SECTION 09 97 13. 23 - EXTERIOR STEEL
FLUOROPOLYMER COATING
(Meets LEED EQ 4.2. & CARB/VOC 2010)

SPECIFIER NOTE
This specification is provided by Mid-Atlantic Coatings, Inc. as a service and is intended to be used as a guide-line for preparing a project specific specification section. Every heading may not be needed. Delete headings not used and renumber remaining used headings to be numerically correct. Contact Mid-Atlantic Coatings or Tnemec Company before using this specification for any product updates.

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. This Section includes shop and field surface preparation and shop and field painting of various substrates.

1. Surface preparation, including in the shop and applications of metal primer, and field applications of primers and finishes are specified in this Section.

B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates:

a. Steel Trusses & Structural Steel

B. Related Sections include the following:

1. Division 1 Section "LEED Green Building Summary, Requirements, and Goals" for additional LEED requirements.
2. Division 5 Sections for shop priming of metal substrates with primers specified in this Section.
3. Division 9 Section "Painting" for general field painting.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of finish-coat product indicated.

C. Samples for Verification: For each type of coating system and in each color and gloss of finish coat indicated.

1. Submit Samples on rigid backing, 8 inches square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

D. Product List: For each product indicated. Cross-reference products to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules.

E. LEED Submittals: For Credit EQ 4.2, manufacturers' product data for coatings, including printed statement of VOC content and chemical components.

1.4 QUALITY ASSURANCE

A. Material Performance Criteria:

1. Products: Provide certified test reports when submitting products other than those specified herein the specification. Test reports shall indicate the test method, system and requirements for those products being submitted, and shall meet or exceed the test criteria and performance values of the specified coatings herein.

B. Applicator Qualifications:

1. Preparation and Workmanship: A firm or individual with a minimum of (5) years experienced in applying coatings similar in material design, and extent to those indicated for a particular project, whose work has resulted in applications with a record of successful in-service performance.

C. Mockups: Apply benchmark samples of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each type of coating and substrate.

a. Provide samples of a section of the steel/metal surface to be coated.
b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.
3. Final approval of color selections will be based on benchmark samples.
4. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.
5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to project site in manufacturer’s original, unopened packages and containers bearing manufacturer’s name and label and the following information.

1. Product name or title of material.
2. Product description (generic classification or binder type)
3. Manufacturer’s stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.

5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F.

B. Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 PRODUCT WARRANTY

A. Provide manufacturer’s (10) year color and gloss, crack, check, peel warranty at the completion of the project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Materials specified are those that have been evaluated for the specific service on this project. Products of the Tnemec Company, Inc. are listed to establish a standard of quality. Equivalent materials of other manufacturer's may be submitted a minimum ten days prior to bid date on written approval of the Architect.

B. Materials specified herein shall not preclude consideration of equivalent or superior materials. Requests for substitution shall be submitted to the architect a minimum ten days prior to bid date in accordance with the general construction documents and in compliance with substitution procedures in Section 01 60 00 of this Project Manual.

1. Requests for substitution shall include evidence of satisfactory past performance on substrates that are listed herein.
2. Substitutions will not be considered that change the generic type, number of coats or do not meet specified total dry film thickness.

C. Colors: As selected by Architect from manufacturer's full range.

2.2 HIGH PERFORMANCE COATINGS GENERAL REQUIREMENTS

A. Materials Compatibility: Provide shop and field primers, and finish-coat materials that are single source and compatible with one another and with the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Requirements: USGBC Version LEED 3 (v3), and EQ 4.2 Low-Emitting Materials; Paints & Coatings.

