

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CLEANING AND COATING EXISTING STRUCTURAL STEEL

STR:JAB

1 of 16

APPR:REL:SCK:11-20-25
FHWA:APPR:11-20-25

Delete section 715, on pages 7-160 through 7-175 of the Standard Specifications for Construction in its entirety and replace with the following:

715.01. Description

This work consists of cleaning and coating metal surfaces of existing steel structures and containing, storing, and disposing of spent material. Spent material includes paint chips, abrasive particles, dust, and debris resulting from cleaning operations. Metal surfaces of existing steel structures include downspouts, sign supports, and brackets but do not include railings, chain link fencing, utility conduits, and associated brackets and hangers.

A. Definitions

Feathering. Feathering is the process of tapering or blending-in an existing intact coating in preparation of applying a new touch-up, repair, rework, and/or tie in coating. This industry common practice is intended to ensure good adhesion of the new coating to the existing coating, and to provide a seamless aesthetic transition. Feathering is defined as tapering the edges of tightly adhering existing coating for 2 to 3 inches into the newly prepared bare metal surface or underlying coating.

Stripe Coat. As outlined and defined in the SSPC/AMPP standard SSPC Guide 11 (Protecting Edges, Crevices, and Irregular Steel Surfaces by Stripe Coating), typical stripe coat application calls for a 2 inch wide stripe on and over either side of an edge and a 1 inch wide stripe over and to each side of a weld. stripe coat is an additional layer of coating applied to specific areas such as welds, outside corners, flange edges, boltheads and threads, nuts, crevices, and all other edges to provide the added barrier protection.

715.02. Materials

Provide materials in accordance with the following sections:

Sealant for Perimeter of Beam Plates	713
Bridge Coating System	915

Use a Department-approved low dusting abrasive or steel grit or a combination for blast cleaning that produces a uniform sharp angular surface profile of 2.0 to 3.5 mils measured using extra coarse replica tape. Select a low dusting abrasive from the Qualified Products List. Any steel grit that produces a sharp angular surface profile of 2.0 to 3.5 mils and is free of dust, oil, grease, corrosion, non-magnetic matter, and other

contaminants is allowed. Supply a technical data sheet for the selected abrasive and/or steel grit to be utilized.

When steel grit is used as a recyclable abrasive, it must be cleaned to the requirements of SSPC-AB 2, *Cleanliness of Recycled Ferrous Metallic Abrasives*. When recycling an abrasive from the Qualified Products List, it must be cleaned to the requirements of SSPC-AB 1, *Mineral and Slag Abrasives*. Do not reuse abrasive unless the abrasive is specifically designed for that purpose.

Use an organic or alternative zinc-rich primer to coat internal surfaces of slip-critical bolted connections only. Use a primer from the same manufacturer that supplied the coating system for the remainder of the structure and that meets Class B (0.5 or greater) slip coefficient requirements of the Research Council on Structural Connections' *Specification for Structural Joints Using High-Strength Bolts*. Before coating, submit the Slip-Coefficient and Creep Resistance Test Certificate to the Engineer. The test certificate must be from an independent laboratory identifying that the primer meets Class B slip coefficient. The test certification must identify the minimum cure time, maximum allowed dry film thickness (DFT), maximum allowed thinner requirements, and any other necessary application parameters. Use the same primer on both connecting faying surfaces. Select materials from the Qualified Products List.

Use primer for stripe coating that is the same material as the chosen paint system primer with a color that contrasts to the primer and the intermediate coat. Obtain approval from the Engineer for the color contrast. Do not thin the stripe coating material.

Use a tie coat to promote adhesion over galvanized surfaces if recommended by the coating manufacturer. Apply the tie coat using a method and thickness recommended by the coating manufacturer.

For galvanized surfaces to receive additional coatings, repair damaged galvanized surfaces with a zinc-rich primer from the same manufacturer as the coating system and that meets ASTM A780/A780M.

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

When potable water is required, it must be in accordance with section 911.

No partial mixing of paint units or field tinting will be permitted.

715.03. Construction

Do not field coat from October 1 to May 1 in Superior and North Regions or from October 15 to April 15 in the remaining regions unless otherwise approved by the Engineer. Comply with temperature restrictions specified in section 915.

Refer to SSPC *Painting Manual*, Volumes 1 and 2, for definitions of cleaning criteria and other coating terms.

Provide and erect scaffolding to allow inspection of steel before and after coating. Erect scaffolding to prevent damage to the structure and comply with MIOSHA requirements. If

requested by the Engineer, submit all calculations and documentation for pre-engineered systems, and shop drawings and calculations stamped by a Licensed Engineer in the State of Michigan for all other systems.

Obtain the Engineer's approval for rubber rollers or other protective devices used on scaffold fasteners. Do not use metal rollers, clamps, or other fasteners that may mar or damage the steel or coating.

