**REVISION OF SECTION 509**

**STEEL STRUCTURES**

**Section 509 of the Standard Specifications is hereby revised for this project as follows:**

**Replace 509.24 with the following:**

**509.24 Coating First-Use Galvanized Steel Products – Plant and Shop.**

*(a) General*. The Contractor shall provide, install, and repair if necessary, products that are prepared and coated in conformance with this Subsection. Finished coatings shall be warranted for a period of two years from the date of written project acceptance. All associated costs for repair or replacement work necessary during the warranty period shall be at the Contractors expense.

The Contractor shall furnish a warranty performance bond equal to 100 percent of the contract price for coated galvanized products; this bond shall be maintained until release of responsibility is issued by the Engineer in writing. The Contractor’s public and property damage liability insurance shall also remain in effect during the entire warranty period. Conditions for release of warranty responsibility are addressed in Subsection (g).

Steel products to be galvanized and coated shall be cleaned of weld spatter and bevel finished at exposed corners, edges and points. Areas having welds, cuts, bores, notches or grooves shall also be beveled unless otherwise noted in the Contract or directed by the Engineer. Bevel work shall produce a uniform, smooth finish for galvanizing. Bevel size to be used is based on steel thickness and other criteria as follows:

 (1) Less than ½ in. thick - 1/32 in. to 1/16 in.

 (2) Over ½ in. thick – 1/16 in. to 1/8 in.

 (3) Bores, notches & grooves – root face of 1/32 in. to 1/16 in.

 (4) Welds – clean and work finish according to AWS standards.

All fabricators and users of potentially hazardous materials or operations shall determine and comply with Colorado Department of Public Health and Environment regulations.

All coating measurements shall be taken with a Type 2 fixed probe Dry Film Thickness (DFT) gauge. The gauge shall be calibrated according to the Society for Protective Coatings (SSPC) Standard PA-2. In cases of differing readings affected parties shall agree to use the gauge displaying the greater degree of accuracy.

*(b) Galvanizing.* Galvanizing shall be done according to the Standard ASTM Specification stated in the Contract except that items shall not be quenched with water, oil or liquid. Ambient air quenching is acceptable. Chromate treatment of any type is not acceptable. Zinc-Phosphate Pretreatment or Acrylic Passivation Pretreatments as described in Subsection (d-1) and (d-2) are acceptable.

The Galvanizer shall measure and record thickness of galvanized coating. Measure frequency shall comply with the applicable ASTM specification. Records shall be provided to the Engineer and to the point of next fabrication.

Spot areas not requiring galvanizing shall be marked and cleanly patched with material that prevents galvanization but does not weaken the adjacent spelter. Repair of patch areas shall comply with Practice Method 1) or 2) of Subsection (c).

**-2-**

**REVISION OF SECTION 509**

**STEEL STRUCTURES**

Prior to further work, the Galvanizer shall notify the Engineer in writing that the galvanized order is chromate free, air quenched, date(s) of galvanizing, and date(s) of any Zinc-Phosphate or Acrylic Passivation Pretreatments.

Products not certified chromate free by the Galvanizer shall be tested prior to further work. The Contractor shall provide the Engineer with certification from an independent ASTM accredited laboratory listing all individual items that test chromate free. Testing shall comply with ASTM D-2092 Appendix X2. Test results shall be provided to the Engineer before work resumes.

*(c) Repair of galvanized products.* Uncoated areas or damaged coatingexceeding applicable specification limits shall be re-galvanized per original specification. Cuts made after galvanizing shall be ground, beveled, and smoothed before repair. Repair of all cuts, uncoated areas or minor damage shall comply with Practice Method 1) or 2) as described below:

 (1) Metallizing – conforming to ASTM A-780, Annex A3, except that minor repair areas shall be cleaned according to SSPC method SP-3. SSPC Method SP-2 may be used to clean difficult access areas. Thickness of the repair coat shall reasonably match adjacent galvanizing, as measured by calibrated DFT gauge.

