



Florida Department of Transportation

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June 11, 2009

Monica Gourdine
Program Operations Engineer
Federal Highway Administration
545 John Knox Road, Suite 200
Tallahassee, Florida 32303

Re: Office of Design, Specifications
Section 975
Proposed Specification: 9750000, Structural Coating Systems

Dear Ms. Gourdine:

We are submitting, for your approval, two copies of the above referenced Supplemental Specification.

These changes were proposed by Tom Malerk of the State Materials Office and provides a complete rewrite of the Section.

Please review and transmit your comments, if any, within four weeks. Comments should be sent via Email to ST986RP or rudy.powell@dot.state.fl.us.

If you have any questions relating to this specification change, please call Rudy Powell, State Specifications Engineer at 414-4110.

Sincerely,

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

RP/dr

Attachment

cc: Gregory Jones, Chief Civil Litigation
Florida Transportation Builders' Assoc.
State Construction Engineer

STRUCTURAL COATING SYSTEMS.(REV ~~6-11-098-26-7-16-08~~)

SECTION 975 (Pages 878 – 883) 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 and capable of performing according to its designated purpose for an extended service life of greater than 20 years. The composition of the coating is left to the discretion of the manufacturer but the finished product must *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.* All coatings must be designed for a marine, coastal environment and must be self-curing. Coatings that are multi-component must be prepackaged in required ratios for ease of mixing. Any coating not meeting these Specifications will be rejected by the Engineer.

975-1.2 Environmental Requirements: Coating materials and their waste projects must *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 ~~AASHTO R-31~~ *ASTM D 3960*.

975-2 Materials.

~~975-2.1~~ **975-1.3 Qualified Products List:** All *polymeric* coating materials and coating systems ~~except the materials in 975-4~~ must *shall* be listed on the Department's Qualified Products List (QPL). ~~Submit an application in accordance with Section 6~~ *Manufacturers seeking evaluation of their products shall submit the product data sheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, a 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 an application in accordance with Section 6* ~~Manufacturers seeking evaluation of their products shall submit the product data sheets, Material Safety Data Sheets for each product, and application in accordance with Section 6.~~

~~975-2.2~~ **975-1.4 Packaging and Labeling:** Ship ~~in~~ *Materials shall be shipped* in strong containers plainly ~~legibly~~ *legibly* marked with user information and lot or batch number, and QPL number *with application instructions, lot number, batch number, date of manufacture, shelf life, and Department QPL number*. Each lot or batch manufactured

must have a unique number. The name and address of the manufacturer also must be shown.

975-3 Product Testing and Certification.

———**975-3.1 General:** The Contractor shall provide the Engineer a certification conforming to the requirements of Section 6 from the manufacturer of the coatings materials confirming that the requirements of this Section are met. Each certification shall cover only one batch of coating.

———**975-3.2 Information to Accompany Samples:** Manufacturer's submitting QPL applications shall furnish product information according to AASHTO R-31, Section 6 and applicable section within this Specification. Use Federal Color Standard No. 595B, Table VIII, Shade No. 36622 for the finish coat color on test panels.

975-4 Galvanizing Compounds for Field Metallizing and Touch up Repair.

———**975-4.1 General:** Galvanizing compound materials must produce an adherent coating capable of preventing corrosion and specifically intended for use over mechanically cleaned or blasted steel. All coatings must possess physical properties and handling characteristics that are compatible with the use and application requirements of Section 560 and 562. Furnish product testing information according to AASHTO R-31, Section 8; the coating should not blister, soften or loosen bond at the end of the test period; there will be no primer creep, blistering or loss of adhesion relative to a scribed line applied prior to testing exceeding 0.05 inch at any point at the scribe and no corrosion in the field per ASTM D 610.

———**975-4.2 Composition Requirements for Zinc Coatings:** Zinc coatings must contain a minimum of 83% zinc dust pigment by weight in the primer. The zinc dust pigment used in the formulation must be Type II in accordance with ASTM D 520.

———**975-4.3 Composition Requirements for Aluminum Mastic Coatings:** Aluminum mastic coatings must contain aluminum pigment and minimum 80% volume solids.

