ORIGINATION FORM
Proposed Revisions to the Specifications

(Please provide all information - incomplete forms will be returned)

Date: April 24 2020

Office: State Materials Office

Originator: Dale DeFord

Specification Section: 930

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Article/Subarticle: 930-4.3 Table 1, 930-5.3 Table 2

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****Will the proposed revision require changes to:**

Publication	Yes	No	Office Staff Contacted and date contacted
Standard Plans Index	◉	○	Rick Jenkins, Cheryl Hudso
Traffic Engineering Manual	◉	○	Javier Ponce 4/21/2020
FDOT Design Manual	◉	○	Bobby Bull 4/21/2020
Construction Project Administration Manual	◉	○	Scott Arnold 4/21/2020
Basis of Estimate/Pay Items	◉	○	Melissa Hollis 4/21/2020
Structures Design Guidelines	◉	○	Ben Goldsberry 4/21/2020
Approved Product List	◉	○	Karen Byram 4/21/2020
Materials Manual	◉	○	Richard DeLorenzo 4/21/20

**This section must be completed prior to processing proposed revisions.

Will this revision necessitate any of the following:

Design Bulletin ☐ **Construction Bulletin** ☐ **Estimates Bulletin** ☐ **Materials Bulletin** ☐

Are all references to external publications current? **Yes** ◉ **No** ○

If not, what references need to be updated? (Please include changes in the redline document.)

Why does the existing language need to be changed?

1) minor editorial changes needed; 2) The CTE range of values listed for repair materials does not cover the lower range of CTE values for concrete. The purpose for the range is to prevent serious mismatch of CTE values between the concrete and repair material.

Summary of the changes:

1) Minor editorial changes were made.
2) Section 930-4.3 Table 1 (2 entries) and Section 930-5.3 Table 2 (1 entry): Changed allowable CTE range of repair materials from 5 - 9 x 10^-6 in./in./°F to 3 - 9 x 10^-6 in./in./°F.

Are these changes applicable to all Department jobs? **Yes** ◉ **No** ○

If not, what are the restrictions?

Contact the State Specifications Office for assistance in completing this form.

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M E M O R A N D U M

DATE: May 28, 2020

TO: Specification Review Distribution List

FROM: Daniel Strickland, P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **9300100 MATERIALS FOR CONCRETE REPAIR**

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

These changes are proposed by Harvey (Dale) DeFord from the State Materials Office to modify Tables 1 and 2, and incorporate language to meet Section 457 requirements for sampling into the Standard Specification.

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 online at http://fdotewp1.dot.state.fl.us/programmanagement/development/industryreview.aspx . Comments received after **June 25,2020,** may not be considered. Your input is encouraged.

DS/dh

Attachment

MATERIALS FOR CONCRETE REPAIR
(REV 4-30-20)

ARTICLE 930-1 is deleted and the following substituted:

930-1 Description.

This Section covers cementitious materials used to repair concrete including defects or purposely placed openings in concrete elements. Materials containing organic compounds, such as bitumens and epoxy resin as the principal binder are not included. The requirements for epoxy resin materials are covered in Section 926. Any depth larger than the manufacturer's recommendation for the specific material shall be repaired with portland cement concrete meeting the requirements of Section 346.

SUBARTICLE 930-2.2 is deleted and the following substituted:

930-2.2 Material Supply, Storage, and Marking: The material shall be pre-proportioned including aggregate. Deliver products in original, unopened containers with manufacturer's name, date of manufacture, and clearly marked with all information described below. Store the material in an elevated dry and weather protected enclosure in full compliance with the manufacturer's recommendations. Material must be used within manufacturer's recommended shelf life.

The material from which the containers are made shall have water vapor transmission not greater than 100 g/m^2 in 24 hours as determined in accordance with Procedure B of ASTM E96.

All containers shall be marked with the following information:

1. LOT identification number and material expiration date
2. Directions for use shall include but are not limited to the following:
   a. The type and kind of adhesive recommended (if any) to bond fresh repair material to the concrete or mortar being repaired.
   b. The recommended amount of resin, other liquid component, or both, to be mixed with the package contents.
   c. The recommended length of mixing time or sequence of mixing and resting times in minutes.
3. Date the material was packaged.
4. The yield in cubic feet or yield in $ft^2/in.$ thickness when mixed with the recommended amount of liquid.
5. The net weight in each container. The contents of any container shall not vary by more than 2% from the weight stated in the declarations. The average weight of filled containers in a LOT shall be not less than the individual weight stated in the declarations.
6. Instructions for the maximum and minimum water (or solutions) to cementitious material ratio.
7. State the approximate working time.