 (2) Paint – conforming to ASTM A-780, Annex A2, except that an organic zinc-rich epoxy paint containing minimum 80% zinc concentration shall be used. The epoxy paint shall conform to all other requirements in Subsection (e), as defined for epoxy. Thinning shall comply with manufacturer’s instruction to prevent adjacent spelter damage. A repair coat of 3 to 5 mils shall be applied by brush or dauber only.

Coat imperfections such as burring, run/drip, high spots, heavy dross, or ash inclusion shall be removed and cleaned. Areas of re-work falling below zinc thickness limits shall be repaired according to Practice Method 1) or 2) of this Subsection.

Printed technical data sheets (PTDS) shall be provided to the Engineer for repair materials used. Spray can paint or cold galvanizing compound repair will be rejected; these substances are not compatible with the coating systems to be employed.

*(d) Preparing galvanized surfaces for coating.* Products shall be inspected for shipping and handling damage before surface prep work begins. Damage shall be reported to the Galvanizer and to the Engineer prior to repair. The Engineer will order repair or replacement of damaged items. Minor repair of galvanizing shall comply with Practice Method 1) or 2) of Subsection (C).

The Contractor shall prepare all coat-able surfaces to provide a slightly roughened profile without removing over 1.0 mils of the galvanized coating. Minimum ASTM zinc thickness specifications shall still apply after preparation.

Fasteners to be coated shall be lightly brushed or sanded on the surfaces to be coated. Care shall be taken so that a minimal amount of zinc is removed.

**-3-**

**REVISION OF SECTION 509**

**STEEL STRUCTURES**

Surfaces that become soiled after pretreatment shall be cleaned prior to coating by low pressure, mild detergent wash and rinse. Stained or oiled surfaces may also be mildly scrubbed with a soft bristle nylon brush. Stubborn stains may be mildly scrubbed with a 1-2 percent ammonia solution and thoroughly rinsed. Wash and rinse pressure shall not exceed 100 PSI or 185 F temperature.

 Surface preparation work shall be done according to one of the following methods:

(1)  *Zinc-Phosphate Pretreatment.* Treatment can only be used on new galvanizing less than 48 hours of age. Thickness measure after treatment is not required when using this method.

Items shall be immersed in a bath of acidic zinc-phosphate solution for 3 to 6 minutes, rinsed with clean water and dried. The first epoxy coat shall be applied within 48 hours after immersion treatment.

If treated items are shipped to a different coating facility they shall be rewashed, rinsed and dried to remove surface soiling. The first epoxy coat must still be applied within 48 hours after immersion treatment.

(2)  *Acrylic Passivation Pretreatments.* Treatment can only be used on fresh hot galvanizing or new galvanizing less than 48 hours of age. Thickness measure after treatment is not required for either application method. Only chrome-free solutions shall be used, applied by a method that ensures complete coverage of all coat-able surfaces. The Treater shall provide the Engineer with treatment dates for each item and PTDS for solution(s) used.

 (a) The Galvanizer may apply solution to fresh hot galvanizing that is less than 6 hours of age, still clean, dry, and has cooled to treatment application temperature guidelines.

 (b) If newly galvanized items are shipped to another treatment facility they shall be washed, rinsed and dried to remove surface soiling. Solution shall then be applied and cured according to supplier’s instructions.

Fully cured, treated items shall be rewashed, rinsed and dried again just before coating. Articles not coated within 100 days of treatment shall be abrasive blasted per Subsection (d-3).

(3)  *Abrasive Blasting.* This treatment may be used on galvanized items of any age if beveling requirements as listed in the third and fourth paragraphs of Subsection (a) have been met.