Provide an experienced Quality Control (QC) Inspector on the project to conduct all testing and inspections required to verify and document the quality of all aspects of the work. The inspector must have a minimum AMPP Bridge Coatings Inspector Level 2 Coating qualification. Additionally, the inspector must have a minimum of 5 years of experience on similar bridge-type projects. The Quality Control Inspector must not participate in coating production activities or have other duties outside the scope of performing QC activities (ex. Project Manager, Superintendent, Foreman, Competent Person, Painter, Laborer etc.) if the project has more than one containment or ongoing operations. Submit, for the Engineer's approval, the Quality Control Inspector's resume, including ability, experience, and education.

Provide all QC records to the Engineer within 24 hours.

Difficult access does not relieve the Contractor from utilizing specialized equipment for properly cleaning, abrasive blasting, hand or power tool cleaning, painting, and inspecting these areas.

A. Protection of Work and Environment during Cleaning Operations

- 1. Training Program.** Provide a documented training program covering the handling and storage of hazardous waste. Provide a copy of the program to the Engineer before beginning cleaning operations and keep a copy at the project site.
- 2. Worker Training.** Train every employee involved in cleaning the steel structure (i.e., generating waste) and in cleanup, handling, and storage of spent material. Provide training in the management of hazardous waste as required by the Resource Conservation and Recovery Act 42 USC 6901 et seq. and 40 CFR 265.16. Keep training records available at the project site.
- 3. Hazardous Waste Contingency Plan.** Develop a contingency plan for generating, handling, and storing hazardous waste in accordance with 40 CFR Part 265, Subparts C and D. Address containment and cleanup of accidental spills or releases to the environment. The plan must list an emergency coordinator and a telephone number that can be used to reach the emergency coordinator 24 hours a day, 7 days a week.

Submit a copy of the contingency plan to the Engineer and keep a copy at the project site.

- 4. Labeling of Spent Material Containers.** Provide and place the required labeling for hazardous waste storage containers. Label containers before using for hazardous waste storage, and list the date waste is first placed into each container. Make the labels visible without moving containers. The Engineer will provide the

Environmental Protection Agency (EPA) generator number required by the NREPA, Part 111, Hazardous Waste Management, MCL 324.11101 et seq. and Rule R299.9306 (1), (b) and (c).

5. **Weekly Inspection Log.** If temporarily storing hazardous waste on the project, maintain an inspection log of the storage area and containers. Keep the log on-site and update weekly to document inspection and security of the storage area and containers in accordance with 40 CFR 265.174.
6. **On-Site Records.** Keep the following records on-site and available until blast cleaning is completed and spent material is removed from the job:
 - a. Hazardous waste training program;
 - b. Worker training records;
 - c. Hazardous waste contingency plan;
 - d. Weekly inspection log;
 - e. Waste characterization reports; and
 - f. Waste disposal manifests.

Keep the records near the hazardous waste storage area in a conspicuous location and make available for inspection and review.

On-site records may be placed in a clearly marked, closed container next to the stored hazardous waste.

7. **Storage in Gondolas, Roll-off Boxes, or Barrels.** Store spent material, hazardous or nonhazardous, at the bridge site, secured and protected from weather, accidental spills, and vandalism. Locate the storage containers on a gradually sloped, free draining area not immediately next to a traffic lane, water course, or direct drainage ditch or structure. Do not place storage containers in standing water. The Engineer will review proposed storage areas before cleaning operations begin.

Keep waste containers closed and covered except during addition or removal of spent material. Label each container as hazardous or nonhazardous material storage and include the accumulation start date, as required.

Follow the hazardous waste contingency plan and immediately clean up spent material that spills onto the ground while depositing into storage containers.

- a. **Gondolas or Roll-off Boxes.** Cover each gondola or roll-off box with a cover integral to the gondola or box and a continuous, water-repellent tarpaulin. Use support ribs or other means to prevent water from ponding on the tarpaulin.
- b. **Barrels.** Seal barrels storing hazardous waste with bolt-locking rims. Elevate barrels on pallets and arrange in single or double rows, allowing access for

inspection and viewing of the labels. Bind the rows of barrels together with rope, cable, or binding straps to prevent tipping over. Cover rows of barrels with waterproof tarpaulins, held in place in accordance with 40 CFR 264.175(c) and 40 CFR 265, Subpart I; NREPA, Part 111, Hazardous Waste Management, MCL 324.11101 et seq. and Rule R299.9306 (1), (e) and (f).

8. **Disposal of Spent Material.** Notify the Engineer of the intent to sample. Sampling must be conducted by a AMPP Competent Person and witnessed by the Engineer. Take separate samples of spent material collected and stored in waste containers, dust collected from bag house filters, and shower water. Prepare a chain of custody form for each sample. Ship samples, with their chain of custody forms, in a tamper-proof container or bag sealed and witnessed by the Engineer, to a National Environmental Laboratory Accreditation Program accredited laboratory for testing according to the EPA, Toxicity Characteristic Leaching Procedure.

