Section 2509. Cleaning, Surface Preparation, and Painting of Galvanized Surfaces

2509.01 DESCRIPTION

A. For the galvanized steel designated for painting on the plans:

1. Clean the surface.

2. Prepare the surface for painting.

3. Apply an intermediate coat of polyamide epoxy with a coating thickness of 3 mils to 4 mils (75 µm to 100 µm).

4. Apply a topcoat of aliphatic polyurethane which matches the Federal Standard Color number listed in the contract documents.

B. Clean, prepare, and paint the surface in the same shop to ensure single source responsibility of the entire coating system. Submit the sequence of operation to the Iowa Department of Transportation, Attention: Structures Engineer, Office of Materials, 800 Lincoln Way, Ames, IA, 50010. Describe the procedure used in preparing the galvanized surface, the brand names of the paint to be used, and certification that the paint that is used is compatible with galvanized surfaces.

2509.02 MATERIALS

A. One of the two-coat epoxy/polyurethane paint systems listed in Materials I.M. 482.08.

B. Ensure all materials used in the coating system are compatible and from the same manufacturer.

C. Ensure all materials are in unopened, original, dated containers from the manufacturer. Material used shall be within manufacturer's shelf life.

D. Ensure all materials have been and continue to be stored in such a manner as to prevent freezing and/or overheating. Follow the manufacturer recommendations as to maximum and minimum storage temperatures.

2509.03 CLEANING, PREPARATION, AND PAINTING

A. Surface Preparation of Galvanized Surfaces.
Prepare and prime the surface as soon as possible after galvanizing. The surfaces shall be primed within 24 hours of the galvanizing operations. There shall be no visible signs of zinc oxide or zinc hydroxide, which first appear as a fine white powder.

B. Surface Smoothing
Remove zinc high spots by cleaning with hand or power tools as described in SSPC SP2 or SP3. Remove the zinc until it is level with the surrounding area, taking care that the base coating is not removed by the cleaning

methods. After cleaning, inspect the surface for conformance to the required zinc thickness according to ASTM A 123 using a magnetic or eddy current type thickness instrument complying with ASTM E 376. Repair all items falling below the required zinc thickness, before or after removal of high spots, according to ASTM A 780.

C. Surface Cleaning

1. Hot dip galvanized surfaces shall be clean and free of oil and grease before they are painted.

2. No water quenching, or chromate conversion coating, of the galvanized surface that is to be painted is allowed. These processes interfere with the adhesion of the paint coatings to the zinc surface.

3. Use one of the following methods, as deemed necessary by the paint manufacturer, for surface cleaning galvanized surfaces:

a. Aqueous Alkaline Cleaning.
An alkaline solution, with a pH of 11 to 13 may be used to remove traces of oil, grease, or dirt. Alkaline cleaner shall not be used for removal of heavy build-up of zinc oxide or wet storage stain. The solution may be applied through immersion in a tank filled with the solution, spraying, or brushing with a soft bristle brush. After cleaning, rinse thoroughly in hot water or water under pressure. Use heat drying to accelerate the complete removal of water from the surface.

b. Solvent Cleaning.
Typical cleaning solvents, such as mineral spirits or high-flash naphtha, may be used to remove oil and grease. The procedure used shall be specified in SSPC SP1. Proper rags or brushes shall be used to wipe the galvanized parts. These rags or brushes shall be cleaned or recycled often since oil can accumulate on their surfaces and be transferred back to the galvanized part. After cleaning, rinse surfaces thoroughly in hot water or water under pressure. Allow to dry completely before proceeding.

D. Surface Preparation

Use any of the following methods, as per the written recommendation of the paint manufacturers, to prepare the galvanized surface for painting:

1. Sweeping Blasting.

a. The purpose of the sweep blasting is to deform, not to remove, the galvanized metal. Repair areas falling below the required zinc thickness, before or after the sweep blasting, according to ASTM A 780. The procedure for this process can be found in SSPC SP7.

b. Abrasive sweep or brush blasting which uses a rapid nozzle movement will roughen the galvanized surface profile. Ensure the abrasive material provides a stripping action without removing excess zinc layers. Particle size should be in the 8 mils to 20 mils (200 µm to 500 µm) range.

c. Materials that can be used are aluminum/magnesium silicate, soft mineral sands with a mohs hardness of 5 or less, corundum, limestone, and organic media such as corncobs or walnut shells.