The Contractor shall notify the Engineer in writing at least 5 working days before blasting begins. Zinc thickness shall be measured and recorded immediately after blasting and provided to the Engineer within 48 hours of blasting. Thickness limits and measure frequency shall comply with the original applicable ASTM specification. Blast operations shall reasonably conform to ASTM Standard Practice D-6386, Subsection 5.4.1 except for:

**-4-**

**REVISION OF SECTION 509**

**STEEL STRUCTURES**

 (a) Small areas falling below required zinc thickness shall be repaired according to Subsection (c) Practice Method 1) or 2). No single area shall exceed 2 in. at its largest width or 12 in. at its longest dimension. Total repair area shall not exceed 1% of the coatable surface per item; if limits are exceeded or zinc thickness is below specification the item shall be re-galvanized per original specification.

 (b) The Contractor shall measure and record the size, location and repair method used for all repairs. This information shall be included on the report of thickness measurements so the Department can later inspect these areas.

 (c) The first epoxy coat shall be applied within 90 minutes of abrasive blasting. Items shall be cleaned free of blast debris before coating. Compressed air used to clean items shall be free of oil residue or other harmful contamination.

*(e) Coating and Paint Systems.* Prepared items shall be coated with a 2 or 3 coat system described in this Subsection. Alternative coating systems shall be pre-approved in writing by the Engineer. Manufacturers PTDS for each coating type shall state test values for ASTM requirements of this Subsection. Prior to product use the coating supplier shall provide the PTDS and certify to the Engineer in writing that all furnished coating materials meet applicable requirements of this Subsection.

 Faying surfaces shall not be painted unless written approval is given by the Engineer. All shop fabrication including welds and attachments shall be completed prior to coating unless otherwise noted in the Contract or directed in writing by the Engineer.

 Inorganic zinc coatings shall not be used. Combined DFT of all coats applied over the galvanizing shall range from 6.5 to 10 mils with a topcoat DFT of 3 mils minimum. Dried color of the base coat and topcoat shall closely match. Finished color shall not vary more than 4 delta units from plan specification.

 Volatile Organic Compound (VOC) levels shall not exceed 3.0 lbs. per gallon for each applied coat. Dry films shall contain less than 1% lead and other toxic heavy metals. Zinc concentration of epoxy coats shall not exceed 40 percent. Topcoats shall be of semi-gloss material with a rating of 50-75.

 All coatings shall be able to withstand prolonged temperatures up to 180 degrees F. without sag, blister or peel damage during the warranty period. Topcoat formulation shall provide weathering, chemical, and ultraviolet (UV) resistance. All coatings shall meet the following ASTM requirements as amended:

 **Corrosion Weathering.** ASTM D-5894, minimum 6-cycles of exposure;

 - corrosion rating of 8 or higher according to ASTM D-1654.

 - blistering rating of 8 or higher according to ASTM D-714.

 **Impact Resistance.** ASTM D-2794, 30 day test. Epoxies – Minimum 40 in. lbs. All Topcoats – Minimum 90 in. lbs.

**-5-**

**REVISION OF SECTION 509**

**STEEL STRUCTURES**

**Adhesion Testing.** ASTM D-4541, 30 day test. Minimum 500 PSI for either: Method B - flat surface; Method E - curved surface.

**Abrasion Resistance.** ASTM D-4060, 30 day test. Maximum 90 mg loss for 1000 cycles with CS10 or CS17 wheel.

**Flexibility.** ASTM D-522, 30 day test - Method B. Epoxies shall pass a 180 degree bend over a 3/4" mandrel. All Topcoats shall pass a 180 degree bend over a 3/8” mandrel.

Coats shall be applied uniformly to provide an appearance free of laps, streaks, sags, drips, pinholes, and other discontinuities; all such defects shall be repaired prior to project shipment.

The Coater shall measure the DFT of each applied coat according to SSPC, Guide PA-2, except that measurements shall be taken with a calibrated Type 2 fixed probe gauge. Thickness records shall be provided to the Engineer prior to product shipment. The following two coating systems do not require pre-approval:

 (1) Powder Coating. The Coater shall oven preheat the articles to abate out-gassing potential. The Coater shall be responsible for utilizing compatible materials and coating processes to obtain proper coat to coat adhesion.