1. Paints and coatings used on the interior of the building (defined as inside of the weatherproofing system and applied on-site) shall comply with the following criteria:

a. Coating Type: VOC weight in grams/liter of product minus water
b. Non-flat: 150 g/L
c. Flat: 50 g/L
d. Anti-Corrosive Primer & Paint: 250 g/l

C. CARB/VOC Requirements

1. Industrial & Exterior – 250 g/l

2.3 EXTERIOR METAL PRIMERS

A. Aromatic Urethane, Zinc-Rich Primer (Anti-Corrosive Primer)

1. Tnemec Series 94-H_20
2. Properties:

a. Solids by Volume: 62.0 +/- 2.0% (mixed)
b. VOC: 0.80 lbs/gallon (96 grams/litre)
c. HAPS: 0.8 lbs/gal solids.
d. Zinc Dust Content: 83% by weight in dried film

3. Performance Criteria:

a. Adhesion: ASTM D 4541 (TTM-34) Type II Fixed Alignment Adhesion Tester. No less than 1,533 psi.
b. Adhesion: ASTM D4541 (TTM-34) Type V Self-Aligning Adhesion Tester. No less than 1,730.
c. Cathodic Disbondment: ASTM G 8, Method A. No rusting, blistering, cracking or delamination and no undercutting at holiday after 30 day exposure.
d. Galvanic Protection: A one coat aromatic urethane zinc-rich coated steel panel containing several holidays is placed in a container of tap water. The panel's potential is measured by a voltmeter with the positive (+) pole attached to a bare spot on the panel above the water line and the negative (-) pole attached to an Ag/AgC1 referenced electrode immersed in the tap water. True theorectical galvanic action of the zinc having actual zinc-to-zinc contact would show a potential of -1100 millivolts. A range of -1100 millivolts to -750 millivolts would indicate galvanic action is occuring. The potential of -654 millivolts or less would indicate that the coating is only acting as a barrier coat

when tested with a Ag/AgCl reference electrode. The average measured potential of 94-H_20 is 818 millivolts.

e. Immersion: ASTM D 870. No blistering, cracking, rusting or delamination of film after two years immersion.

f. Prohesion: ASTM G 85 Prohesion Cabinet Testing. No blistering, cracking, rusting or delamination of film. No more than 1/8" creepage at scribe after 10,000 hours.

g. Re-coat Time/Immersion: Series 94-H_2O steel panles were exposed to direct sunlight for one, two, six and months. One set of panels was topcoated (without scarification) with a two-component epoxy and another set with an acrylic polyurethane. All panels were then exposed to 10 freeze/thaw cycles and adesion rated in accordance with ASTM D 3359, Method B (crosshatch). No rusting, blistering, delamination, or other film defects after 12 months immersion. Salt Spray (Fog): ASTM B117. No blistering, cracking or delamination of film. No more than 1% rusting on plane and no more than 1/16"rust creepage at scribe after 10,000 hours exposure.

2.4 EPOXY INTERMEDIATE COATING

A. Tnemec Series L69 and L69F Hi-Build Epoxoline II (Non-Flat, Intermediate Coat)

1. Generic Type: Polyamidoamine Epoxy
2. Finish: Satin
3. Properties:

   a. Solids by Volume: 65 +/- 2.0% (mixed)
   b. VOC: 0.82 lbs/gallon (98 grams/litre)
   c. HAPS: 0 lbs/gal

4. Performance Criteria:

   a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load). No more than 140 mg. loss after 1,000 cycles.
   b. Adhesion: ASTM D 4541Type II Fixed Alignment Adhesion Tester. No less than 1,583 psi (10.91 MPa) pull, average of three tests.
   c. Adhesion: ASTM D4541 Type V Self-Aligning Adhesion Tester. No less than 1,943 psi (13.40 MPa) pull; average of three tests.
   d. Exterior Exposure: ASTM D 1014. No blistering, cracking, checking, rusting or delami nation of film. No more rust creepage at scribe after (5) years exposure.
   e. Exterior Exposure: Exposed at 45 degrees facing south (light industrial area). No blistering, cracking or delamination of film. No rust creepage at scribe or no rusting at edges after 72 months exposure.
   f. Fresh Water: Continuous immersion in tap water at 75^0F (24^0C). No blistering, cracking, rusting or delamination of film after four years.
   g. Humidity: ASTM D4585. No blistering, cracking, rusting or delamination of film after 4,500 hours exposure.
   h. Immersion: ASTM D 870. No blistering, cracking, checking, rusting or delamination of film after two years or 17,088 hours continuous water immersion.
   i. Moisture Vapor Transmission: ASTM D 1653. No more than 9.9 g/m^2 24 hours water vapor transmission and no more than 0.31 grains/ft^2 hour in Hg. Water vapor permeability.