Use test results to characterize the spent material, bag house dust, and shower water for disposal.

Return the chain of custody form with the test results to the Engineer. The Engineer may sample and test spent material, bag house dust, and shower water during the project.

Dispose of spent material and bag house dust characterized as hazardous waste at a licensed hazardous waste disposal facility. Dispose of spent material and bag house dust, characterized as nonhazardous waste at an approved Type II landfill in accordance with NREPA, Part 115, Solid Waste Management, MCL 324.11501 et seq.

Dispose of shower water characterized as a hazardous waste at a licensed hazardous waste disposal facility. Dispose of shower water characterized as nonhazardous as a liquid industrial waste at an approved licensed liquid industrial waste disposal facility in accordance with NREPA, Part 121, Liquid Industrial By-Products, MCL 324.12101 et seq.

Provide copies of waste manifests and disposal receipts to the Engineer.

Dispose of spent material within 90 days from the date the spent material is first placed in the container.

The Department may remove and dispose of hazardous and nonhazardous waste and back-charge the Contractor for the work if the Contractor is untimely in removing waste in accordance with 40 CFR 262 and NREPA, Part 111, Hazardous Waste Management, MCL 324.11101 et seq. and Rule R299.9306.

B. Containment Requirements

1. **General Requirements.** Clean steel structures using total enclosure. Protect pedestrians, vehicles and other traffic on or under the structure, and workers in accordance with subsection 104.07.B. Include a barrier system that protects against the following:

- a. Direct, or indirect blasting of vehicles, water vessels, and pedestrians;
- b. Abrasive material and debris falling on the traveled portions of the pavement or into waterways; and
- c. Abrasive material and debris spreading into areas where it may create a traffic hazard.

The Contractor is responsible for damage to vehicles, persons, property, and the environment in accordance with subsection 107.07.

Provide total containment of portions of the bridge during cleaning and vacuuming. Contain spent material resulting from cleaning operations. Use tarpaulins or other Department-approved material to enclose portions of the structure undergoing cleaning. Use tarpaulins made of an airtight material, and secure tightly and continuously at the seams. Do not use burlap or open web materials. Extend the enclosure from the bottom of the deck to ground level or to the level of a solid work platform, and fasten to prevent lifting or opening by the wind. Clamp seams and laps on tarpaulins or sheeting together along the length of the seams or laps to prevent material or dust from escaping the enclosed area. Protect the steel from binding chains or other connection devices with softeners approved by the Engineer.

For work completed in multiple enclosure set-ups for a single element, overlap enclosures at least 1 foot between successive stages.

Provide artificial white lighting in the enclosure to illuminate active work surfaces to at least 50 foot-candles during surface preparation and coating application and at least 200 foot-candles during inspection. All lighting provided must be explosion-proof and compliant with all other pertinent safety standards.

Design the required enclosure and provide air flow and dust filtering equipment. The Engineer will evaluate the performance of the design on its ability to prevent the visible release of spent material and provide ventilation to ensure worker safety.

Maintain negative pressure inside the enclosure to prevent spent material from leaving the enclosure during cleaning. Maintain air flow through the enclosure to provide visibility and a safe working environment for blasting operators. Provide limited air intake openings in the enclosure during the operation of air-moving equipment. Filter air exhausted from the enclosure through a portable truck-mounted filtering system or dust collectors. Clean filters or dust collectors before delivery to the project and before removal from the project. Obtain the required state and local air quality and noise ordinance permits for operating air-filtering equipment at the bridge site. Do not discharge dust from the filter exhaust, dust collectors, or vacuum truck.

Place ground cloths under the enclosed area and extend at least 10 feet beyond the enclosure edges but not into open traffic lanes. Provide ground cloths with sealed seams or laps. Collect spent material that settles on ground cloths from work platforms and enclosures.

If protective devices do not serve the intended purpose, suspend work until corrected. If the Engineer determines that threatening weather conditions may cause a release of spent material into the surrounding environment, the Engineer will shut down cleaning operations and require immediate cleanup of spent material in the enclosure.

Prevent the release of spent material from the tarpaulins and other components of the containment enclosure during relocation or removal. Mechanically clean or vacuum the dust-contaminated portions before moving. Protect workers from exposure to lead-bearing dust during moving or removal work.