SUBARTICLE 930-4.3 is deleted and the following substituted:

930-4.3 Physical Properties: The repair material shall meet or exceed the physical properties stated in Table 1 as determined by the specified test methods.

Table 1 - Physical Properties of Repair Materials for Horizontal Surfaces			
Requirement	Test Method	Rapid Hardening	Very Rapid Hardening
Minimum Compressive Strength, psi			
3 hours	ASTM C39* or ASTM C109*	N/A	2,000
24 hours		2,000	4,000
7 days		4,000	6,000
28 days		Greater than or equal to strength at 7 days.	
Maximum Length Change, %			
Allowable expansion at 28 days when water cured compared to length at one day	ASTM C157**	0.12	0.12
Allowable shrinkage at 28 days when air cured compared to length at one day		-0.12	-0.12
Allowable difference between increase in water and decrease in air		0.20	0.20
Minimum Slump (Concrete), inches	ASTM C143***	3	3
Minimum Flow (Mortar), %	ASTM C1437***	100	80
Time of Setting (Initial), minutes	ASTM C191* or ASTM C403*	Minimum 30	10 to 29
Coefficient of Thermal Expansion, in/in/°F	ASTM C531* or AASHTO T336	3.0~~5.0~~ x 10^{-6} to 9.0 x 10^{-6}	3.0~~5.0~~ x 10^{-6} to 9.0 x 10^{-6}
Minimum Bond Strength by Slant Shear, psi			
24 hours	FM 5-587	400	450
7 days		Greater than or equal to strength at 24 hours.	
Maximum Allowable Total Chlorides lb~~s~~/yd^3	FM 5-516	0.40	

* as applicable
** Make and cure the test specimens in accordance with ASTM C-157, except omit the curing period in Section 10.3; however both 11.1.1 and 11.1.2 shall apply for 28 day curing period.
*** Testing for flow/slump will be completed in 15 plus or minus 1/2 minute after the start of mixing liquid with the rapid hardening materials or 5 plus or minus 1/2 minute after mixing the liquid with the very rapid hardening materials.

SUBARTICLE 930-5.3 is deleted and the following substituted:

930-5.3 Physical Properties: The repair material shall meet or exceed the physical properties stated in Table 2 as determined by the specified test methods.

Table 2 - Physical Properties of Repair Materials for Vertical Surfaces*			
Requirement	Test Method	High Performance	Ultra-high Performance
Minimum Compressive Strength, psi			
24 hours	ASTM C39** or ASTM C109**	1,000	2,000
7 days		N/A	5,000
28 days		5,000	Greater than or equal to strength at 7 days
Maximum Length Change, %			
Allowable expansion at 28 days when water cured compared to length at one day	ASTM C157**	0.12	0.12
Allowable shrinkage at 28 days when air cured compared to length at one day		-0.08	-0.08
Maximum Slump (Concrete), inches	ASTM C143	3****	3****
Maximum Flow (Mortar), %	ASTM C1437	100****	100****
Time of Setting (Initial), minutes	ASTM C191** or ASTM C403**	10 to 180****	10 to 180****
Coefficient of Thermal Expansion, in/in/°F	ASTM C531*** or AASHTO T336***	3.0~~5.0~~ x 10^{-6} to 9.0 x 10^{-6}	
Minimum Bond Strength by Slant Shear, psi,			
24 hours	FM 5-587	450	750
7 days		750.	750
Minimum Flexural Strength (at 7 days), psi	ASTM C580	500	700
Maximum Absorption (Mortar at 7 days), %	ASTM C413	4	4
Minimum Surface Resistivity (Concrete at 28 days), kohm~~KOhm~~-cm	AASHTO T358	N/A	22
Maximum Allowable Total Chlorides lb~~s~~/yd^3	FM 5-516	0.40	

* Use cement based materials modified with polymers and silica fume for extremely aggressive environments
** Make and cure the test specimens in accordance with ASTM C157, except omit the curing period in Section 10.3; however both 11.1.1 and 11.1.2 shall apply for 28 day curing period.
*** As applicable
**** For pump and pour applications, the maximum flow, slump and time of setting can be adjusted according to the manufacturer's recommendation.

