

ORIGINATION FORM

THE INFORMATION BELOW IS TO BE PROVIDED BY THE ORIGINATOR (The person who receives or originates the issue and needs to forward the issue for action.)

Specification: 453-4.5.2, 4.5.3 and 4.5.4

Subject: Epoxy Jointing of Precast Segments

Origination date: 7/9/10

Originator: Charles Boyd

Office/Phone: 414-4275

Problem statement: Minimum Compressive Yield and Bond Strength requirements for slow set epoxies are not clearly associated with the cure times required before conducting these tests.

Proposed solution: Based on input from industry, the minimum Compressive Yield and Bond Strength requirements have been tied to the associated cure times to be consistent with the similar requirements for Contact Time as is currently listed in 453-4.5.2. For consistency, the comparable requirements for normal set epoxy from ASTM C 881 are now also listed in the same format that is already used in 453-4.5.2.

Information source: Andrew Fulkerson, The Euclid Chemical Company, 800-321-7628; Paul Vinik, SMO.

Recommended Usage Note: All Precast Segmental Bridge Jobs

Estimated fiscal impact, if implemented: None

Implementation of these changes, if and when approved, will begin with the *July* ~~January~~ 2011 letting.



Florida Department of Transportation

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STEPHANIE KOPELOUSOS
SECRETARY

MEMORANDUM

DATE: September 22, 2010

TO: Specification Review Distribution List

FROM: Rudy Powell, Jr., P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **4530405 Epoxy Jointing of Precast Segments.**

In accordance with Specification Development Procedures, we are sending you a copy of a proposed specification change.

These changes were proposed by Charles Boyd of the State Structures Design Office to associate minimum compressive yield and bond strength requirements for slow set epoxies with the cure times required before conducting these tests because ASTM C881 Type VI Grade 3 requirements do not address FDOT defined slow set epoxy cure times for these tests.

Please share this proposal with others within your responsibility. Review comments are due within four weeks and should be sent to Mail Station 75 or to my attention via e-mail at ST986RP or rudy.powell@dot.state.fl.us. Comments received after **October 20, 2010**, may not be considered. Your input is encouraged.

RP/dt
Attachment

EPOXY JOINTING OF PRECAST SEGMENTS.

(REV ~~97-22159-10~~)

SUBARTICLE 453-4.5.1 (of the Supplemental Specifications) is deleted and the following substituted:

453-4.5 Physical Requirements:

453-4.5.1 General: Epoxy bonding agents proportioned as designated by the manufacturer and mixed in accordance with the manufacturer's recommendations shall meet the requirements of ASTM C 881. For the properties listed below, modify the ASTM test procedures as noted. The components of the epoxy-bonding agent shall be conditioned to the temperature at which testing is to be done prior to mixing the test specimen.

453-4.5.2 Contact Time (open Time) and Contact Strength: The contact time (open time) of the mixed epoxy-bonding agent shall be:

Normal-Set Epoxy 60 -Minutes, Minimum

Slow-Set Epoxy6 -Hours, Minimum

The above contact time (open time) will be deemed acceptable if a slant cylinder test specimen, prepared and tested in accordance with the conditions below, sustains the following stress (contact strength) on the slant plane calculated as the axial (vertical) load divided by the area of the slant ellipse:

Normal-Set Epoxy 1,000 psi at 48 hours after joining

Slow-Set Epoxy 1,000 psi at 14 days after joining

The cement mortar/concrete material for the slant-cylinder test shall have a compressive strength of at least 4,500 psi at 28 days when tested to ASTM C 39. The slant-cylinder test procedure must be in accordance with ASTM C 882 with the following modifications:

1. ~~Delay~~ ~~Joining~~ of the sloped surfaces ~~shall be delayed~~ for the following period of time, measured from the time the epoxy was mixed:

Normal-Set Epoxy 60 -Minutes

Slow-Set Epoxy6 -Hours

2. During the period between mixing of the epoxy and joining of the sloped surfaces, the specimens will be uncovered and maintained at the maximum temperature of the application range for the formulation tested.

3. Assemble the specimens together and cure at the maximum temperature of the formulation range (48 hours for normal set and 14 days for slow set epoxies) prior to testing.

For slow-set epoxy, ~~an~~ *prepare an* additional test specimen ~~shall be made~~ and tested *it* to failure at ~~36~~*24* hours. The formulation of the slow-~~set~~ epoxy is acceptable only if the epoxy-bonding agent exhibits a brittle break.

453-4.5.3 Compressive Yield Strength: The compressive yield strength of the epoxy-bonding agent shall be:

Normal-Set Epoxy 2,000 psi at 24 hours after joining

..... 6,000 psi at 48 hours after joining

Slow-Set Epoxy..... 2,000 psi at 7 days after joining

..... 6,000 psi at 14 days after joining

~~in accordance with ASTM C881 when tested using~~ *Determine compressive yield strength in accordance with* ASTM ~~Method D -695~~ with the following conditions:

1. ~~Pour the E~~epoxy-bonding agent ~~shall be poured~~ into the mold for forming specimens within ten minutes after starting mixing of the components.
2. ~~Cure T~~he specimens ~~shall be cured~~ at the minimum temperature of the formulation range ~~for a period of 24 hours~~ *(24 or 48 hours for normal set and 7 or 14 days for slow set epoxies, as appropriate) prior to testing.*

453-4.5.4 Bond Strength: Bond strength shall be:

Normal-Set Epoxy..... 1,000 psi at 48 hours after joining
Slow-Set Epoxy..... 1,000 psi at 14 days after joining

~~in accordance with ASTM C 881 and the test is~~ *Determine the bond strength in accordance with* ~~conducted on a slant cylinder according to~~ ASTM C 882 with the following modifications:-

———1. The test cylinder of concrete shall have a compressive strength of at least 6,000 psi at seven days age.

———2. ~~Prepare T~~he specimens ~~shall be prepared~~ as defined in ~~Subarticle~~ 453-4.5.2.

SUBARTICLE 453-5.1 (of the Supplemental Specifications) is deleted and the following substituted:

453-5.1 General: Apply an epoxy bonding agent meeting the requirements of this Section to mating surfaces of all match-cast precast concrete segments.

Prior to the manufacture of epoxy for the project, a site meeting will be held with representatives from the; Engineer, Contractor and epoxy manufacturer, to discuss the selection of the proper formulations, storage and handling, mixing and application of the epoxy.

Have the necessary cleaning materials immediately available at the location of the segment joining, in the event that the segments must be separated and cleaned or epoxy reapplied.

Include in the erection manual required by Section 452, details of erection and post-tensioning operations which assure that the time elapsing between mixing components of the first batch of epoxy bonding agent applied to the joining surfaces of precast concrete segments and the application of a compressive contact pressure across the joint does not exceed 70% of the open time for the particular formulation of epoxy bonding agent used. Also, include details of how the minimum, closing, contact pressure of approximately 40 psi will be applied uniformly to each joint to which epoxy is applied during the epoxy curing period. Contact pressure may be attained through combinations of weight and temporary and/or permanent post-tensioning.