———**975-4.4 Field Qualification:** Attain a numerical rating of not less than 9 in accordance with ASTM D 610 and ASTM D 1654 and 9F in accordance with ASTM D 714 when applied to KTA composite test panels prepared according to AASHTO R-31 and exposed at the Department's beach corrosion test site or applied at a test location. The coatings will be evaluated initially following an exposure period of 18 months. The coatings must continue to provide acceptable protection and performance for a period of 5 years. Application characteristics must be judged acceptable prior to beach testing.

975-5 Structural Steel Coatings.

———**975-5.1 General:** Structural steel coatings and coating systems must produce an adherent coating capable of preventing corrosion and specifically intended for use over mechanically cleaned steel. All coatings must possess physical properties and handling characteristics that are compatible with the application requirements of Section 560. Furnish product testing information according to AASHTO R-31, Section 8; the coating should not blister, soften or loosen bond at the end of the test period; there will be no primer creep, blistering or loss of adhesion relative to a scribed line applied prior to

testing exceeding 0.05 inch at any point at the scribe and no corrosion in the field per ASTM D 610; color retention, $\Delta E \leq 3$, in accordance with ASTM D 2244; and 10% max gloss loss in accordance with ASTM D 523.

Additional Laboratory Performance and Tests		
Property	Test Method	Limits
Impact Resistance	ASTM D 2794, 30 inch/lbs	Pass
Elongation	ASTM D 522, 1/2 inch cylindrical mandrel	No cracking
Chemical Resistance	ASTM G 20, 180 days: 5% Ammonia, 5% Urea, and Diesel fuel	The Coating should not blister, soften or loosen at the end of the test period.

All coatings and coating systems that perform as finish coats must create a finished surface that is resistant to color and gloss degradation. The default finish coat must meet Federal Color Standard No. 595B, Table VIII, Shade No. 36622, unless otherwise specified by the Engineer.

975-5.2 Composition Requirements for Primer Coatings: Meet the requirements of 975-4 galvanizing compounds.

975-5.3 Composition Requirements for Intermediate Coatings (Tie Coat): An intermediate coating is optional for a coating system. Coatings must be suitable as an intermediate tie coat between the primer and finish coat. Intermediate coatings must contain a minimum of 40 percent solids by volume as per ASTM D 5201.

975-5.4 Composition Requirements for Finish Coatings: Finish coatings must provide the final coating containing color and gloss for the coating system. A finish coat may be comprised of a single pigmented coating or a pigmented coating with a clear coat.

975-5.5 Composition Requirements for Clear Coating: When used, the clear coating must be suitable as a final coating over a finish coat and the two coatings used together will constitute the finish coat.

The clear coat must contain a UV degradable color for inspection purposes. UV degradable color must dissipate in a reasonable time period to allow inspection but not detract from visual impact of the structure.

975-5.6 Joint Sealants: Manufacturer's of coating systems must identify joint sealants that are compatible with their coating system. Sealants must be self-curing. If not top coated, the caulking must match the color of the joint surface being caulked.

975-5.7 Field Qualification: Attain a numerical rating of not less than 9 in accordance with ASTM D 610 and ASTM D 1654 and 9F in accordance with ASTM D 714; the coating should not blister, soften or loosen bond at the end of the test period; there will be no corrosion in the field per ASTM D 610; color retention, $\Delta E \leq 3$, in accordance with ASTM D 2244; and 10% max gloss loss in accordance with ASTM D 523 when applied to KTA Composite test panels prepared according to AASHTO R-31 and exposed at the Department's beach corrosion test site or applied at a test location. The coatings will be evaluated initially following an exposure period of 18 months. The coatings must continue to provide acceptable protection and performance for a period of 5 years. Application characteristics must be judged acceptable prior to beach testing.

975-2 Structural Steel Coating Systems.

975-2.1 General: Structural steel coatings shall meet the application requirements of Section 560.