2. **Bridges Over Waterways.** For cleaning bridges over waterways, provide the following measures in addition to the requirements of subsection 715.03.B.1:
 - a. Provide a stable barge in the water directly under the area enclosed for cleaning. Size and secure the barge to provide freeboard and stability to preclude the possibility of capsizing or sinking. Evenly distribute equipment and material loads on the barge. Extend containment enclosures to the level of the barge and secure to prevent release of spent material into the waterway. Cover the surface of the barge with ground cloths to allow collection of spent material.
 - b. If it is impractical to use a barge, erect a temporary work platform under containment enclosures to collect spent material. Extend containment enclosures to the level of the temporary platform and secure to prevent release of spent material. Before installation, submit working drawings for the proposed work platform in writing to the Engineer for review.
 - c. Stretch a floating boom across the waterway 200 feet from the bridge on the downstream and downwind side of the bridge. Collect, store, and dispose of spent material that accumulates at the booms as specified for other waste generated by cleaning operations.
3. **Cleanup and Storage of Spent Material.** Clean spent material in the containment enclosure at the end of each work day. Clean spent material on areas to be coated and adjacent to work areas prior to coating. Clean ground cloths. Immediately clean spent material released outside the enclosure in accordance with the hazardous waste contingency plan.

Place spent material in storage containers.

- C. **Cleaning Structures.** Shield and protect utility pipes, conduits, and other items attached to the structure not requiring cleaning and coating. Notify affected utility companies at least 48 hours before beginning blast-cleaning operations. Shield or mask freshly coated surfaces, railings, galvanized fencing, appurtenances, and adjacent concrete not requiring cleaning and coating. Wire brush coated steel surfaces damaged by blasting or, if visibly rusted, re-clean to a near-white or bare metal condition. Vacuum and re-prime wire-brushed or blast-cleaned surfaces.

Do not blast clean or coat stainless steel pins. Protect stainless steel pins throughout cleaning and coating operations.

Prior to commencing the work, inspect all surfaces to verify the suitability of the surface to be prepared and to receive paint. Report to the Engineer, in writing, any condition that may affect proper surface preparation, coating application, or overall performance of the coating system. Do not proceed with work until these conditions have been corrected. Commencing work indicates acceptance of existing conditions and responsibility for the performance of the applied coating.

Remove and dispose of loose concrete from the bottom of deck slabs, fascia, concrete diaphragms, and beam perimeters at dependent backwalls. If possible, remove concrete with handheld, non-power tools.

Remove foreign matter (other than grease and oil) by one or a combination of the following: abrade, scrape, or brush with stiff fiber or wire brushes. Cleaning with solutions of appropriate cleaners is permitted with Engineer approval and provided the solution cleaning is followed by a potable water rinse. Remove all visible oil, grease, drawing and cutting compounds, and other soluble contaminants from steel surfaces in accordance with SSPC-SP 1, *Solvent Cleaning*.

To ensure compliance with contract requirements for surface profile and cleanliness, on the first day of abrasive blasting operations, blast the structure for no more than 15 minutes, blow down the prepared surface, and perform three surface profile tape tests in the presence of the Engineer. If the average surface profile does not fall within specification, adjust means and methods (grit size, pressure, standoff distance, nozzle angle, etc.). Perform additional 15-minute maximum blasting, cleaning, and testing until the surface profile is within specifications, at which time the contractor will be allowed to proceed with full production blast cleaning. Rework any area that does not meet specifications until it meets the requirements of the contract. This approach applies to all painted steel substrates except for galvanized steel.

If after a minimum of three 15-minute test blasts the blasting process cannot produce the specified surface profile, blast a test panel to demonstrate that the proposed blasting process produces a sharp angular surface profile of 2.0 to 3.5 mils. Supply a non-blasted, non-corroded piece of similar grade steel at least 1 foot by 1 foot by ¼ inch for the test panel. Blast clean test panel using the same abrasives, pressures, and equipment to be used on the structure. Obtain the Engineer's approval for the resulting profile before continuing.

Clean surfaces to SSPC-SP 10, *Near White Blast Cleaning*, or SSPC-SP 11 Level 1, *Power Tool Cleaning to Bare Metal*. Remove fins, tears, slivers, and burred or sharp edges that are present on steel members or that appear during blast cleaning in accordance with SSPC-SP 11 Level 1. Provide a uniform sharp angular profile of 2.0 to 3.5 mils to the area.

Scaling hammers may be used to remove heavy scale on existing structures. Do not use chipping hammers.

Do not abrasive blast when the steel is less than 5 °F above the dew point temperature. Perform final blast cleaning operations when the steel temperature is above 40 °F and below 85% relative humidity.

After completion of surface preparation, and prior to applying coatings, verify that

surface chlorides are remediated to a level of no greater than $7 \mu\text{g}/\text{cm}^2$. Use the cell methods of SSPC Guide 15 to collect the samples and analyze them with Kitagawa tubes or QuanTab strips. Test the same samples for the presence of ferrous ions to confirm that these salts are remediated to a level not greater than $10 \mu\text{g}/\text{cm}^2$.

