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Section 716. SHOP CLEANING AND COATING STRUCTURAL STEEL

716.01. Description. This work consists of shop cleaning and applying a complete coating system on new structural steel as a part of fabricating and providing structural steel; field cleaning and repairing surfaces damaged in shipping, handling, and erecting the structural steel; and repairing damaged galvanized surfaces.

Refer to Society for Protective Coatings (SSPC) *Steel Structures Painting Manual*, Volume 1 and Volume 2 for definitions of cleaning criteria and other coating terms.

If more than 500 square feet of steel surface is painted, ensure work is performed by a fabricator with an AISC Sophisticated Paint Endorsement. The Engineer will accept Society of Protective Coatings, SSPC QP3 Shop Painting Certification Program as an acceptable alternate to an AISC Sophisticated Paint Endorsement.

716.02. Materials. Provide materials in accordance with the following:

Bridge Coating System.....915

Use a Department-approved low dusting abrasive, steel grit or shot, or a combination of these, for blast cleaning. Select abrasives from the Qualified Products List. Provide abrasives with a gradation capable of producing a uniform profile of 1 mil to 2.8 mils using extra coarse replica tape.

Use inorganic or organic zinc-rich primer to coat faying surfaces of slip critical connections. Use the same primer on both connecting faying surfaces. Do not mix use of inorganic and organic zinc rich primers on the same connection. Use primer from the same manufacturer that supplied primer for the remainder of the structure. Use a primer meeting Class B (0.5 or greater) slip coefficient requirements of the Research Council on Structural Connections' *Specification for Structural Joints Using ASTM A 325 or A 490 Bolts*. Before coating, submit to the Engineer, a certification of testing from an independent laboratory, showing that primer meets Class B slip coefficient.

Select the sealant for perimeter of beam plates from the Qualified Products List. Supply the sealant in caulking tubes.

Select zinc-rich paint, for repairing damaged galvanized surfaces, from the Qualified Products List. Use a zinc-rich paint with a gray color closely matching the surface requiring repair.

716.03. Construction.

A. **Cleaning Structural Steel.** Before cleaning, remove oil or grease deposits in accordance with SSPC-SP 1, Solvent Cleaning. Clean surfaces to SSPC-SP 10, Near White Blast Cleaning. Grind surface irregularities, including fins, tears, slivers, and burred or sharp edges on steel members in accordance with SSPC-SP 11, Power Tool Cleaning to Bare Metal. The Engineer will inspect for steel cleanliness using the visual standard specified in SSPC-VIS 1 Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning, SSPC-SP 10 for the initial rust condition.

Provide a uniform profile of 1 mil to 2.8 mils, measured using extra coarse replica tape.

Remove abrasives from steel surfaces with a commercial grade vacuum cleaner equipped with a brush-type cleaning tool, or by double blowing with partial vacuuming. If using the double blowing method, vacuum the top surfaces of structural steel, including flanges, longitudinal stiffeners, splice plates, and hangers after double blowing. For blowing the steel clean, use an air line with an in-line water trap that delivers air free of oil and water as it leaves the air line. Maintain steel dust free and prime within 8 hours of cleaning.

Before shop coating, mask areas requiring field welding, except top flange areas receiving welded stud-shear connectors. After applying the prime coat, but before applying the intermediate coat, mask areas where welding stud-shear connectors to the top flange. Provide a primer dry film thickness for the top flange between 1 mil and 2.5 mils.

B. **Coating Structural Steel.** Load material for shipment after the shop coating has cured and the Engineer has inspected material. The Engineer will stamp the components "Recommended for Use" after loading is complete.

1. **Applying the Coating.** Apply coating in accordance with subsection 715.03.D.1 and subsection 715.03.D.3.
2. **Coating Faying Surfaces and Connections.** Faying surfaces are all surfaces internal to a connection that bear on an adjacent surface including the contact surface of bolts, nuts, and washers. Before cleaning and coating, disassemble bolted connections. Blast clean components separately. Apply a prime coat and allow to cure before reassembly. Use the same primer for both connecting surfaces. Vacuum the connection again immediately before reassembly. If the Engineer determines the surface is not clean enough for bolting, scrub the surface with a commercial detergent and rinse with water

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before assembling the connection. Reassemble the connection by tightening the bolts using the turn-of-nut method in accordance with subsection 707.03.D.7.c.

- a. **Slip Critical Connections.** Apply the same primer to faying surfaces and filler plate surfaces. Apply prime coat to a minimum dry film thickness of 1 mil and a maximum dry film thickness determined by the slip coefficient test results in accordance with subsection 716.02. Apply a prime coat to the external surfaces of splice plates with a dry film thickness from 4 mils to 10 mils. Ensure the primer meets the requirements of Class B slip coefficient. Mask the faying surface during subsequent coat applications.
 - b. **Other Connections.** Apply the same prime coat to faying surfaces, other than slip critical, in accordance with subsection 715.03.D.1. Mask the faying surface before subsequent shop coating operations. After assembly in the field, solvent clean exposed primed splices and other bolted connection locations in accordance with SSPC-SP 1. Use the same intermediate and top coat materials as for the remainder of the structure. Apply an intermediate and top coat to exposed surfaces of the bolts, nuts, and washers in accordance with subsection 715.03.D.1.
 - c. **Contact Surfaces without Primer.** If painting with an epoxy intermediate coat, edge seal unprimed contact surfaces. Use a sealant designated for sealing perimeter of beam repairs selected from the Qualified Products List.
3. **Stenciling.** Apply stencils in accordance with subsection 715.03.D.5. Designate the coating type as 4S.
 4. **Galvanizing.** As a substitute for applying a zinc rich primer, the Department will allow hot-dipped galvanizing of structural steel members in accordance with ASTM A 123, except for surfaces internal to slip critical connections and surfaces of filler plates. Apply a zinc-rich primer coat to surfaces internal to slip critical connections and surfaces of filler plates at a minimum dry film thickness of 1 mil and a maximum dry film thickness as determined by the slip coefficient test results in accordance with subsection 716.02. Mask the faying surface before applying subsequent coats. Apply subsequent coats in accordance with subsection 715.03.D. Repair damaged galvanized surface in accordance with subsection 716.03.E.