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 (Federal Standard 595B, Shade X6134 or X4062) and submit to the State Materials Office. Also submit 1-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. ~~In addition, the color designated in AASHTO R-31 will be used for evaluation purposes, but all coatings regardless of color shall meet the color and gloss requirements designated below.~~

<i>Laboratory Testing</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Slip Coefficient</i>	<i>AASHTO R-31; Section 8, Test No. 1</i>	<i>Min. Class B (primer only)</i>
<i>Salt Fog Resistance</i>	<i>AASHTO R-31; Section 8, Test No. 2</i>	<i>Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.1 inches</i>
<i>Cyclic Weathering Resistance</i>	<i>AASHTO R-31; Section 8, Test No. 3</i>	<i>Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.2 inches, Color Retention $\Delta E \leq 8$, Gloss loss less than 30 units</i>
<i>Abrasion Resistance</i>	<i>AASHTO R-31; Section 8, Test No. 4</i>	<i>Wear Index ≤ 2.7 mg/cycle</i>
<i>Adhesion</i>	<i>AASHTO R-31; Section 8, Test No. 5</i>	<i>Avg. system tensile strength ≥ 800 psi</i>
<i>Freeze Thaw Stability</i>	<i>AASHTO R-31; Section 8, Test No. 6</i>	<i>Avg. tensile strength ≥ 800 psi</i>
<i>Coatings Identification</i>	<i>Fourier Transform Infrared Spectroscopy</i>	<i>IR scan (2.5 to 15 μm) for each base, catalyst, and mixed coating.</i>
<i>Impact Resistance</i>	<i>ASTM D 2794</i>	<i>Greater than 25 inch/lbs, 1/2" impact, intrusion</i>
<i>Flexibility</i>	<i>AASHTO R-31, ASTM D 522, 1 inch cylindrical mandrel</i>	<i>No cracking</i>
<i>Outdoor Testing</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>

<i>Rusting</i>	<i>ASTM D 610 ASTM D 1654 (scribed) ASTM D 1654 (un-scribed)</i>	<i>≥ 9 after 5 years ≥ 9 after 5 years ≥ 9 after 5 years</i>
<i>Blistering</i>	<i>ASTM D 714</i>	<i>10 after 5 years</i>
<i>Adhesion</i>	<i>ASTM D 4541; annex A4</i>	<i>≥ 800 psi (un-scribed area) after 5 years</i>
<i>Color Retention</i>	<i>ASTM D 2244</i>	<i>$\Delta E \leq 8$ after 2 years</i>
<i>Gloss</i>	<i>ASTM D 523</i>	<i>≤ 30 gloss units after 2 years</i>

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 D 520. 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 520. 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 Prime Coat: Inorganic zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Inorganic zinc rich primers shall meet the requirements of SSPC Paint 20, Type I, Level 2.

975-2.3.3.2 Finish Coat: The finish coat shall be one coat of white polyamide or cycloaliphatic amine epoxy coating. 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 D 520. Organic zinc rich primers shall meet the requirements SSPC Paint 20, Type II, Level 2.

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 A 123 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 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 8ΔEs 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 8ΔEs per the CIE L*a*b* 1976 will constitute a color retention failure. The Department will measure the CIE 1976 color chromaticity coordinates for the color of the top coat of the two sample coupons provided with 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 ~~Post-Tensioning Anchorage~~ 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:

Property	Test Method	Requirement
Hardness, Shore A	ASTM D 2240	Between 60 and 90

<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Tensile Strength</i>	<i>ASTM D 412</i>	<i>≥750 psi</i>
<i>Elongation</i>	<i>ASTM D 412</i>	<i>≥400%</i>
<i>Tear Strength</i>	<i>ASTM C 957</i>	<i>>70 pli</i>
<i>Abrasion Resistance H-18 wheels 1,000 gm/wheel</i>	<i>ASTM C 957</i>	<i>≤350 mg loss / 1,000 revs.</i>
<i>Crack Bridging 1,000 Cycles</i>	<i>ASTM C 957</i>	<i>System Passes</i>
<i>Elongation Recovery</i>	<i>ASTM C 957</i>	<i>≥94%</i>

975-5.3 System Modifications for Use on Bridge Substructure: Supply the elastomeric coating system with a 100% acrylic aliphatic polyurethane top coating.

975-6 Class 5 Applied Finish Coatings for Concrete.

975-6.1 General: Use a commercial product designed specifically for this purpose, which upon curing is capable of accommodating the thermal and elastic expansion ranges of the substrate without cracking.

_____ All coatings ~~must~~ *shall* possess physical properties and handling characteristics ~~that are~~ compatible with the application requirements of Section 400.

