

Part 1 GENERAL

1.1 SECTION INCLUDES

- A. This Section specifies factory-applied metal coatings including the following:
 - 1. The basis of design is **Colorgalv® 20 Plus** - Hot-dip galvanizing, factory-applied polyamide epoxy prime coat, an aliphatic acrylic urethane intermediate coat and a fluoropolymer urethane topcoat and aliphatic acrylic urethane UV resistant anti-graffiti clear-coat for iron and steel fabrications.

1.2 RELATED SECTION

- A. Examine Contract Documents for requirements that affect Work of this Section. Other Specification Sections that directly relate to Work of this Section include, but are not limited to:
 - 1. Section 033000 - Cast-In-Place Concrete.
 - 2. Section 042000 - Unit Masonry.
 - 3. Section 051200 - Structural Steel Framing.
 - 4. Section 053000 - Metal Decking.
 - 5. Section 055000 - Metal Fabrications.
 - 6. Section 055100 - Metal Stairs.
 - 7. Section 055200 - Metal Railings.
 - 8. Section 057000 - Decorative Metal.
 - 9. Section 077100 - Roof Specialties.
 - 10. Section 107000 - Exterior Specialties.
 - 11. Section 107500 – Flagpoles.
 - 12. Section 129300 - Site Furnishings.
 - 13. Section 323000 - Site Improvements.
 - 14. Section 323100 - Fences and Gates.

1.3 SUBMITTALS

- A. **Product Literature for Factory-Applied Metal Coatings:** Submit galvanizer's product data sheets for coatings specified in this Section including physical performance test data.
- B. **Certificate of Compliance for Items Coated by Galvanizer:** Submit notarized Certificate of Compliance, signed by the galvanizer, indicating compliance with requirements of specifications.
- C. **Substitutions:** Substitutions must be submitted with performance criteria that meet or exceed the requirements of this specification.
- D. **Certification from the American Galvanizers Association** that Galvanizer has a certified Master Galvanizer on staff.
- E. **Certificate of Compliance for Shop Application:** The galvanizer/applicator shall be SSPC-QP3 certified.

1.4 QUALITY ASSURANCE

- A. **Galvanizer's Qualifications:** Galvanizer must have a minimum of ten years of experience in hot-dip galvanizing using the dry kettle process and the application of the coatings required

in this specification. The coating application must be performed in the same facility as the galvanizing.

- B. **Coordination between Fabricator and Galvanizer:** The galvanizer shall review fabricator's shop drawings for suitability of materials for galvanizing and coatings and will notify the fabricator of any required modifications.
- C. **Coating Applicator:** For the purpose of establishing a standard of quality, appearance and performance of the finished product, the finish provide by the coating applicator must be equal to or better than the finish provided by Duncan Galvanizing.

PART 2 PRODUCTS

2.1 SECTION INCLUDES

- A. **Hot-Dip Galvanizing:** For steel exposed to the elements, weather or corrosive environments and other steel indicated to be galvanized, provide coating for iron and steel fabrications applied by the hot-dip process. Galvanizing bath shall contain special high-grade zinc.
 - 1. Basis of design: **Duragalv®**
 - 2. Comply with ASTM A 123 for fabricated products and ASTM A 153 for hardware.
 - 3. If required, plug vent holes after galvanizing and grind smooth.
 - 4. Galvanized surface shall be prepared per SSPC SP2 or SP3 to provide a smooth surface removing all runs, drips or sags.
 - 5. Galvanizing shall exhibit a rugosity (smoothness) of 16-25 microns or less when measured by a profilometer. This pertains to those elements that are less than 24 pounds per running foot.
 - 6. Galvanized surfaces, that are to receive coatings, must be blasted per SSPC SP 16. The use of iron, steel shot, and aluminum oxide grit as a blast medium, and power wire brushes are not permitted.
- B. **Factory-Applied Primer over Galvanized Steel:** Provide factory-applied polyamide epoxy prime coat over hot-dipped galvanized steel.
 - 1. Basis of design: **Primergalv®**.
 - 2. Primer shall be certified OTC/VOC compliant at less than 2.8 lbs. / gal. and conform to EPA and local requirements.
 - 3. Apply the primer at the galvanizer's facility within 12 hours after galvanizing or blasting. Application must be in a controlled environment meeting applicable conditions as required by the coating manufacturer. Primer shall have a one-year re-coat window for application of finish coat.
 - 4. Primer shall be applied at 4-6 mils DFT and meet or exceed the following performance criteria as stipulated by the coating manufacturer:
 - a. Abrasion Resistance: ASTM D 4060 (CS17 Wheel, 1,000 grams load) 1 kg load, 200 mg loss.
 - b. Adhesion: ASTM D 4541, 1050 psi.
 - c. Corrosion Weathering: ASTM D 5894, 13 cycles, 4,368 hours, 10 per ASTM D 714 for blistering; 7 per ASTM D 610 for rusting.
 - d. Direct Impact Resistance: ASTM D 2794, 160 in. lbs.
 - e. Flexibility: ASTM D 522, 180 degrees bend, 1-inch mandrel, Passes.
 - f. Pencil Hardness: ASTM D 3363, 3H.