Sweep blast zinc at a rate of no less than 130 square yards per hour (110 m^2/h) using these types of abrasives. Substrate should be maintained at a temperature greater than 5ºF (3ºC) above the dew point temperature.

d. Following abrasive blast cleaning, blow surfaces down with clean, compressed air. The formation of zinc oxide on the blasted surface will begin very quickly so the paint coating shall be applied immediately, and no later than within 60 minutes, after sweep blasting.

2. Wash Primer Treatment.

a. This process involves the use of a metal conditioner to neutralize surface oxides and hydroxides along with etching the surface. One example of a wash primer is SSPC-Paint Specification No. 27. The process is based on three primary components: 1) a hydroxyl-containing resin; 2) a pigment capable of reacting with resin and acid; and 3) an acid capable of making the resin insoluble by reacting with the resin, the pigment, and the zinc surface. The result is a film of approximately 0.3 mils to 0.5 mils (8 µm to 13 µm). Failures can occur if the film exceeds 0.5 mils (13 µm). The film is usually applied by spray, but may be applied by soft bristle brush, dip, or roller coater. Using these latter coating methods, it may be difficult to control film thickness.

b. For drying time prior to topcoating, follow the manufacturer's instructions.

c. This wash primer treatment may be better suited to certain types of paint systems. See SSPC-Paint Specification No. 27 for the best match of this treatment to a paint system.

3. Acrylic Passivation/Pretreatment.

a. The passivation/pretreatment process consists of applying an acidic acrylic solution to the newly galvanized surface and then allowing it to dry, forming a thin film coating. When applied, the solution first reacts with the zinc surface forming a passivating conversion coating while simultaneously forming an acrylic coating suitable for painting on top of the passivation layer. The underlying conversion coating provides strong adhesion to the galvanized surface while the thin film acrylic layer provides barrier protection that inhibits corrosion and provides a highly compatible surface for the application of organic paint films. There are versions of these solutions that contain chrome and versions without chrome.

b. The application methods for these water-based treatments are: dipping, flow coating, spraying, or other appropriate means. Following application, the coating is dried in an oven or in air. In some instances the coating is applied to hot galvanized articles, in which case separate drying is not necessary. Rinsing is not required. The coating is approximately 0.04 mils (1 µm) thick.

c. Painting is possible any time during a period of four months after application if the surface is free of visible zinc oxides or zinc hydroxides. If harmful contaminants such as dust, dirt, oils, grease, or deposits are present, they shall be removed with a mild alkaline degreasing solution (pH 11.5 maximum), followed by a thorough

rinse with hot water (140ºF (60ºC) maximum temperature) or a pressure wash, and then thoroughly dried. This treatment is applied in the galvanizing plan or later in the paint shop. When applied in the paint shop, the surface shall first be appropriately cleaned as described above to remove contaminants picked up after galvanizing.

E. Final painting.

1. Apply all materials under conditions within the tolerances listed below. Keep permanent records of the processing conditions during the complete finishing process.

- Air temperature 50ºF (10ºC) minimum and 90ºF (32ºC) maximum.
- Steel surface temperature 50ºF (10ºC) minimum and 100ºF (37ºC) maximum.
- Humidity 85% maximum.
- Steel temperature at least 5ºF (3ºC) above the dew point.

2. Ensure all surfaces are dry and free from dust, dirt, oil, grease, or other contaminants.

3. Ensure total thickness, including epoxy intermediate coat and urethane topcoat, is from 5 mils to 10.5 mils (130 µm to 260 µm) dry film thickness.

4. After the painted galvanized steel has been erected in the field, touch up all areas where the shop paint has been damaged using the same materials from the same manufacturer as specified for shop application.

5. Submit the paint manufacturer's product data sheets to the Engineer prior to the start of work. Follow the requirements as outlined in the data sheets. Apply the intermediate coat of epoxy in two applications.