_____ ~~Unless otherwise specified, the default~~ *the color of the* finish coat *shall* meet Federal Color Standard No. 595B, Table VIII, Shade No. 36622 ~~unless otherwise specified by the Engineer.~~

975-6.2 Material Tests: Meet the following requirements: **Coating Requirements:**

975-6.2.1 Laboratory Requirements: Use 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. Coatings shall meet the following requirements:

Laboratory Performance and Tests <i>Testing</i>		
Property	Test Method	Limits <i>Requirement</i>
Resistance to Wind Driven Rain	ASTM D 6904	No visible water leaks, and if the rear face of the block is damp, the average gain in weight of the three 8 by 16 by 2 inch blocks must be less than 0.2 lb.
Freeze thaw resistance	AASHTO R-31	The coating should not blister, soften or loosen bond at the end of the test period. <i>No disbondment</i>
Water Vapor Permeance <i>Transmission</i>	ASTM D 1653; Method B, Condition C	WVT ≥ 10 perms
Abrasion Resistance	ASTM D 968, 3,000 liters of sand	No loss of coating thickness ASTM D 1005 <i>6132</i>

Laboratory Performance and Tests <i>Testing</i>		
Property	Test Method	Limits <i>Requirement</i>
Salt Spray (fog) resistance	ASTM B 117, 5 2,000 hours	The coating should not blister, soften or loosen bond at the end of the test period. <i>No disbondment</i>
Impact Resistance	ASTM D 2794, 30 inch/lbs	Pass
Elongation	ASTM D 522, 1/2 inch cylindrical mandrel	No cracking
Chemical Resistance	ASTM G 20, 180 days: 5% Ammonia and 5% Urea	The coating should not blister, soften or loosen bond at the end of the test period.
Accelerated <i>Cyclic</i> Weathering	AASHTO R-31 <i>AASHTO R-31</i> TM G-153, 5,000 hours	<i>No blistering, cracking, checking, chalking, or delamination</i> No disbondment The coating should not blister, soften or loosen bond at the end of the test period.
Fungal Resistance	ASTM D 3273	Rating of 10, ASTM D 3274
Dirt Pick-up	ASTM D 3719	Rating of 10, ASTM D 3274

———**975-6.32.2 Field Qualification:** Attain a numerical rating of not less than 9F in accordance with ASTM D 714 when applied to concrete test panels prepared and exposed at the FDOT beach corrosion test site or applied at a test location. The coatings will be evaluated initially following an exposure period of 18 months. The coatings must continue to provide acceptable protection and performance for a period of 5 years. Application characteristics must be judged acceptable prior to beach testing.

Outdoor Exposure Requirements: Outdoor exposure testing will be performed by the Department. Submit 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 the State Materials Office. Also submit 1-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 shall meet the requirements below. The coatings will be evaluated initially following an exposure period of 2 years. The coatings must continue to provide acceptable protection and performance for a period of 5 years.

<i>Outdoor Exposure Testing Requirements</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Blistering</i>	<i>ASTM D 714</i>	<i>Rating of 10</i>
<i>Fungal Resistance</i>	<i>ASTM D 3273</i>	<i>Rating of 10</i>
<i>Dirt Pick up</i>	<i>ASTM D 3719</i>	<i>Rating of 10</i>

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 graffiti and facilitating the removal of graffiti. All anti-graffiti coatings shall possess the physical and handling characteristics that are compatible with the requirements of Section 563.

Anti-graffiti coatings shall contain less than 5.0 lb/gal volatile organic compounds (VOC) as defined by 40 CFR Part 59, Subpart D, and evaluated as per ASTM D 3960.

The manufacturer will supply the following additional information:

- Cleaning instructions and materials, as applicable. Surfaces must be cleanable with nonproprietary cleaners as defined in ASTM D 6578.
- Sacrificial Coating Removal instructions, as applicable.
- Recommended base coat, as applicable.
- Identification of coating system and type, as applicable.
- Clear coats must contain a UV degradable color for inspection purposes. UV degradable color must dissipate in a reasonable time period to allow inspection but not detract from visual impact of the structure.

975-7.2 Laboratory Requirements: Use flat test panels prepared in accordance with AASHTO R-31.

