

ORIGINATION FORM

Proposed Revisions to the Specifications

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

Date:

Office:

Originator:

Specification Section:

Telephone:

Article/Subarticle:

email:

Will the proposed revision require changes to:

Publication	Yes	No	Office Staff Contacted
Standard Plans Index			
Traffic Engineering Manual			
FDOT Design Manual			
Construction Project Administration Manual			
Basis of Estimate/Pay Items			
Structures Design Guidelines			
Approved Product List			
Materials Manual			

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?

Summary of the changes:

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: November 22, 2018

TO: Specification Review Distribution List

FROM: Dan Hurtado, P.E., State Specifications Engineer

SUBJECT: Proposed Specification: **9750000 Structural Coating Materials.**

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

This change was proposed by Jenny Guan of the State Materials Office (SMO) to modify the language.

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://www2.dot.state.fl.us/ProgramManagement/Development/IndustryReview.aspx> . Comments received after **December 20, 2018**, may not be considered. Your input is encouraged.

DH/dt
Attachment

STRUCTURAL COATING MATERIALS.**(REV 11-5-18)**

SECTION 975 is deleted and the following substituted.

SECTION 975
STRUCTURAL COATING MATERIALS

975-1 General Requirements.

975-1.1 General: Upon curing, all coatings and/or coating systems must produce an adherent coating that is visually uniform. The composition of the coating is left to the discretion of the manufacturer but the finished product shall meet all requirements of this Section. All coats of multi-coat systems shall be supplied by the same manufacturer. Multi-component coatings shall be prepackaged in the required ratios.

975-1.2 Environmental Requirements: Coating materials and their waste shall be characterized as non-hazardous as defined by Resource Conservation and Recovery Act (RCRA) Subarticle C rules, Table 1 of 40 CFR 261.24 Toxicity Characteristic.

Volatile Organic Compounds (VOC) shall be less than 3.5 lb/gal when tested in accordance with ASTM D3960.

975-1.3 Approved Product List (APL): All polymeric coating materials except the materials in 975-4 shall be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their products shall submit the product data sheets, performance test reports from NTPEP or an independent laboratory showing that the product meets the requirements of this Section, a Product SDS or performance test reports showing percent weight compositional analysis including Chemical Abstract Number, ACGIH time weighted average and ceiling exposure limits for all components, lower and upper explosive limits, flash point, boiling point, amount of volatile organic compounds by weight, and specific gravity for each component of the coating system, and a APL application in accordance with Section 6.

975-1.4 Packaging and Labeling: Materials shall be shipped in containers legibly marked with application instructions, lot number, batch number, date of manufacture, shelf life, and Department APL number. Each lot or batch manufactured must have a unique number.

975-2 Structural Steel Coating Systems.

975-2.1 General: Structural steel coatings shall meet the application requirements of Section 560. Prepare and coat sixteen flat and four composite test panels in accordance with AASHTO R-31 (FED-STD-595, Shade X6134 or X4062) for each coating system proposed for approval and submit to the State Materials Office (SMO). Samples will be subject to verification testing by the Department, as identified in 975-2.2. In addition, submit one quart wet samples of each component of each coating system (wet samples) to the SMO.

975-2.2 Performance Requirements: Outdoor exposure testing will be performed by the Department. Prepare four composite and four flat scribed test panels in accordance with AASHTO R-31 (FED-STD-595, Shade X6134 or X4062) and submit to the State Materials Office (SMO). Also submit one quart wet samples of each component of each coating incorporated in the system being evaluated. Panels will be exposed at the Department's outdoor test site in accordance with ASTM G7. All coatings, regardless of color, shall meet the

~~requirements below.~~ Each coating system will be subject to the testing identified in 975-2.2.1 & 975-2.2.2. All coatings, regardless of color, shall meet the requirements in Table 975-1.

975-2.2.1 Random Laboratory Verification Testing: Prepare and coat ~~12~~ twelve flat test panels for random laboratory verification testing.

975-2.2.2 Outdoor Exposure Testing: Prepare and coat ~~8~~ eight test panels (four flat and four composite) for exposure at the Department's outdoor test site. Panels will be tested in accordance with ASTM G7.