SUBARTICLE 930-6.2 is deleted and the following substituted:

930-6.2 Physical Properties: The MAPC and MPPC materials shall meet or exceed physical properties stated in Table 3 as determined by the specified standard test methods.

Table 3 - Physical Properties of Repair Material in High Stress Areas		
Requirement	Test Method	Test Value
Minimum Compressive Strength (at 28 days), psi	ASTM C109*	8,500
Minimum Flexural Strength (at 28 days), psi	ASTM C348*	600
Minimum Slant Shear Bond (at 14 days), psi	FM 5-587*	2,500
Time of Setting (Initial), minutes	ASTM C191**	15 to 60
Maximum Scaling Resistance	ASTM C672	No scaling
Maximum Length Change, %		
Allowable expansion at 28 days when water cured compared to length at one day	ASTM C157***	0.03
Allowable shrinkage at 28 days when air cured compared to length at one day		-0.03
Maximum Allowable Total Chlorides lb~~s~~/yd^3	FM 5-516	0.40
* The test methods for compressive strength (ASTM C109), flexural strength (ASTM C348), and Slant Shear Bond (FM 5-587) shall be modified so that the specimens are air cured instead of moist cured. All of these samples shall be air cured until the time of testing. ** Initial time of set for MAPC or MPPC will be tested in accordance with ASTM C191 with the following modification. The initial time of set shall be tested at 95° plus or minus 5°F. *** Make and cure the test specimens in accordance with ASTM C-157, except omit the curing period in Section 10.3; however both 11.1.1 and 11.1.2 shall apply for 28 day curing period.		

SUBARTICLE 930-7.1 is deleted and the following substituted:

930-7 Special Fillers.

930-7.1 General: This material is intended to be used as filler material and for rapid repairs to pile jacket structures and other locations specified in the Plans ~~when no design mix concrete is available or a special filler is specified in the Contract Documents~~. Meet the requirements of Section 457 for preparing the surfaces, placing, sampling, testing and curing the concrete. Mix the material in accordance with the manufacturer's recommendations.

SUBARTICLE 930-7.3 is deleted and the following substituted:

930-7.3 Physical Properties: The repair material shall meet or exceed the physical properties stated in Table 4 as determined by the specified standard test methods. If extended, materials shall meet the minimum requirements of Table 4.

Table 4 - Physical Properties of Special Fillers			
Requirement	Test Method	Cathodic Protection	Non-Cathodic Protection
Minimum Compressive Strength, psi			
24 hours	ASTM C39* or ASTM C109*	1,500	2,000

Table 4 - Physical Properties of Special Fillers			
Requirement	Test Method	Cathodic Protection	Non-Cathodic Protection
28 days		5,000	5,000
Maximum Length Change, %			
Allowable expansion at 28 days when water cured compared to length at one day	ASTM C157**	0.12	0.12
Allowable shrinkage at 28 days when air cured compared to length at one day		-0.12	-0.12
Allowable difference between increase in water and decrease in air		0.20	0.20
Slump (Concrete), inches	ASTM C143	7-9	7-9
Minimum Flow (Mortar), %	ASTM C1437	100	100
Time of Setting (Initial), minutes	ASTM C191* or ASTM C403*	200 to 400	200 to 400
Minimum Bond Strength by Slant Shear (at 7 days), psi	FM 5-587	450	450
Minimum Flexural Strength (at 7 days), psi	ASTM C580	700	700
Minimum Tensile Strength (at 7 days), psi	ASTM C307	200	200
Surface Resistivity (at 28 days), kohm~~KOhm~~-cm	AASHTO T358	15 or less	22 or greater
Maximum Allowable Total Chlorides lb~~s~~/yd^3	FM 5-516	0.40	

* as applicable
** Make and cure the test specimens in accordance with ASTM C157, except omit the curing period in Section 10.3; however both 11.1.1 and 11.1.2 shall apply for 28 day curing period.