



# Iowa Department of Transportation

## SPECIAL PROVISIONS FOR MASS CONCRETE – CONTROL OF HEAT OF HYDRATION

Lee County  
NHSX-061-1(126)--3H-56

Effective Date  
February 16, 2010

THE STANDARD SPECIFICATIONS, SERIES 2009, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

### 090015.01 DESCRIPTION

The Contractor shall produce a structure free of shrinkage cracks that would be a result of heat of hydration during the curing of large concrete cross-sections. Large concrete is defined as a concrete footing pour greater than 5.0 feet in depth or concrete members other than footings that have a least dimension of 4.0 feet or greater.

### 090015.02 MATERIALS

All material shall meet the quality requirements for the respective items in Division 41 with the following exceptions:

- Cement Type IS , IP, or Type I/II.
- Cement content shall be a minimum of 567 pounds per cubic yard.
- Maximum substitution of 50% Ground Granulated Blast Furnace Slag. Maximum substitution of 40% Class F fly ash. When fly ash, Class C or Class F, and Ground Granulated Blast Furnace Slag are substituted, maximum substitution of fly ash is 25% Class F or 20% Class C, with a maximum total substitution of 50% of the Portland cement.
- The maximum water to cementitious ratio shall be 0.45.
- Air entrainment shall be used. To improve workability and aid in air entrainment, water reducing or retarding admixtures may be used, in accordance with Article 2513.02, C, of the Standard Specifications.
- A mid range water reducing admixture may be used and the slump may be increased to six inches maximum.

### 090015.03 CONSTRUCTION

Develop and submit a procedure that, during the period of heat dissipation following concrete placement, the temperature differential between the interior of the section and the outside surface of the section does not exceed 36°F. Maintain records of the temperature differential and immediately apply corrective measures when the differential nears 36°F. Maximum concrete temperature at the time of placement shall not exceed 75°F and shall not be less than 40°F. The maximum concrete temperature during the period of heat dissipation shall not exceed 160°F.

No concrete covered by this specification shall be placed until the Contractor's detailed temperature differential plan is approved by the Engineer. Provide and install temperature sensing devices of a type and at locations approved by the Engineer. These devices shall be accurate to within  $\pm 2^{\circ}\text{F}$  in the temperature range of  $32^{\circ}\text{F}$  to  $212^{\circ}\text{F}$ . The temperature shall be recorded automatically by an approved recorder furnished by the Contractor. Provide a back-up temperature sensing system, which includes both back-up temperature sensors and back-up temperature read out device. The back-up system shall be used to complete the monitoring of a pour should the primary system fail. The primary system shall be repaired or replaced before the commencement of the next pour.

Procedures include, but are not limited to, the following:

- Cooling component materials prior to addition to the mix to reduce the temperature of the concrete while in its plastic state.
- Adding ice to the mix water.
- Sprinkle coarse aggregate with water or wet the stockpile.
- Controlling rate of concrete placement (low lifts).
- Insulating the forms and the surface of the concrete to prevent temperature differential.
- Placing concrete at times of day when the ambient temperature is lowest (in summer) or highest (in winter).
- Other acceptable methods that may be developed by the Contractor and approved in writing by the Engineer.

Note that compliance with this specification may result in long cooling times. Consider options to control heat of hydration that are compatible with the desired construction schedule and erection procedures.

The location of construction joints shall be as shown on the plans.

#### **090015.04 METHOD OF MEASUREMENT**

The installation and operation of a temperature sensing system will not be measured directly for payment.

#### **090015.05 BASIS OF PAYMENT**

The cost of installation and operation of the temperature sensing system shall be considered incidental to the contract unit price for Structural Concrete.