j. Prohesion: ASTM G 85. No blistering, cracking, checking, rusting or delamination of film. No rust creepage at scribe after 5,000 hours exposure.
k. Salt Spray (Fog). ASTM B117. No blistering, cracking or delamination of film. No more than 1% rusting on plane. No more than 1/64" rust creepage at scribe after 10,000 hours exposure and no more than 1/16" rust creepage at scribe after 6,700 hours exposure.

2.5 FLUOROPOLYMER FINISH COATING

A. Fluoropolymer, Pigmented & Metallic Coating (Non-Flat, Finish Coat)

1. Product: Tnemec Series 1071V Fluoronar (Exterior Finish Coat)
2. Finishes:

a. Series 1070V - Gloss
b. Series 1071V – Semi-Gloss
c. Series 1072V - Satin
c. Series 1078 - Metallic

3. Properties:

a. Solids by Volume:

i) 1070V: 51.0 +/- 2.0%
ii) 1071V: 56.0 +/- 2.0%
iii) 1072V: 54.0 +/- 2.0%
iii) 1078: 54.0 +/- 2.0%

b. VOC:

i) Series 1070V: 0.83 lbs/gallon (99 grams/litre)
ii) Series 1071V: 0.81 lbs/gallon (97 grams/litre)
iii) Series 1072V: 0.77 lbs/gallon (93 grams/litre)
iii) Series 1078: 3.40 lbs/gallon (407 grams/litre)

4. Performance Criteria:

a. Abrasion: ASTM D4060, (CS-17 Wheel, 1,000 grams load). No more than 103 mg loss after 1,000 cycles.
b. Adhesion: ASTM D 4541 (Method B, Type II Tester). No less than 1,333 psi (9.19 MPa) pull, average of three tests.
c. Adhesion: ASTM D 4541 (Method E, Type V Tester). No less than 1,930 psi (13.3 MPa) pull, average of three tests.
d. Exterior Exposure: Exposed at 45 degrees facing south. No blistering, cracking, rusting or delamination of film. No less than 87% gloss retention (8.9 units gloss change) and 2.99 DED FMCII (MacAdam units) color change after 24 months.
e. Exterior Exposure: ASTM D 4141, Method C (EMMAQUA). No blistering, cracking or chalking. No less than 96% gloss retention (3.2 units gloss change) and 0.18 DED Hunter Lab color change after 1,260 M/J m2 EMMAQUA exposure, average of five tests in five colors.

f. Flexibility: ASTM D 522 (Method A – Conical Mandrel). No less than 14.83% elongation average of three tests.

g. Graffiti Resistance: The following graffiti materials applied to coating and allowed to 7 days.

Reagent	Series 680	Xylene	MEK
Acrylic Spray Paint	Removal	Removal	Removal
Epoxy Spray Paint	Removal	Removal	Removal
Markette Marker	Removal	Removal	Removal
Ball Point Ink	Removal	Removal	Removal
Crayon	Removal	Removal	Removal
Lipstick	Removal	Removal	Removal

Some slight gloss loss and/or softening may occur depending on the amount of effort required for removal of the graffiti and length of exposure of the underlying coating to the cleaning solvents.

h. Hardness: ASTM D 3363. No gouging or scratching with an 8H or less pencil.

i. Humidity: ASTM D 4585. No blistering, cracking, rusting or delamination of film after 3,000 hours exposure.

j. Impact: ASTM D 2794. No visible cracking or delamination of film after 34.6 inch/pounds (3.9J) or less direct impact.