Conduct chloride and ferrous ion tests, in the presence of the Engineer, in corroded areas or as directed by the Engineer. Perform a minimum of 3 tests per bridge span. If unacceptable levels of soluble salt remain, re-clean the affected areas by re-blasting, or other Engineer approved methods, until acceptable results are achieved. The costs for additional testing will be the responsibility of the Contractor.

Remove existing slag, flux, mill scale and weld spatter/splatter prior to application of any paint. Any sharp edges or projections require a minimum of 1/8 inch rounded or satisfactory condition suitable for painting as determined by the Engineer. Remediate any areas that cannot receive the specified anchor pattern due to flame cutting or shearing during fabrication by grinding prior to blasting as determined by the Engineer.

The Engineer will use the visual standard in accordance with SSPC-VIS 1, *Guide and Reference Photographs for Steel Surfaces Prepared by Dry Abrasive Blast Cleaning*; SSPC-SP 10; or SSPC-VIS 3, *Guide and Reference Photographs for Steel Surfaces Prepared by Hand and Power Tool Cleaning*; SSPC-SP 11 Level 1 that corresponds to the initial rust condition to determine acceptable steel cleanliness.

Verify that the compressed air used during the blast cleaning, double blowing, and coating operations is free of oil and moisture contamination in accordance with ASTM D4285. Use an absorbent or nonabsorbent white collector positioned within 24 inches of the air-discharge point, centered in the air stream. Allow air to discharge onto the collector for a minimum of 1 minute. Visually examine the collector for the presence of oil and/or water. Conduct the test at least one time per shift for each compressor system in operation in the presence of the Engineer. If air contamination is evident, make adjustments to achieve clean, dry air. Examine the work performed since the last acceptable test for evidence of defects or contamination due to contaminated compressed air. Contaminated work must be repaired at no additional cost to the Department.

Provide a uniform sharp angular surface profile from 2.0 to 3.5 mils, measured on the structural steel using extra coarse replica tape.

Remove abrasive and coating residue 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 completing double blowing. Maintain the steel dust free and apply the prime coat as soon as possible after the blasted surface has been cleaned and before degradation and/or contamination has occurred and within 8 hours of cleaning.

Cleaned and prepared surfaces must be inspected by the Engineer prior to painting.

When the Contractor's blasting process produces a surface profile outside the specified profile range, blast a test panel to demonstrate that the proposed blasting process produces a uniform sharp angular surface profile of 2.0 to 3.5 mils. Supply a

non-blasted, non-corroded piece of similar grade steel at least 1 foot by 1 foot by ¼ inch for the test panel. Blast clean test panel using the same abrasives, pressures, and equipment to be used on the structure.

In difficult areas where accessibility proves impractical, or the specified surface profile is not obtainable, consideration may be given for acceptance of non-conforming profile depth by the Engineer. Provide written request to the Engineer requesting any deviations and provide a new primer formulation from a product technical expert. If these conditions are accepted, additional primer may be applied, ensuring the minimum dry film thickness of the coating above the profile peaks is maintained. No additional compensation will be provided for the additional primer.

D. Coating Structural Steel

1. **Applying the Coating.** After the Engineer approves cleaned surfaces, spray apply the coatings using the manufacturer's recommended nozzles and pressures. Use wet film thickness gauges in accordance with ASTM D4414 to monitor the thickness of each coat at the time of application. Provide a DFT of 4.0 to 8.0 mils for primer coat, 2.0 to 3.0 mils for the stripe coat, 3.5 to 7.0 mils for intermediate coat, and at least 2.0 mils for the top coat. Apply the intermediate and top coats to provide complete coverage with uniform color and appearance. If the DFT exceeds the maximum, sand the areas to below the maximum thickness and clean before applying subsequent coats.

If a second pass is needed to achieve the required DFT of any coat, apply the second pass in accordance with manufacturer's recommendations.

Ensure that all coating DFT are measured in accordance with SSPC-PA 2, *Procedure for Determining Conformance to Dry Coating Thickness Requirements*, Level 2.

Apply the stripe coat after the prime coat has cured a minimum of 4 hours, but prior to applying the intermediate coat. Apply stripe coat to edges of plates and structural members, welds, lattice bars, rivets, angles, bearings, corners, crevices, bolts, nuts, rivets, or other areas as required by the Engineer to assure sufficient film build prior to the application of the intermediate coat. The stripe coat may be applied by spray if it is immediately and thoroughly worked into these areas by brush, or applied by methods approved by the Engineer.

Extend the striping at least 1 inch in each direction from the surfaces to be stripe coated. Apply the stripe coat to ensure complete and uniform coverage, and to build up the thickness of the coating on the irregular surfaces. Apply the intermediate coat after the prime coat has cured for a minimum of 24 hours and the stripe coat has cured for a minimum of 4 hours.

Ensure a stripe coat is not applied to any slip critical surfaces.