Table 975-1 Structural Steel Coating System Performance Requirements		
Laboratory Testing		
Property	Test Method	Requirement Acceptance Criteria
Slip Coefficient	AASHTO R31 <u>Test No. 1</u>	Min. Class B (primer only)
Salt Fog Resistance	AASHTO R31 <u>Test No. 2</u>	Blister Size Value = 10 Average Rust Creep at the Scribe ≤ 0.1 inches <u>after 5000 hours</u>
Cyclic Weathering Resistance	AASHTO R31 <u>Test No. 3</u>	Blister Size Value = 10 Average Rust Creep at the Scribe ≤ 0.2 inches, Color Retention $\Delta E \leq 8$, Gloss loss less than 30 units <u>after 15 cycles – 336 hours each cycle</u>
Abrasion Resistance	AASHTO R31 <u>Test No. 4</u>	Wear Index ≤ 2.7 mg/cycle
Adhesion	AASHTO R31 <u>Test No. 5</u>	Avg. system tensile strength ≥ 800 psi
Freeze Thaw Stability	AASHTO R31 <u>Test No. 6</u>	Avg. tensile strength ≥ 800 psi
Coatings Identification	Fourier Transform Infrared Spectroscopy	IR scan (2.5 to 15 μm) for each base, catalyst, and mixed coating.
Impact Resistance	ASTM D2794	Greater than 25 inch/lbs, 1/2" impact, intrusion
Flexibility	AASHTO R31, ASTM D522, 1 inch cylindrical mandrel	No cracking
Outdoor Testing		
Property	Test Method	Requirement Acceptance Criteria
Rusting	ASTM D610 ASTM D1654 (scribed) ASTM D1654 (un-scribed)	<u>Rust Grade</u> ≥ 9 after 5 years <u>Rating of Failure at Scribe</u> ≥ 9 after 5 years <u>Rust Grade</u> ≥ 9 after 5 years

<u>Table 975-1</u> <u>Structural Steel Coating System Performance Requirements</u>		
Laboratory Testing		
Property	Test Method	Requirement <u>Acceptance Criteria</u>
Blistering	ASTM D714	<u>Blister Value</u> = 10 after 5 years
Adhesion	ASTM D4541; annex A4	<u>Avg. Tensile Strength</u> $\geq$ 800 psi (un-scribed area) after 5 years
Color Retention	ASTM D2244	<u>Avg. ΔE</u> $\leq$ 8 after 2 years
Gloss	ASTM D523	<u>Avg.</u> $\leq$ 30 gloss units after 2 years

975-2.3 Structural Steel Coating Systems for New Structures.

975-2.3.1 High Performance Coating Systems (Color Pigmented):

975-2.3.1.1 Prime Coat: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D520. Inorganic zinc rich primers shall meet the requirements of the Society for Protective Coatings (SSPC) Paint 20, Type I, Level 2.

975-2.3.1.2 Intermediate Coat: Intermediate coatings, when required by the manufacturer, shall be a component of the full coating system.

975-2.3.1.3 Finish Coat: The finish coat shall provide the color and gloss required for the completed coating system. A finish coat may be comprised of a single pigmented coat or a pigmented coat with a clear coat. The clear coat shall contain a dissipating colorant. The dissipating colorant shall be visible for a minimum of 12 hours after application and shall completely dissipate within 96 hours after application.

975-2.3.2 Inorganic Zinc Coating System: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 20. Inorganic zinc rich primers shall meet the requirements of SSPC Paint 20, Type I, Level 2. The performance requirements for gloss and color retention are not applicable.

975-2.3.3 Interior Box Girder Coating System:

975-2.3.3.1 Interior Coating: The interior coat shall be one coat of white polyamide or cycloaliphatic amine epoxy coating. The faying surfaces are to be masked off and coated with a zinc primer from the APL. The performance requirements for gloss and color retention are not applicable.

975-2.4 Structural Steel Coating Systems for Existing Structures.

975-2.4.1 Prime Coat: Zinc dust pigment shall be a minimum of Type II in accordance with ASTM D520. Organic zinc rich primers shall meet the requirements SSPC Paint 20, Type II, Level 2.

Zinc primers shall be used as galvanizing repair compounds for areas greater than 100 square inches.

975-2.4.2 Intermediate Coat: Intermediate coatings, when required by the manufacturer, shall be a component of the full coating system.

975-2.4.3 Finish Coat: Finish coating shall provide the color and gloss required for the completed coating system. A finish coat may be comprised of a single pigmented coating or a pigmented coating with a clear coat. The clear coat shall contain a dissipating colorant. The dissipating colorant shall be visible for a minimum of 12 hours after application and shall completely dissipate within 96 hours after application.

975-3 Galvanized Steel Coating System.