<i>Laboratory Testing- Non-Sacrificial</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Cyclic Weather Testing</i>	<i>AASHTO R-31</i>	<i>No blistering, cracking, checking, chalking, or delamination; color change less than 3 Delta E CIE LAB units; Retention of 60° Gloss ratio >= 0.80</i>
<i>Taber Abrasion Resistance</i>	<i>ASTM D4060968, CS17, 1,000 gliters of sand</i>	<i>60 g maximum weight lossNo loss of coating thickness per ASTM D1005</i>
<i>Impact Resistance</i>	<i>ASTM D2794</i>	<i>Minimum of 30 inch-pounds, 1/2" impact, intrusion</i>
<i>Graffiti Resistance</i>	<i>ASTM D6578, Use identified marking materials; initial and recleanability; and after exposure initial and recleanability</i>	<i>Cleanability Level 81, 92, or 103.</i>
<i>MEK Double Rub</i>	<i>ASTM D 47525402; 50 rubs</i>	<i>No coating wear through (4 minimum rating)</i>
<i>Fluid Resistance</i>	<i>ASTM D1308- spot; Paint Thinner, Gasoline</i>	<i>No blistering, discoloration, softening or adhesion loss.</i>

<i>Laboratory Testing- Sacrificial</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>

<i>Laboratory Testing- Sacrificial</i>		
<i>Property</i>	<i>Test Method</i>	<i>Requirement</i>
<i>Cyclic Weather Testing</i>	<i>AASHTO R-31, no salt fog, 95 degrees Fahrenheit, 0%-90% Relative Humidity, 500 hours, alternating RH every 100 hours</i>	<i>No melting or disbondment</i>
<i>Sacrificial Coating removability</i>	<i>Per Manufacturer's specifications: 6 months exposure at FDOT test site</i>	<i>Complete removal of material from substrate</i>

975-7 Steel Strain Poles, Mast Arm and Monotube Assembly Coatings.

—————**975-7.1 General:** All coatings must possess physical properties and handling characteristics that are compatible with the application requirements of Section 649. All top coats must create a finished surface that is visually uniform and resistant to color and gloss degradation. Materials must be specifically intended for use over galvanized steel. Furnish product testing information according to AASHTO R-31, Section 8 and using galvanized KTA Flat test panels: the coating should not blister, soften or loosen bond at the end of the test period; there will be no primer creep, blistering or loss of adhesion relative to a scribed line applied prior to testing exceeding 0.05 inch at any point at the scribe and no corrosion in the field per ASTM D 610; color retention, $\Delta E \leq 3$, in accordance with ASTM D 2244; and 10% max gloss loss in accordance with ASTM D 523.

<i>Additional Laboratory Performance and Tests</i>		
<i>Property</i>	<i>Test Method</i>	<i>Limits</i>
<i>Impact Resistance</i>	<i>ASTM D 2794, 30 inch/lbs</i>	<i>Pass</i>
<i>Elongation</i>	<i>ASTM D 522, 1/2 inch cylindrical mandrel</i>	<i>No cracking</i>
<i>Chemical Resistance</i>	<i>ASTM G 20, 180 days: 5% Ammonia, 5% Urea, and Diesel fuel</i>	<i>The coating should not blister, soften or loosen bond at the end of the test period</i>

—————The default finish coat must meet Federal Color Standard No. 595B, Table VIII, Shade No. 36622 unless otherwise specified by the Engineer.

—————**975-7.2 Composition Requirements:** Coating systems must meet the requirements of Section 649 and 975-5 intermediates and finish coats.

—————**975-7.3 Field Qualification:** Attain a numerical rating of not less than 9 in accordance with ASTM D 610 and ASTM D 1654 and 9F in accordance with ASTM D 714 when applied to galvanized KTA Flat test panels and exposed at the Department's beach corrosion test site or applied at a test location. The coatings will be evaluated initially following an exposure period of 18 months. The coatings must continue to provide acceptable protection and performance for a period of 5 years. Application Characteristics must be judged acceptable prior to beach testing.

975-8 Elastomeric Coatings.

——— **975-8.1 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 must be supplied by a single manufacturer and sold as a waterproof coating system. The surface preparation and application of the coating system must be applied in strict accordance with the manufacturer's specifications.

——— **975-8.2 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 must not be less than 30 mils. The cured coating system must meet the following requirements:

Property	Test Value	Test Method
Hardness, Shore A	Between 60 and 90	ASTM D 2240
Tensile Strength	≥ 750 psi	ASTM D 412
Elongation	$\geq 400\%$	ASTM D 412
Tear Strength	> 70 pli	ASTM C 957
Abrasion Resistance H-18 wheels 1,000 gm/wheel	≤ 350 mg loss / 1,000 revs.	ASTM C 957
Crack Bridging 1,000 Cycles	System Passes	ASTM C 957
Elongation Recovery	$\geq 94\%$	ASTM C 957

——— **975-8.3 System Modifications for Use on Bridge Substructure:** Supply the elastomeric coating system with an aliphatic polyurethane top coating.