Apply coatings in conditions in accordance with subsection 915.04, except apply coatings when the relative humidity is below 85%.

Use a Type 2 electronic gauge per SSPC-PA 2, *Procedure for Determining*

Conformance to Dry Coating Thickness Requirements, to measure the DFT. Calibrate the gauge with a plastic shim with the same thickness as the minimum DFT, placed on a smooth section of newly cleaned steel. Recoat areas with less than the required minimum primer DFT.

Protect wet coating against damage from dust and other deleterious material. Schedule blast cleaning and coating to minimize the amount of dust and other contaminants that may fall on to newly applied wet coatings.

Clean accumulated dirt from previously coated surfaces and achieve approval from the Engineer before applying subsequent coats. If the Engineer determines that the surface is unfit for further coating after initial cleaning, clean the surface with a commercial detergent, rinse with potable water, and allow to dry for at least 24 hours before continuing.

If coating applications result in runs, bubbles, or sags, apply coating using multiple passes of the spray gun and allow several minutes between each pass.

Brush out runs and sags immediately, or remove and recoat the surface. Repair bubbles, pinholes, craters, and other defects by sanding the area and applying coating.

Remove all dry spray by sanding.

Correct coating that the Engineer determines unsatisfactory. Coating performed prior to Engineer approval of cleaned surfaces is subject to rejection.

Apply sealant along the perimeter of beam plates in accordance with subsection 713.03.F.

Clean galvanized components, including nuts, bolts, and washers, to an SSPC-SP 1 condition. Prepare the galvanized surface according to the coating manufacturer's recommendation and coat with intermediate and top coats. Apply the tie coat using a method and thickness recommended by the coating manufacturer.

2. **Coating Faying Surfaces and Connections.** Faying surfaces consist of surfaces internal to a connection that bears on adjacent surfaces.

Coat new connections and disassembled connections in existing structures. Apply the prime coat the same way and to the same thickness as on the adjacent structural steel. Mask faying surfaces during subsequent coating operations.

Coat slip critical connections in accordance with section 716.

Perform final vacuuming of the connection immediately before assembly. If vacuuming does not remove accumulated dust and dirt or the Engineer determines that the surface is unfit for bolting, clean the surface. Scrub the surface with a mild detergent solution, rinse with potable water, and allow it to dry before assembling connections. After assembling the connection, blast clean and coat exposed areas of the connection. Clean and coat immediately after erection or when blast cleaning

and coating the remainder of the structure.

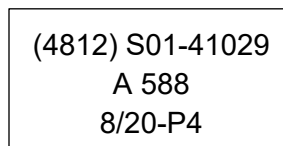
3. **Cure Times for Coatings.** Cure coatings for the minimum cure times specified in subsection 915.04.A. Follow the manufacturer's recommended maximum cure time, except do not allow more than 15 calendar days between coat applications. If the maximum time between coats is exceeded, blast clean newly coated surfaces and recoat at no additional cost to the Department.
4. **Protection of Work and Environment During Coating Operations.** Protect portions of the structure, including superstructure, substructure, slope protection, and highway appurtenances, from spatter and overspray of coating material. Shield utility pipes, conduits, and other items attached to the structure not requiring coating.

Protect pedestrian, vehicular, water vessels, and other traffic in accordance with subsection 104.07.B.

If protective devices do not serve the intended purpose, the Engineer may suspend work, with no extension of time, until the Contractor makes corrections.

When environmental conditions during coating application, or the drying/curing cycle, are subject to change outside of allowable ranges steps must be taken to verify proper conditions are maintained. Coatings applied, and/or drying/curing, outside of recommended temperature and relative humidity ranges must be removed and replaced at no cost to the Department. When changing environmental conditions are anticipated data loggers such as Defelsko DPM L Dew Point Meter Logger or equal are to be used and a printed log of conditions must be presented to the Engineer within 24 hours.

5. **Stenciling Requirement.** When coating is complete, stencil the structure number and MDOT ID, completion date (month and year), and coating type onto the structure. On structures fabricated from ASTM A588/A588M steel, stencil "A 588" just above the completion date. For partial painting projects, stencil the letter "P" before the coating type (e.g., 8/20-P4). See Figure 715-1 for an example.



(4812) S01-41029
A 588
8/20-P4

Figure 715-1: Stencil Example

Use black urethane spray paint and 4-inch numbers for stenciling. Use a product compatible with the coating system.

Stencil the characters on the inside of each fascia beam at the approaching end of the structure. Place markings at least 10 feet above ground or fill slope elevations and at least 10 feet from abutments.

If not completely coating the fascia beam, stencil the designation on the inside of each fascia beam on the approaching traffic side in the lower right corner of the newly painted section. Place markings completely within the partial coating limits at

least 3 inches above the bottom flange and with the stenciling ending within 3 inches of the right edge of the newly painted area.