k. QUV: ASTM D 4587 (UVA-340 Bulbs, Cycle 4:8 hours UV/4 hours condensation). No blistering, cracking, or chalking. No less than 93% gloss retention (5.7 units gloss change) and 2.21 DED FMCII (MacAdam Units) color change after 10,000 hours exposure, average of five tests in five colors. No blistering, cracking, or chalking. No less than 60% gloss retention (31.4 units gloss change) and 1.89 DED FMCII (MacAdam Units) color change after 25,000 hours exposure, average of five tests in five colors.

l. Salt Spray (Fog): ASTM B 117. No blistering, cracking, rusting or delamination of film. No more than 1/32 inch rust creepage at scribe after 10,000 hours exposure. No blistering, cracking, rusting or delamination of film. No more than 1/8 inch rust creepage at scribe after 10,000 hours exposure. No blistering, cracking, rusting or delamination of film. No more than 1/16 inch rust creepage at scribe after 10,000 hours exposure.

m. Weatherometer Exposure: ASTM D 5031. No blistering, cracking, or chalking. No less than 92% gloss retention (6 units gloss change) and 0.73 DED Hunter Lab Scale color change after 5,000 hours exposure.

2.6 SHOP SURFACE PREPARATION

SPEC WRITER NOTE
List Surface Preparation and shop primer for Steel & Galvanized Metal Substrates in one or more of the following; Section 05 10 00 Structural Steel, Section 05 50 00 Metal Fabrications, Section 05 70 00 Ornamental Metals or Section 05 08 00 Factory-Applied Metal Coatings.

A. Ferrous Metals – Surface preparation SSPC-SP6 Commercial Blast Cleaned steel

2.7 SHOP PRIMER

A. Ferrous Metals – Tnemec Series 94-H_20 Tneme-Zinc applied at 2.5 to 3.5 mils DFT

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
3. Coating application indicates acceptance of surfaces and conditions.

3.2 FIELD PREPARATION

A. Comply with manufacturer's written instructions and recommendations.

B. Steel Substrates: Remove rust and loose mill scale.

1. Clean using methods recommended in writing by coating manufacturer.
2. Blast clean according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning.

3.3 APPLICATION

A. Apply high-performance coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings by spray application to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when coatings are being applied:

1. Owner will engage the services of a qualified testing agency to sample coating material being used. Samples of material delivered to Project site will be taken, identified, sealed, and certified in presence of Contractor.
2. Testing agency will perform tests for compliance with specified requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with specified requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

3.6 HIGH-PERFORMANCE COATING SCHEDULE

A. Steel Substrates: Exterior Exposed Steel, Handrails, Cast Iron and Ornamental Metals

1. Acrylic Polyurethane, Pigmented Coating, Exterior

a. Shop Primer: Series 94-$H_2$0 Hydro-Zinc applied at 2.5 to 3.5 mils DFT

SPEC WRITER NOTE
List Surface Preparation and shop primer for Steel & Galvanized Metal Substrates in one or more of the following; Section 05 10 00 Structural Steel, Section 05 50 00 Metal Fabrications, Section 05 70 00 Ornamental Metals or Section 05 08 00 Factory-Applied Metal Coatings.

b. Touch-up: Series 94-$H_2$0 Hydro-Zinc applied at 2.5 to 3.5 mils DFT
c. First Coat: Series L69 and L69F Hi-Build Epoxoline II, applied at 4.0 to 6.0 mils DFT]
d. Finish Coat: Series 1071V-color Fluoronar, applied at 2.0 to 3.0 mils [1070V, gloss] [1071, semi-gloss] [1078, metallic [1)]]

SPEC WRITER NOTE
[1)] *If Series 1078 is selected a clear coat of [Series 1079, gloss] [1079-0762, Semi-Gloss] or [1079-0763, Satin] is required for warranty protection.*

END OF SECTION 09 97 13. 23