- g. Moisture Condensation Resistance: ASTM D 4585, 100 degrees F, 2000 hours, Passes no cracking or delamination.
 - h. Dry Heat Resistance: ASTM D 2485, 250 degrees F.
 - i. Accelerated Weathering: QUV- ASTM D 4587 QUV A 5000 Hours, Passes.
 - j. Salt Fog Resistance: ASTM B 117, 5,600 hours No cracking or blister.
- C. **Intermediate Coat:** Provide factory applied premium performance fluoropolymer urethane topcoat in the specified color and gloss range per approved samples.
 - 1. Intermediate coat shall be certified OTC/VOC compliant and conform to EPA and local requirements.
 - 2. Intermediate coat shall be applied over the primer per the manufacturer's recoat schedule in a controlled environment meeting applicable conditions as required by the coating manufacturer.
 - 3. Intermediate coat shall be applied at 4-6 mils DFT and meet or exceed the following performance criteria as stipulated by the coating manufacturer:
 - a. Abrasion Resistance: ASTM D 4060, CS17 Wheel, 1,000 cycles 1 kg load; 87.1 mg loss.
 - b. Adhesion: ASTM D 4541; 1,050 psi.
 - c. Direct Impact Resistance: ASTM D 2794; greater than 32 in. pounds.
 - d. Dry Heat Resistance: ASTM D 2485; 200 degrees F (93 C).
 - e. Salt Fog Resistance: ASTM B 117 9,000 hours; Rating 10 per ASTM D 714 for blistering, Rating 9 per ASTM D 610 for rusting.
 - f. Flexibility: ASTM D522, 180 degrees bend, 1/8-inch mandrel; Passes.
 - g. Pencil Hardness: ASTM D 3363; F.
 - h. Moisture Condensation Resistance: ASTM D 4585, 100 degrees F (38 C), 1,000 hours; No rusting blistering or delamination.
 - i. Corrosion Weathering: ASTM D 5894, 21 Cycles, 7,056 Hours; Rating 10 per ASTM D714 for blistering. Rating 9 Per ASTM D 610 for Rusting.
 - j. Thermal Shock: ASTM D 2246, 15 cycles; Excellent
- D. **Fluoropolymer Topcoat:** Provide factory applied premium performance fluoropolymer urethane topcoat in the specified color and gloss range per approved samples.
 - 1. Fluoropolymer Topcoat shall be certified OTC/VOC compliant and conform to EPA and local requirements.
 - 2. Fluoropolymer Topcoat shall be applied over the primer per the manufacturer's recoat schedule in a controlled environment meeting applicable conditions as required by the coating manufacturer.
 - 3. Fluoropolymer Topcoat will be applied at 2-3 mils DFT and must meet or exceed the following performance criteria as stipulated by the coating manufacturer:
 - a. Adhesion: D 4541; 2,655 psi
 - b. Direct Impact Resistance: ASTM G 14; 80 in. pounds.
 - c. Dry Heat Resistance: ASTM D 2485; 200 degrees F (93 C).
 - d. Flexibility: ASTM D 522, 180 degrees bend, 1/8-inch mandrel; Passes.
 - e. Pencil Hardness: ASTM D 3363; HB.
- E. **Clear coat:** Provide factory applied aliphatic acrylic urethane UV resistant clear-coat in specified gloss range per approved samples.
 - 1. Clear coat shall be certified OTC/VOC compliant and conform to EPA and local requirements.