 Epoxy Powder base coat(s) shall measure 2 to 6 mils DFT and be applied by electrostatic or Tirbo/Airstatic spray. Powder formulation shall be a non-hybrid epoxy of anti-gassing grade.

The powder topcoat shall be electrostatic or Tirbo/Airstatic spray applied and measure 3 to 6 mils DFT. Powder formulation shall be non-acrylic, high-build, aliphatic-based, Enhanced Polyester or Urethane Polyester of anti-gassing grade.

 (2) Liquid Coating. The Coater shall apply coats by conventional or airless spray according to supplier’s guidelines. Minimal striping at difficult work areas is permissible. The Coater shall be responsible for utilizing proper work methods and compatible materials to obtain proper coat adhesion. Thinning of paints shall be done according to manufacturer’s instruction so that thinned products conform to the solids content and VOC limits of this Subsection.

Epoxy base coat(s) shall measure 2 to 6 mils DFT. Paint shall be a low-blush epoxy polyamide, or a low-blush cycloaliphatic bisphenol-A polyamine. Minimum solids by weight of all epoxies used shall be 68 percent.

The topcoat shall measure 3 to 6 mils DFT. Paint shall be an aliphatic-based Urethane Polyester or aliphatic-based Polyurea Urethane. Specially formulated aliphatic-based Polyaspartic Polyureas may also be used over compatible epoxy bases.

*(f) Repair of Coated Products.* The Contractor shall be responsible for repairing damage from shipment, installation, field welding, or other repairs necessary during the warranty period. Damage

**-6-**

**REVISION OF SECTION 509**

**STEEL STRUCTURES**

 shall be reported to the Engineer prior to repair. Repairs shall be done to the satisfaction of the Engineer.

 Significant repair procedures shall require written submittal of proposed repair from the Contractor. The Engineer shall approve the proposal in writing before repairs begin. Significant repairs shall be classified as:

 (1) Any damaged area to the base coat material over 1 sq. in.

 (2) Total repair areas exceeding 5% of the coating per item.

 (3) Any single topcoat repair area over 64 sq. in.

 Minor and touchup repair of topcoats shall be done as follows:

 (1) A UV rated, aliphatic-based liquid topcoat paint shall be used. The paint shall be compatible with existing topcoat material and closely match existing color. Paint requirements listed in Subsection (e) shall apply to the material. The paint supplier shall provide the Engineer with PTDS for the product(s) used.

 (2) Single area repairs smaller than 8 sq. in. shall be scuffed with 220 grit sandpaper or an equivalent scuff material. Larger areas up to 64 sq. in. may be cleaned according to SSPC, Method SP-2. All border areas at the undamaged topcoat shall be scuffed with 220 grit material.

 (3) Cleaned, scuffed areas shall be bordered and coated by airless or conventional spray. Work areas shall be adequately shielded to contain errant spray. Fresh repair areas shall be protected as necessary during the initial cure. Repair thickness shall reasonably match the adjacent coating.

 (4) The repair coat shall provide an appearance free of sags, runs, streaks, drips, pinholes or other discontinuities. Spray can paint repair will be rejected.

*(g) Acceptance conditions for release of warranty responsibility.* Coated products shall be free from the following defects for two full years from the initial date of written project acceptance. Defect areas that received repair during the warranty period shall also be free from the described defects:

 (1) No peeling shall exist on any portion of the coatings.

 (2) No blistering shall exist on any portion of the coatings.

 (3) Color fading shall not fall below a 35 gloss rating.

 (4) Mottling defects shall not exceed 3% of the topcoat surface.

 (5) No cracking of the topcoat material shall be visible.

 (6) No rusting discoloration shall be visible on the coating.

 (7) No sag or other coating adhesion loss shall be evident.

*(h) Basis of Payment.* The cost of coating galvanized steel products shall be included in the work.