6. Ensure the coating is packaged in separate containers bearing a label clearly showing the name of the manufacturer, brand name of the product, lot number, and date of manufacture.

7. Ensure the topcoat matches the Federal Standard Color number listed in the contract documents. Submit samples of the topcoat color to Iowa Department of Transportation, Office of Materials, 800 Lincoln Way, Ames, IA 50010.

8. Special handling will be required to prevent damage to the paint system during lifting, shipping, and installation.

9. After completing construction, properly prepare and repaint, according to the manufacturer’s specifications, all defects or damage to the paint system. Ensure steel surfaces to be repainted are free of contaminants, including dirt or concrete. For repairs use the same paint from the same manufacturer as was used for the shop painting. Protect adjacent surfaces not to receive paint by masking or other means of protection.

F. Shop Conditions

Ensure surfaces to be painted after surface preparation remain free of moisture and other contaminants. Control the operations to ensure that dust, dirt, and/or moisture do not come in contact with surfaces prepared or painted that day. In addition to the manufacturer's written instructions for surface preparation and painting, apply the following conditions (when in conflict, the most restrictive conditions govern):

- Apply paint only when steel and air temperatures are 40ºF (4ºC) or above. Do not apply paint to steel that is at a temperature that will: 1) cause blistering or porosity; or 2) be otherwise detrimental to the life of the painted surfaces.
- Do not apply paint when the steel surface temperature is less than 5ºF (3ºC) above the dew point.
- Do not apply paint to wet, damp, or frosted surfaces.
- Do not apply paint when the relative humidity is above 85%.
- Work accomplished under unfavorable weather conditions will be considered unacceptable. Complete recleaning and painting of these areas will be required, at no additional cost to the Contracting Authority.

G. Equipment.

Prior to beginning any painting operations, ensure air equipment passes the requirements of ASTM D 4285. This test will be repeated as determined by the Engineer. Comply with the following:

1. Cleaning and painting equipment.

- Includes gages capable of accurately measuring fluid and air pressures.
- Has valves capable of regulating the flow of air, water, or paint as recommended by the equipment manufacturer.
- Is maintained in proper working order.

2. Spray painting and surface preparation equipment.

- Utilizes filters, traps, or separators recommended by the manufacturer of the equipment.
- Filters, traps, and separators kept clean using the methods and intervals recommended by the manufacturer of the equipment.
- Paint pots equipped with air operated continuous mixing devices.

3. Pressure type abrasive air blasting equipment.

Capable of providing the minimum required pressure and volume, free of oil, water, and other contaminants.

H. Quality Control.

1. Conduct a quality control program, consisting of the items below, that ensures the work accomplished complies with the contract documents:

- Qualified personnel to manage the program and conduct quality control tests,
- Proper quality measuring instruments,
- Quality Control Plan, and
- Condition and quality recording procedures.

2. Ensure personnel managing the quality control program have experience and knowledge of industrial coatings and the measurements needed to assure quality work. Ensure the personnel performing the quality control tests are trained in the use of the quality control instruments. These personnel are not to perform surface preparation and painting. Have painters perform wet film thickness measurements.

3. Provide necessary equipment to perform quality control testing of shop conditions, equipment, surface preparation, and profile and paint film thickness. Calibrate the equipment according to manufacturer's recommendations.

4. Implement a Quality Control Plan, approved by the Engineer, which includes: 1) a schedule of required measurements and tests as outlined herein; 2) procedures for correcting unacceptable work; and 3) procedures for improving surface preparation and painting quality as a result of quality control findings. Supply and use forms approved by the Engineer to record the results of quality control tests. Make these forms available at the work site for the Engineer to review.

5. The purpose of the quality control program is to assist the Contractor in the proper performance of the work. Quality control tests performed by the Contractor will not be used as the sole basis for acceptance of the work.

2509.04 METHOD OF MEASUREMENT

None.

2509.05 BASIS OF PAYMENT

The cost of cleaning, surface preparation, and painting of galvanized structural steel is incidental to the contract price for the items that have galvanized steel designated for painting as listed in the contract documents. This cost includes:

- Labor, materials, and equipment to complete the cleaning, surface preparation, and painting according to this specification.
- Costs to repaint or repair the paint system after erection.