Coatings applied over galvanized steel shall meet the outdoor exposure requirements of 975-2.2 with the exception that test panels shall be galvanized in accordance with ASTM A123 prior to application of subsequent coatings.

Coatings applied over galvanized steel strain poles, mast arms, and monotube assemblies shall meet the requirements of Section 649 and 975-4.

975-4 Painting for Strain Poles, Mast Arms and Monotube Assemblies.

Paint systems used on galvanized steel strain poles, galvanized steel mast arms and galvanized steel monotube assemblies shall meet the color requirements as specified in the Contract Documents and shall exhibit no loss of adhesion or loss of color greater than $8\Delta E$ s for five years after final acceptance as specified in 5-11. A galvanized steel strain pole, mast arm or monotube assembly that exhibits a cumulative surface area of delamination in excess of 100 square inches will constitute an adhesion failure. Delamination shall be defined as any area of exposed metal surface subsequent to hand tool cleaning in accordance with SSPC-SP2. A change in the coating color in excess of $8\Delta E$ s per the International Commission on Illumination (CIE) $L^*a^*b^*$ 1976 measured in accordance with ASTM- D2244 will constitute a color retention failure.

The Department will measure and enter in the Department's database the CIE 1976 color chromaticity coordinates for the color of the top coat of ~~the two~~ sample coupons provided with as required by Section 649-4.3 using a BYK-Gardner Handicolor colorimeter using D65 illuminant and 2 degree geometry settings. The Department-measured $L^*a^*b^*$ chromaticity coordinates shall define the initial color and will be used for resolution of color retention failures and the resolution of color retention disputes. All paint systems shall possess physical properties and handling characteristics that are compatible with the application requirements of Section 649. Materials shall be specifically intended for use over galvanized steel.

975-5 Elastomeric Coatings.

975-5.1 General: Use an elastomeric coating system to provide a waterproof barrier over post-tensioning anchorages or other areas designated in the Plans. The components of the coating system shall be supplied by a single manufacturer and sold as a waterproof coating system. The surface preparation and application of the coating system shall be performed in strict accordance with the manufacturer's specifications.

975-5.2 Physical Properties: The use of an epoxy prime coat is dependent upon the requirements of the manufacturer's waterproofing system. The polyurethane chemistry may be either waterborne aromatic (moisture-curing) or aromatic (moisture-sensitive). ~~The minimum thickness of the system shall not be less than 30 mils.~~ The elastomeric coating shall meet the ~~following~~ requirements in Table- 975-2.

<u>Table 975-2</u> <u>Elastomeric Coatings Performance Requirements</u>
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Property	Test Method	<u>Requirement</u> <u>Acceptance Criteria</u>
Hardness, Shore A	ASTM D2240	Between 60 and 90
Tensile Strength	ASTM D412	≥750 psi
Elongation	ASTM D412	≥400%
Tear Strength	ASTM C957	>70 psi
Abrasion Resistance H-18 wheels 1,000 gm/wheel	ASTM C957	≤350 mg loss / 1,000 revs.
Crack Bridging 1,000 Cycles	ASTM C957	System Passes
Elongation Recovery	ASTM C957	≥94%

975-5.3 System Modifications for Use on Bridge Substructure Exposed External Anchorages: Supply/Provide the elastomeric coating system with a 100% acrylic aliphatic polyurethane top coating where required as shown on Standard Plans Index 462-002, or when applied to other exposed external surfaces. Manufacturers of the elastomeric coating system shall include the acrylic top coating as part of the elastomeric coating system for approval.

975-6 Class 5 Applied Finish Coatings.

975-6.1 General: All coatings shall possess physical properties and handling characteristics compatible with the application requirements of Section 400. Unless otherwise specified, the color of the finish coat shall meet FED-STD-595, Table VIII, Shade No. 36622, or No. 36642 for uncoated weathering steel bridges.

975-6.2 Coating Requirements: Prepare four, 4 inch by 8 inch (except as required below) fiber cement test panels with a mass of 7 to 9 pounds per square foot of surface area to perform the laboratory tests. Apply the finish coating to each test panel at a rate of 50 square feet per gallon, plus or minus 10 square feet per gallon. Seal the corners of all test panels with a high build epoxy or equivalent to prevent moisture ingress at corners and cut edges. Submit the samples to an independent laboratory for testing. Coating performance shall meet the following requirements in Table- 975-3.