If these locations are inconsistent with the newly painted areas of the structure, the Engineer will designate the stencil location.

6. Solvents

- a. **Solvent Reuse Determination Procedures.** Prepare a written Solvent Reuse Determination Procedures that complies with NREPA, Part 111, Hazardous Waste Management, MCL 324.11101 et seq. and Rule R299.9202. Provide a copy of this procedure to the Engineer before performing field coating.

In the Solvent Reuse Determination Procedures, include the methods for determining whether the solvent is reusable, applications for use of reusable solvent, and a statement of effectiveness of the reusable solvent in each application cited.

Include in the Solvent Reuse Determination Procedures documentation a certification of an agreement to:

- i. Maintain records regarding solvent reuse on a "Bridge Painting Solvent Tracking Log";
 - ii. Handle the solvent in a manner consistent with the product status as either waste or reusable solvent;
 - iii. Reuse solvent within 1 year of the initial use; and
 - iv. Reclaim only solvent after reusing it.
- b. **General.** During performance of the work and before leaving the bridge site, determine whether solvents for cleaning and coating equipment are reusable or considered waste. Make the determination and document in accordance with Solvent Reuse Determination Procedures and the applicable federal, state, and local laws and regulations. Provide a copy of the written determination documentation to the Engineer before removing solvents from the project. Dispose of non-reusable waste solvent associated with the project.

Manage, label, contain, store, and ship solvent determined reusable in accordance with the applicable federal, state, and local laws and regulations. Provide certification (shipping paper) for reusable solvent transported from the bridge site. Manage, label, contain, store, ship, and dispose of solvent characterized as waste in accordance with the following:

- i. NREPA, Part 111, Hazardous Waste Management, MCL 324.11101 et seq.
- ii. Subtitle C of the federal Resource Conservation and Recovery Act of 1976, as amended (RCRA);
- iii. NREPA, Part 121, Liquid Industrial By-Products, MCL 324.12101 et seq.; and

- iv. The administrative rules or regulations promulgated pursuant to these acts and other applicable federal, state, and local laws and regulations.

- E. Removal and Replacement of End Diaphragms.** Before beginning the removal and replacement of end diaphragms, divert traffic on the bridge from the affected bay until shoring placement is complete. Place shoring to support the concrete deck during diaphragm removal. Disconnect each end diaphragm from connecting plates or angles by removing existing bolts or rivets.

Clean and coat the diaphragm along with any portions of the structure that would be inaccessible with the diaphragm in place prior to re-erection of end diaphragms. For faying surfaces, apply the prime coat and allow to cure in accordance with the requirements of the zinc primer's Slip-Coefficient and Creep Resistance Test Certificate for slip critical connections at 75 °F or higher. Mask faying surfaces and the top of the diaphragm top flange. Apply the intermediate coat.

After the intermediate coat is dry to the touch, coat the top of the diaphragm top flange with epoxy grout. Immediately bolt the diaphragm in place in accordance with subsection 707.03.E.6.

Clean the galvanized nuts, bolts, and washers to SSPC-SP 1 condition and apply a tie coat. Apply the tie coat by a method and coating thickness recommended by the coating manufacturer. Coat bolts, nuts, and washers, and missed areas with an intermediate coat.

Apply the top coat to the area, including behind the reinstalled diaphragms.

- F. Cleaning, Coating, and Installing New Hanger Assemblies.** Select a coating system from the Qualified Products List meeting the required cure time. Use the same coating system for the joint area as for the remainder of the bridge.

Do not blast clean or coat stainless steel pins. Protect stainless steel pins throughout cleaning and coating operations.

If the dry film exceeds the maximum required thickness, sand to below the maximum thickness and clean before applying subsequent coats. If the maximum time between coats is exceeded, blast clean and recoat newly coated surfaces at no additional cost to the Department.

Modify girder end cleaning and coating procedures as follows for areas within 3 feet of each side of the centerline of the pin holes:

1. Enclose joint areas in accordance with subsection 715.03.B except that negative pressure in the containment is not required. Containment may be removed during coating and curing if the temperature is at least 50 °F.
2. Blast clean joint areas to a white metal finish, in accordance with SSPC-SP 5 *White Metal Blast Cleaning* (see SSPC-VIS 1, *Visual Standards*), with a uniform sharp angular surface profile of 2.0 to 3.5 mils.

