for Curing Concrete: White burlap-polyethylene sheeting weighing not less than ten (10) ounces per linear yard, forty (40) inches wide, impregnated on one side with white opaque polyethylene 0.004 inch thick as specified in ASTM C171 shall be used when called out in the DRAWINGS or in other applicable SPECIFICATIONS. The polyethylene shall be securely bonded to the burlap so that there will be no separation.
- B. Liquid Membrane-Forming Compounds for Curing Concrete: Liquid membrane-forming compounds for curing concrete shall and conform to ASTM C309, Type 1-D with a red or white fugitive dye. Use a white dye unless otherwise directed by ENGINEER.
- C. Polyethylene Film: Polyethylene film shall conform to ASTM D2103. The film shall have a thickness of six (6) mils and be a white opaque color.
- D. Evaporative Retardant: Confilm manufactured by Master Builders, Inc. or approved equal.
- E. Water: Only water from sources approved by ENGINEER shall be used.
- F. Penetrating Sealer and Chloride Ion Screen: Masterseal SL40 by Master Builders, Inc. or approved equal.
- G. Organic Corrosion Inhibiting Admixture: Rheocrete 222+ by Master Builders or approved equal.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Perform the WORK in accordance with this SPECIFICATION and in accordance with applicable ACI standards. When a conflict occurs between this SPECIFICATION and ACI, the ACI standard shall control. All materials shall be used in accordance with the manufacturer's printed instructions, a copy of which shall be on site.
- B. Beginning immediately after placement, concrete shall be protected from premature drying, excessively hot or cold temperatures, and mechanical injury, and shall be maintained with minimal moisture loss at a relatively constant temperature for the period necessary for hydration of the cement and hardening of the concrete in accordance with ACI 308.1. The materials and method of curing shall be subject to review and acceptance by ENGINEER. Specific curing requirements may be called out on the DRAWINGS.
- C. Curing shall be continued for at least seven (7) days. Alternatively, if tests are made of cylinders kept adjacent to the structure and cured by the same methods, moisture retention measures may be terminated when the average compressive strength has reached seventy percent (70%) of the specified concrete strength.



### 3.02 CURING METHODS

- A. Perform curing of concrete by curing compound, by moist curing, by moisture-retaining cover curing, or combinations thereof, as herein specified.
- B. Provide moisture curing by one of the following methods:
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with moisture retaining cover specified in Paragraph 2.01.A. Place cover to provide coverage of concrete surfaces and edges with four- (4-) inch lap over adjacent moisture retaining covers, and seal using waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- C. Provide liquid membrane curing compound specified in Article Materials to concrete surfaces as follows:
  - 1. Apply specified curing compound to concrete slabs within one (1) hour of final finishing operations or within one (1) hour of form removal. Apply uniformly in continuous operation by spray or roller in accordance with manufacturer's directions and these SPECIFICATIONS. Recoat areas subjected to heavy rainfall within three (3) hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Liquid Membrane Forming Compound and Evaporative Retardant Applicators/Sprayers: Membrane curing and evaporative retardant compounds shall be applied with a sprayer capable of maintaining a constant pressure. Spraying membrane curing compounds or evaporative retardants by other methods, such as rolling, shall be approved by ENGINEER.
    - b. When a spray-applied membrane-curing compound is used, it shall be applied in two (2) coats with the second coat applied at right angles to the first coat.
  - 2. If finish materials are to be applied to the surface of concrete, follow manufacturer's recommendations to remove membrane curing compound.

### 3.03 APPLICATION

- A. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces for seven (7) days by moist curing with forms in place. If forms are removed prior to completion of specified seven (7) day period, continue curing by methods specified in Article Curing.
- B. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by application of specified curing methods in Article Curing.
- C. Other Surfaces: Unless otherwise shown on the DRAWINGS all other surfaces shall be cured using two (2) applications of a membrane-curing compound conforming to



ASTM C309. The second application shall be applied at ninety degrees Fahrenheit (90°F) to the first application.

- D. Rate of Temperature Change: Changes in temperature of the air immediately adjacent to the concrete during and immediately following the curing period shall be kept as uniform as possible and shall not exceed five degrees Fahrenheit (5°F) in any one (1) hour or fifty degrees Fahrenheit (50°F) in any twenty four (24) hour period.
- E. Cold Weather: Curing during cold weather conditions shall include the above methods except for water cure unless measures are taken to prevent freezing of the water as specified in ACI 306.1.
- F. Hot Weather: If the rate of evaporation approaches 0.2 lb/ft<sup>2</sup>/hr, as estimated by ACI 305.1, precautions against plastic shrinkage cracking are required. CONTRACTOR shall have a recording thermometer, hygrometer, and wind gage on site seven (7) days prior to first concrete placement. When necessary, provision for windbreaks, shading, fog spraying, sprinkling, ponding, or wet covering with a light colored material shall be made in advance of placement, and such protective measures shall be taken as quickly as concrete hardening and finishing operations will allow. Precautions against plastic shrinkage cracks may be required in conditions other than what is normally considered hot weather conditions.

#### 3.04 PENETRATING SEALER AND CHLORIDE ION SCREEN

- A. Concrete that may be subjected to deicing salts, brackish water, or spray from brackish water shall be protected with a penetrating sealer and chloride ion screen that is readily absorbed into the surface of the concrete to provide a breathable, water repellent finish that does not affect the surface color or texture of the concrete. A penetrating sealer and chloride ion screen is not required if the concrete contains an organic corrosion inhibiting admixture which slows the ingress of chlorides and moisture and forms a durable, protective film at the level of reinforcing steel. Concrete to be protected includes but is not limited to exterior concrete in walkways, stairs, slabs on grade, elevated parking areas, etc. Concrete surface and air temperature adjacent to the concrete shall be at least forty degrees Fahrenheit (40°F) during application and curing of sealer. Application rate shall be as recommended by manufacturer.

#### 3.05 PROTECTION

- A. During the curing period, the concrete shall be protected from damaging mechanical disturbances, such as load stresses, heavy shock, and excessive vibration. All finished concrete surfaces shall be protected from damage by construction equipment, materials, or methods, by application of curing procedures, and by rain or running water. Self-supporting structures shall not be loaded in such a way as to overstress the concrete.

**END OF SECTION**