——— **975-8.4 Field Qualification:** Attain a numerical rating of not less than 9 in accordance with ASTM D 610 and ASTM D 1654 and 9F in accordance with ASTM D 714; the coating should not blister, soften or loosen bond at the end of the test period; there will be no corrosion in the field per ASTM D 610; color retention, $\Delta E \leq 3$, in accordance with ASTM D 2244; and 10% max gloss loss in accordance with ASTM D 523 when applied to test location and exposed at the Department's beach corrosion test site or applied at a test location. The coatings will be evaluated initially following an exposure period of 18 months. The coatings must continue to provide acceptable protection and performance for a period of 5 years. Application characteristics must be judged acceptable prior to beach testing.

STRUCTURAL COATING SYSTEMS.**(REV 6-11-09)**

SECTION 975 (Pages 878 – 883) 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 D 3960.

975-1.3 Qualified Products List: All polymeric coating materials except the materials in 975-4 shall be listed on the Department's Qualified Products List (QPL). Manufacturers seeking evaluation of their products shall submit the product data sheets, performance test reports from an independent laboratory showing the product meets the requirements of this section, a 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 an 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 QPL 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.

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 (Federal Standard 595B, Shade X6134 or X4062) and submit to the State Materials Office. Also submit 1-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.

<i>Laboratory Testing</i>		
Property	Test Method	Requirement
Slip Coefficient	AASHTO R-31	Min. Class B (primer only)
Salt Fog Resistance	AASHTO R-31	Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.1 inches
Cyclic Weathering Resistance	AASHTO R-31	Blister Size = 10 Average Rust Creep at the Scribe ≤ 0.2 inches, Color Retention $\Delta E \leq 8$, Gloss loss less than 30 units
Abrasion Resistance	AASHTO R-31	Wear Index ≤ 2.7 mg/cycle
Adhesion	AASHTO R-31	Avg. system tensile strength ≥ 800 psi
Freeze Thaw Stability	AASHTO R-31	Avg. tensile strength ≥ 800 psi
Coatings Identification	Fourier Transform Infrared Spectroscopy	IR scan (2.5 to 15 μ m) for each base, catalyst, and mixed coating.
Impact Resistance	ASTM D 2794	Greater than 25 inch/lbs, 1/2" impact, intrusion
Flexibility	AASHTO R-31, ASTM D 522, 1 inch cylindrical mandrel	No cracking
<i>Outdoor Testing</i>		
Property	Test Method	Requirement
Rusting	ASTM D 610 ASTM D 1654 (scribed) ASTM D 1654 (un-scribed)	≥ 9 after 5 years ≥ 9 after 5 years ≥ 9 after 5 years
Blistering	ASTM D 714	10 after 5 years
Adhesion	ASTM D 4541;annex A4	≥ 800 psi (un-scribed area) after 5 years
Color Retention	ASTM D 2244	$\Delta E \leq 8$ after 2 years

Gloss	ASTM D 523	≤ 30 gloss units after 2 years
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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 D 520. 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 520. 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 Prime Coat: Inorganic zinc dust pigment shall be a minimum of Type II in accordance with ASTM D 520. Inorganic zinc rich primers shall meet the requirements of SSPC Paint 20, Type I, Level 2.

975-2.3.3.2 Finish Coat: The finish coat shall be one coat of white polyamide or cycloaliphatic amine epoxy coating. 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 D 520. Organic zinc rich primers shall meet the requirements SSPC Paint 20, Type II, Level 2.

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 A 123 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 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 8ΔEs 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 8ΔEs per the CIE L*a*b* 1976 will constitute a color retention failure. The Department will measure the CIE 1976 color chromaticity coordinates for the color of the top coat of the two sample coupons provided with 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:

Property	Test Method	Requirement
Hardness, Shore A	ASTM D 2240	Between 60 and 90
Tensile Strength	ASTM D 412	≥750 psi
Elongation	ASTM D 412	≥400%
Tear Strength	ASTM C 957	>70 pli
Abrasion Resistance H-18 wheels 1,000 gm/wheel	ASTM C 957	≤350 mg loss / 1,000 revs.
Crack Bridging 1,000 Cycles	ASTM C 957	System Passes
Elongation Recovery	ASTM C 957	≥94%

975-5.3 System Modifications for Use on Bridge Substructure: Supply the elastomeric coating system with a 100% acrylic aliphatic polyurethane top coating.

