



INDIANA DEPARTMENT OF TRANSPORTATION

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Indianapolis, Indiana 46204

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Eric Holcomb, Governor
Michael Smith, Commissioner

September 22, 2022

CONSTRUCTION MEMORANDUM

22-02

(REVISED)

TO: District Deputy Commissioners
District Construction Directors, Area Engineers, Project Engineers/Supervisors
Division of Materials and Tests
District Project Management Directors
District Technical Services Directors
District Testing Engineers

FROM: Gregory G. Pankow, Chief Engineer of Construction *p.p. J. J. Narak*
Division of Construction Management and District Support

SUBJECT: Alternate Curing Method for Structural Concrete using E5 Internal
Cure and E5 Liquid Fly Ash

SUPERSEDES: 21-05

E5 Internal Cure and E5 Liquid Fly Ash are a new type of concrete admixture that has been shown to provide significant benefits during the placement of concrete and in the overall quality of the in-place concrete. Some of the benefits include improved water retention, workability, pumpability and higher pozzolanic activity, which can create higher strength and reduced permeability.

To evaluate the performance of these admixtures, an alternate curing method was developed in lieu of the water curing requirements in 702.22 Standard Specifications. This alternate curing method is to be considered for bridge decks, slab bridges and reinforced concrete bridge approaches on existing and future construction contracts.

In lieu of the water curing requirements in 702.22, concrete may be placed and cured as follows. Concrete shall be in accordance with 702 except as follows:

Mix Design & Batching:

Mix Option 1:

1. The concrete mix design shall include the admixture "E5 Internal Cure" by Specification Products with a dosage rate of 4 oz/cwt of cementitious.

2. The concrete mix design shall include either 3% silica fume addition or 30% slag cement replacement per 709.05(c). Class C concrete mix designs shall be based on 658 lbs/cu yd of cement. The cement content shall not be increased.
3. The water-cementitious ratio shall be 0.42 to 0.49.
4. A water-reducing admixture is not required.
5. Ensure that the concrete mixture is fully wetted before adding the E5 Internal Cure admixture to the load.

Mix Option 2:

1. The concrete mix design shall include the following two admixtures by Specification Products: “E5 Internal Cure” with a dosage rate of 4 oz/cwt of cementitious and “E5 Liquid Fly Ash” with a dosage rate of 8 oz/cwt of cementitious.
2. Mix design shall be based on a cement content from 550 to 650 lbs/cu yd. The cement content shall not be increased above 650 lbs/cu yd. No other supplementary cementitious materials shall be added.
3. Minimum 28-day compressive design strength shall be 4,000 psi
4. The water-cementitious ratio shall be 0.42 to 0.49.
5. A water-reducing admixture, Type A, may be used.
6. Ensure that the concrete mixture is fully wetted before adding the E5 Internal Cure and Liquid Fly ash admixtures to the load.

During placement:

1. A representative from Specification Products shall be on site during placement.
2. Each truck shall mix the concrete on site for a minimum of 30 seconds at mixing speed before discharging concrete.
3. Water shall not be applied to the plastic concrete surface.
4. To avoid damaging the air void system when the slump is greater than or equal to 5 inches (≥ 5 in.) minimal mechanical vibration shall be used. To the extent practical handheld vibrators should only be used as needed to consolidate concrete along copings or in areas that are heavily congested with reinforcing steel.
5. Products marketed as “evaporative retardants” or “evaporation reducers” shall not be used. Some common trade names for these products include Sika Film, MasterKure ER50 and Eucobar.
6. The following products may be used as finishing aids as directed by the manufacturer:
 - a. E5 Miracle Aid by Specification Products
 - b. EZ Finish by Specified Surfaces
 - c. The Juice by M2 Solutions.

After placement:

1. Curing shall be for a minimum period of five days (120 h) and until flexural test beams indicate a modulus of rupture of 600575 psi. Curing shall consist of covering

with white plastic sheeting (minimum 4 mil thickness) or clear plastic sheeting (minimum 6 mil thickness). Sheeting shall be applied as soon as possible.

2. Acceptance beams shall be field cured by wrapping the beams in wet burlap and then wrapping in plastic. The beams will be placed near the structure and shaded from direct sunlight. Beams shall remain in the form and covered with wet burlap and plastic for a minimum of 48 hrs before removing them from the form. It is imperative that the burlap around the beams remain moist during the curing period. The surfaces of the beam shall be moist at the time of flexural testing. If any of the surfaces are dried, the beam shall be soaked for 24 hrs prior to testing.
3. The requirements of 702.24(a) are modified as follows. Equipment or traffic will not be allowed on structures for a minimum of 120 hours and until flexural test beams representing all concrete required to carry live loads indicate a modulus of rupture of 575 psi.
4. The requirements of 702.14(b)1 and 702.14(b)2 are modified as follows. Falsework and/or falsework jacks shall remain in place at least 120 hours after concrete placement and until flexural test beams indicate a modulus of rupture of 600 psi or greater has been achieved.
5. For the purpose of determining cold weather concrete conditions in accordance with section 702.11 the minimum curing period shall be continuous for 168 hours after placement.
6. The Department's project personnel will provide feedback to the Concrete Engineer at Department's Division of Materials and Tests, including strength data and visual observations both during the pour and curing periods.

7. Concrete surface sealing is not required.

The Contractor shall submit a request to use one of the two E5 mix options and alternate curing method to the Department's project personnel for approval. The request shall be submitted a minimum of seven days prior to placement. Project personnel will then forward the request to the Area Engineer and the Concrete Engineer at the Division of Materials and Tests. Upon approval, a zero-cost change order will be processed to add the appropriate contract pay item(s) with a supplemental description as follows:

609-06259 Reinforced Concrete Bridge Approach, E5 Internal Cure
704-51002 Concrete, C, Superstructure, E5 Internal Cure

Any questions should be directed to the Concrete Engineer at Materials and Tests, Mike Nelson
mnelson@indot.in.gov.

GGP/mwn