2. Clear coat shall be applied over the topcoat at the galvanizer's facility. Clear coat shall be applied in a controlled environment meeting applicable conditions and recoat times as required by the coating manufacturer.
3. Clear coat shall be applied at 4-6 mils DFT and meet or exceed the following performance criteria as stipulated by the coating manufacturer:
 - a. Abrasion Resistance: ASTM D 4060, CS17 Wheel, 1,000 cycles 1 kg load; 55 mg loss.
 - b. Adhesion: ASTM D 4541; 1,250 psi.
 - c. Direct Impact Resistance: ASTM D 2794; 120 in. pounds.
 - d. Dry Heat Resistance: ASTM D 2485; 200 degrees F (93 C).
 - e. Salt Fog Resistance: ASTM B 117 3,000 hours; Passes, no blistering or rusting
 - f. Flexibility: ASTM D522, 180 degrees bend, 1/8-inch mandrel; Passes.
 - g. Pencil Hardness: ASTM D 3363; HB.
 - h. Corrosion Weathering: ASTM D 5894, 9 Cycles, 3000 Hours; Passes- no blistering, cracking, rusting or delamination.
 - i. Accelerated Weathering: ASTM D 4587, QUV-A 10,000 hours; 100% Gloss retention.
 - j. Graffiti Resistance: epoxy ester spray, acrylic spray, alkyd spray, ballpoint pen ink, crayon, lipstick; all easily and completely removed with either xylene or MEK.

F. Warranty:

1. Provide galvanizer's warranty that materials will be free from 10 percent or more visible rust for 20 years.
2. Gloss and color warranty shall be 20 years in accordance with the following performance specifications:
 - a. Fade: Defined as a loss of gloss in excess of 20 units of gloss, which shall be measured in accordance with ASTM D 523-89 with 60 degrees geometry.
 - b. Color shift: Not to exceed 12 DE CIE LAB units for whites and light colors.

PART 3 EXECUTION

3.1 APPLICATION OF FACTORY APPLIED METAL COATINGS

- A. **Galvanizing Application:** Galvanize materials in accordance with specified standards and this specification. The dry kettle process shall be used to eliminate any flux inclusions on the surface of the galvanized material. The use of the wet kettle process is prohibited.
- B. **Prior to Galvanizing:** The steel shall be immersed in a flux solution (zinc ammonium chloride). The flux tank must be 12 to 14 Baumé density and contain less than 0.4 percent iron.
 1. To provide the galvanized surface required, the following procedures shall be implemented:
 - a. A monitoring recorder shall be utilized and inspected regularly to observe any variances in the galvanizing bath temperature.
 - b. The pickling tanks shall contain hydrochloric acid with an iron content less than 12 percent and zinc content less than 3 percent. Titrations shall be taken weekly at a minimum.

- c. All chemicals and zinc shall be tested at least once a week to determine compliance with ASTM standards. All testing shall be done using atomic absorption spectrometry or x-ray fluorescence (XRF) equipment at a lab in the galvanizing facility.
- C. **Coatings shall be applied under the following conditions:**
1. Surface of the substrate shall be dry and free from dust, dirt, oil, grease or other contaminants. Coating and cure facility shall be maintained free of airborne dust and dirt until coatings are completely cured.
 2. All coatings must be applied in a controlled environment under the conditions specified by the coating manufacturer. All coatings must be mixed and applied according to the coating manufacturer's specifications.

3.2 INSTALLATION

- A. **Installation:** Comply with fabricator's and galvanizer's requirements for installation of materials and fabrications, including use of nylon slings or padded cables for handling factory-coated materials.
- B. **Touch-Up and Repair:** For damaged and field-welded metal coated surfaces, clean welds, bolted connections and abraded areas the following procedures must be used.
1. For galvanized surfaces, apply organic zinc repair paint complying with requirements of ASTM A 780, modified to 95 percent zinc in dry film. Galvanizing repair paint shall have 95 percent zinc by weight. Basis of design is ZIRP by Duncan Galvanizing. Thickness of applied galvanizing repair paint shall be not less than coating thickness required by ASTM A 123 or A 153 as applicable.
 2. For factory-applied finish coatings, field-touch-up shall be performed by qualified applicators with experience in the application of high-performance industrial coatings. All coating manufacturer's requirements for mixing, application and environmental conditions must be followed. Touch-up shall be performed so that the repair is not visible from a distance of 6 feet. A touch-up repair kit and repair procedures shall be provided to the Owner for each type of factory-applied finish upon request.