<u>Table 975-3</u> <u>Class 5 Applied Finish Coatings Performance Requirements</u>		
Laboratory Testing		
Property	Test Method	<u>Requirement</u> <u>Acceptance Criteria</u>
Resistance to Wind Driven Rain	ASTM D6904	No visible water leaks, and if the rear face of the block is damp, the average gain in weight of the three 8"x16"x2" blocks must be less than 0.2 lb.
Freeze thaw resistance	AASHTO R31	No disbondment
Water Vapor Transmission	ASTM D1653; Method B, Condition C	WVT ≥ 10 perms
Abrasion Resistance	ASTM D968, 3,000 liters of sand	No loss of coating thickness ASTM D6132
Salt Spray (fog) resistance	ASTM B117, 2,000 hours	No disbondment

Table 975-3
Class 5 Applied Finish Coatings Performance Requirements

Laboratory Testing		
Property	Test Method	Requirement Acceptance Criteria
Fluorescent UV-Condensation Exposure	ASTM D4587, 2000 hours, 4 hours UV, 4 hours condensation	No blistering (ASTM D714), cracking (visual), or delamination (visual). chalking (ASTM D4214Method D) rating no less than 8.
Fungal Resistance	ASTM D3273	Rating of 10, ASTM D3274

Include a one quart wet sample of each component of each coating incorporated in the total system being evaluated with the submitted APL application.

975-7 Anti-Graffiti Coating Materials.

975-7.1 General Requirements: Anti-graffiti coatings intended for use under this specification shall be of a composition capable of preventing the adhesion of and facilitating the removal of acrylic, polyurethane, and alkyd spray paint. All anti-graffiti coatings shall possess the physical and handling characteristics that are compatible with the requirements of Section 563. The manufacturer shall designate the non-sacrificial product as water cleanable or solvent cleanable in accordance with this Section.

Anti-graffiti coatings shall contain less than 5.0 lb per gallon volatile organic compounds (VOC) as defined by 40 CFR Part 59, Subpart D, evaluated as per ASTM D3960.

The manufacturer shall supply the following additional information:

1. Technical data sheet that includes installation instructions and graffiti removal instructions, including any solvents or other materials, as necessary. Graffiti removal must be accomplished with nonproprietary cleaners as defined in ASTM D6578.

2. Sacrificial Coating Removal instructions, as applicable.

3. Certification that non-sacrificial anti-graffiti coating shall not blister, crack, check, chalk, delaminate, or exhibit a color change of more than 8 dE94 (or dE76) CIE LAB units for a period of one year after installation.

975-7.2 Performance Requirements: For laboratory testing, use flat test panels prepared in accordance with AASHTO R31. Outdoor exposure testing will be performed by the Department. Submit four, 4 inch by 8 inch fiber cement test panels to the SMO. Panels will be exposed at the Department's outdoor test site in accordance with ASTM G7. Coating performance shall meet the ~~following~~ requirements ~~in Table- 975-4~~.

Laboratory Testing - Non-Sacrificial		
Property	Test Method	Requirement Acceptance Criteria
Graffiti Resistance (solvent cleanable)	ASTM D6578. Complete removal of solvent-based acrylic, polyurethane, and alkyd spray paint; after exposure; and recleanability	Cleanability Level 8, 9, or 10, Accelerated or outdoor exposure is not required. Cure per the spray paint manufacturer's requirements and assess cleanability per Section 10 of ASTM D6578.

Laboratory Testing - Non-Sacrificial		
Property	Test Method	Requirement Acceptance Criteria
Fluid Resistance (solvent cleanable)	ASTM D1308 – Spot Test, Paint Thinner, Gasoline	No blistering, discoloration, softening or adhesion loss.
Outdoor Exposure Testing – Non-Sacrificial		
Property	Test Method	Requirement Acceptance Criteria
Graffiti Resistance (water cleanable)	ASTM G7: 6 months exposure at FDOT test site 2500 psi using pressure washer	Complete removal of solvent based acrylic, polyurethane, and alkyd based spray paint. No delamination or visual defects.

Laboratory Testing - Sacrificial		
Property	Test Method	Requirement Acceptance Criteria
Cyclic Weather Testing	AASHTO R31: no salt fog, 95°F, 0%- 90% Relative Humidity, 500 hours, alternating RH every 100 hours	No melting or disbondment
Outdoor Exposure Testing - Sacrificial		
Property	Test Method	Requirement Acceptance Criteria
Sacrificial Coating removability	ASTM G7: 6 months exposure at FDOT test site	Complete removal of solvent based acrylic, polyurethane, and alkyd based spray paint from substrate