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 Federal Color Standard No. 595B, Table VIII, Shade No. 36622.

975-6.2 Coating Requirements:

975-6.2.1 Laboratory Requirements: Use 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. Coatings shall meet the following requirements:

Laboratory Testing		
Property	Test Method	Requirement
Resistance to Wind Driven Rain	ASTM D 6904	No visible water leaks, and if the rear face of the block is damp, the average gain in weight of the three 8 by 16 by 2 inch blocks must be less than 0.2 lb.
Freeze thaw resistance	AASHTO R-31	No disbondment
Water Vapor Transmission	ASTM D 1653; Method B, Condition C	WVT \geq 10 perms
Abrasion Resistance	ASTM D 968, 3,000 liters of sand	No loss of coating thickness ASTM D 6132
Salt Spray (fog) resistance	ASTM B 117, 2,000 hours	No disbondment
Cyclic Weathering	AASHTO R-31, 5,000 hours	No blistering, cracking, checking, chalking, or delamination
Fungal Resistance	ASTM D 3273	Rating of 10, ASTM D 3274

975-6.2.2 Outdoor Exposure Requirements: Outdoor exposure testing will be performed by the Department. Submit 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 the State Materials Office. Also submit 1-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 shall meet the requirements below. The coatings must continue to provide acceptable protection and performance for a period of 5 years.

Outdoor Exposure Testing Requirements		
Property	Test Method	Requirement
Blistering	ASTM D 714	Rating of 10
Fungal Resistance	ASTM D 3273	Rating of 10

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 graffiti and facilitating the removal of graffiti. All anti-graffiti coatings shall possess the physical and handling characteristics that are compatible with the requirements of Section 563.

Anti-graffiti coatings shall contain less than 5.0 lb/gal volatile organic compounds (VOC) as defined by 40 CFR Part 59, Subpart D, and evaluated as per ASTM D 3960.

The manufacturer will supply the following additional information:

a. Cleaning instructions and materials, as applicable. Surfaces must be cleanable with nonproprietary cleaners as defined in ASTM D 6578.

b. Sacrificial Coating Removal instructions, as applicable.

c. Recommended base coat, as applicable.

d. Identification of coating system and type, as applicable.

e. Clear coats must contain a UV degradable color for inspection purposes. UV degradable color must dissipate in a reasonable time period to allow inspection but not detract from visual impact of the structure.

975-7.2 Laboratory Requirements: Use flat test panels prepared in accordance with AASHTO R-31.

Laboratory Testing- Non-Sacrificial		
Property	Test Method	Requirement
Cyclic Weather Testing	AASHTO R-31	No blistering, cracking, checking, chalking, or delamination; color change less than 3 Delta E CIE LAB units; Retention of 60° Gloss ratio ≥ 0.80
Taber Abrasion	ASTM D4060, CS17, 1,000 g of sand	60 g maximum weight loss
Impact Resistance	ASTM D2794	Minimum of 30 inch-pounds, 1/2" impact, intrusion
Graffiti Resistance	ASTM D6578, Use identified marking materials; initial and recleanability; and after exposure initial and recleanability	Cleanability Level 8, 9, or 10.
MEK Double Rub	ASTM D 4752; 50 rubs	No coating wear through (4 minimum rating)
Fluid Resistance	ASTM D1308- spot; Paint Thinner, Gasoline	No blistering, discoloration, softening or adhesion loss.

Laboratory Testing- Sacrificial		
Property	Test Method	Requirement

Laboratory Testing- Sacrificial		
Property	Test Method	Requirement
Cyclic Weather Testing	AASHTO R-31, no salt fog, 95 degrees Fahrenheit, 0%-90% Relative Humidity, 500 hours, alternating RH every 100 hours	No melting or disbondment
Sacrificial Coating removability	Per Manufacturer's specifications: 6 months exposure at FDOT test site	Complete removal of material from substrate