Perform galvanizing using the “dry process”. Do not quench the galvanized components after galvanizing. If the contract requires a top coat on galvanized components, do not apply a chromate surface passivation. Apply a galvanizing thickness of at least 3.9 mils, or 2.3 ounces per square foot.

Ensure areas of field connections have a uniform galvanized coating thickness, free of local excessive roughness that prevents splice plates, bearings, or other field connections from making full contact.

In the shop after galvanizing, use a hand wire brush to roughen faying surfaces other than slip critical connections. Do not use powered wire brushes. Ensure field splice bolt holes are free of zinc build up. Check each hole in the shop after galvanizing to verify the hole is able to receive a drift or barrel pin with a diameter of 1.6 millimeters plus the diameter of the bolt.

After galvanizing, place structural steel in a second shop assembly in accordance with subsection 707.03.C.7 to check alignment of holes, sweep, and camber against the fabricator’s original recorded lay down dimensions. If approved by the Engineer, the Department will allow the fabricator’s personnel to perform this shop assembly at the galvanizer’s facility. The Engineer may waive the second lay down if the fabricator records individual beam or girder cambers and sweeps during the first lay down and the dimensions after galvanizing fall within the following tolerances:

- a. Bearing points after galvanizing are $\pm\frac{1}{8}$ inch from the first lay down;
- b. Camber points after galvanizing are $+\frac{1}{4}$ inch or -0 inch from the first lay down; and
- c. Sweep points after galvanizing are $\pm\frac{3}{8}$ inch from the first lay down.

If individual beams or girders exceed the listed tolerances, place the beam or girder with at least two adjacent beams or girders in lay down to check against the recorded shop assembly records in accordance with subsection 707.03.C.7. Ensure the fabricator records, and the Engineer witnesses, the second lay down or individual member cambers.

Stencil in accordance with subsection 715.03.D.5 except designate the coating type as 4GS.

C. Handling Coated Steel. Use care when handling coated steel in the shop and during shipment, erection, and assembly. To ensure the coating is not damaged, do not move or handle coated steel until the

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coating cures. Protect the steel from binding chains with softeners approved by the Engineer. Use padded hooks and slings to hoist steel. Space diaphragms and similar pieces during shipment to prevent damage from rubbing. At the project site, store the steel components on pallets to ensure they do not rest on the ground or fall against or rest on each other. Provide shipping and project site storage details to the Engineer at the pre-fabrication meeting and obtain Engineer's approval before shipping the steel.

D. Shop and Field Repair. Make shop and field repairs to the coating in accordance with the coating manufacturer's recommendations, or in accordance with this section, whichever is more stringent. Submit written procedures to the Engineer and obtain Engineer's approval for shop and field repairs for approval before applying coating. For surfaces, inaccessible after erection, repair and recoat before erection. Prepare accessible steel for repairs after completion of erection work, including connections and straightening of bent steel.

1. **Cleaning.** Shop clean in accordance with subsection 716.03.A. Field clean in accordance with subsection 715.03.C.
2. **Coating.** Apply shop coats in accordance with subsection 716.03.B. Apply field coats in accordance with subsection 715.03.D, using the same coating material as applied in the shop.

E. Repair of Damaged Galvanized Surfaces. If damage occurs to the zinc coating during transporting, handling, or installing, repair the damage at no additional cost to the Department. Exposed underlying steel or coating thicknesses less than 50 percent of the specified thickness or thickness equivalent is considered damage.

Thickness equivalent: 1 ounce of zinc per square foot equals 1.7 mils.

For repair coating, apply a coating 1½ times the thickness or thickness equivalent specified for galvanizing on the item, but not less than 5 mils. Use zinc-based solder, zinc-rich paint, or sprayed zinc (metallizing) in accordance with ASTM A 780. Obtain the Engineer's approval before using sprayed zinc.

Clean the metal and apply the coating in accordance with Annex A1, A2, or A3 of ASTM A 780, except as modified in this subsection.

If using zinc-based solder for repair, use temperature sensitive crayons to verify the preheat temperature of the metal before depositing the zinc alloy.

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If using zinc-rich paint for repair, clean the damaged surface to near-white metal before applying the paint. Apply the paint in accordance with the manufacturer's recommendations for temperature and dryness.

716.04. Measurement and Payment.

Pay Item	Pay Unit
Field Repair of Damaged Coating (Structure No.)	Lump Sum

The Engineer will measure **Field Repair of Damaged Coating (Structure No.)** as a unit for each structure. The unit price for **Field Repair of Damaged Coating (Structure No.)** includes the costs of making field repairs to the shop applied coating system; applying a prime coat to structural steel surfaces and exposed surfaces of bolts, nuts, and washers; and repairing stenciling and the coating of galvanized components that are not shop coated.

The unit price for **Structural Steel, Furn and Fab**, of the type specified, includes the cost of applying and shop repairing the complete coating system, including stenciling and approved sealants.

Repair of damaged galvanized surfaces is included in the pay item for furnishing the galvanized component.