3. Enclose and heat joint areas as acceptable to the Engineer to maintain steel and air temperatures at 50 °F or higher. If the ambient air temperature is at least 50 °F during coating application and curing, enclosing the joint area is not required. If enclosure is required, apply three coats before removing the enclosure. Apply coating when the relative humidity is below 85%.
 4. Spray on prime coat and cure at 50 °F or higher for at least 12 hours. Provide a DFT of 4.0 to 6.0 mils.
 5. Mask pin holes before applying the intermediate coat. Spray on the epoxy intermediate coat and allow it to cure at 50 °F or higher for at least 12 hours. Provide a DFT of the intermediate coat between 3.5 and 6.0 mils.
 6. After the intermediate coat cures for at least 1 hour and is dry to the touch, install the new pins and link plates. Continue curing the epoxy intermediate coat at 50 °F or higher for at least 12 hours.
 7. Spray the urethane top coat over assembled joint areas when the temperature is at 40 °F or higher. Apply the final coat as soon as possible after the epoxy intermediate coat cures but no later than after 15 days. Coat the areas behind assembled link plates with urethane top coat to the extent possible. Provide complete coverage and a uniform appearance with the top coat application.
 8. If cleaning and coating the remainder of the girder after the joint area, box in or cover the joint area including the new pins and link plates before blast cleaning and prime coating girders. Remove the box or covering before top coating the girders.
 9. If the remainder of the girder is cleaned and coated before the joint area, prevent damage to the girder coating during the blast cleaning and coating of the 6-foot joint area. Protect painted girder as approved by the Engineer.
- G. Touch-Up, Repair, Rework, Tie-Ins.** Prepare area by solvent cleaning in accordance with SSPC-SP 1, *Solvent Cleaning* prior to cleaning. If bare steel is exposed, clean and prepare the area to SSPC-SP 11 Level 1, *Power Tool Cleaning to Bare Metal*. If the bare steel is not exposed, clean and prepare the area in accordance with SSPC-SP 2, *Hand Tool Cleaning*. Ensure each coat (prime, stripe, intermediate, top) is feathered 2 to 3 inches to furnish a smooth, tapered transition into the intact coating. This work will include areas requiring touch-up after containment and staging (beam clamps, rigging, cables, sheeting, mechanical damage, etc.) have been removed. Ensure application of complete coating system is applied. Submit the method of repair for approval by the Engineer.

Repair areas of extensive damage (areas of damage greater than 1 square foot) exposing bare metal by abrasive blast cleaning as directed by the Engineer. When employing abrasive blast cleaning, use extreme care to avoid damage to the surrounding coating due to over blast. Feather into the existing coating as described herein.

All areas requiring repair must be restored to the original specified conditions.

In areas where the new coatings are required to “tie-in” with existing coatings, feather

the new coatings into the existing coatings as described herein.

715.04. Measurement and Payment

Pay Item	Pay Unit
Steel Structure, Cleaning, Type 4 (Structure Identification)	Lump Sum
Steel Structure, Cleaning, Partial, Type 4 (Structure Identification)	Lump Sum
Steel Structure, Coating Type 4 (Structure Identification)	Lump Sum
Steel Structure, Coating, Partial, Type 4 (Structure Identification)	Lump Sum
End Diaphragm, Rem and Replace	Each
Protective Shield, Utility Pipe	Foot

- A. **Steel Structure, Cleaning.** The unit prices for **Steel Structure, Cleaning, Type 4** and **Steel Structure, Cleaning, Partial, Type 4** include the cost of protecting the work and environment during blast cleaning; removing loose concrete; providing barges or temporary platforms, enclosures; and handling, storing, testing, transporting, and disposing of spent material, bag house dust, and shower water regardless of hazardous or nonhazardous. The Department will not make additional compensation for suspension of work by the Engineer. Payment also includes all costs associated with chloride and ferrous ion testing and mitigation, and costs associated with providing documentation, calculations, and shop drawings for scaffolding and work platforms.
- B. **Steel Structure, Coating.** The unit prices for **Steel Structure, Coating, Type 4** and **Steel Structure, Coating, Partial, Type 4** include the cost of coating faying surfaces. Payment also includes all costs associated with stripe coating.

The unit prices for coating pay items include the cost of management, characterization, and disposal of waste solvent.

- C. **Stenciling.** The cost of stenciling is included in the unit price for related structure cleaning and coating pay items.
- D. **End Diaphragm, Rem and Replace.** The unit price for **End Diaphragm, Rem and Replace** includes the cost of shoring the structure while the slab remains unsupported, cleaning and prime coating faying surfaces, providing galvanized high strength bolts, and providing and applying epoxy grout to the diaphragm flange.

The unit prices for **Steel Structure, Cleaning, Type 4** and **Steel Structure, Coating, Type 4** or **Steel Structure, Cleaning, Partial, Type 4** and **Steel Structure, Coating, Partial, Type 4** include the cost of cleaning and coating diaphragms.

Payment also includes all costs associated with stripe coating.

- E **Protective Shield, Utility Pipe.** If pipes or conduits are clustered in groups of at least two, the Engineer will measure the length of the cluster. The unit price for **Protective Shield, Utility Pipe** includes the cost of shielding the utility pipe or conduit during blast cleaning and painting operations or if required, cleaning and coating existing utility conduits, including brackets and hangers.