
AASHTO/NSBA Steel Bridge Collaboration
Preface

This document is a standard developed by the AASHTO/NSBA Steel Bridge. The primary goal of the Collaboration is to achieve steel bridges of the highest quality and value through standardization of the design, fabrication, and erection processes. Each standard represents the consensus of a diverse group of professionals.

As consensus documents, the Collaboration standards represent the best available current approach to the processes they cover. It is intended that Owners adopt and implement Collaboration standards in their entirety to facilitate the achievement of standardization, but it is understood that local statutes or preferences may prevent full adoption of the document. In such cases, Owners should adopt these documents with the exceptions they feel are necessary.

This document establishes and defines the functions, operations, requirements, and activities needed to achieve consistent quality in steel bridge painting. It is based on a cooperative approach to achieving quality, where both the Owner’s and Contractor’s Inspectors work together with a clear understanding of their roles and responsibilities, resulting in steel bridges completed in an efficient manner and meeting all contractual requirements.

Disclaimer

All data, specifications, suggested practices presented herein, are based on the best available information and delineated in accordance with recognized professional engineering principles and practices, and are published for general information only. Procedures and products, suggested or discussed, should not be used without first securing competent advice respecting their suitability for any given application.

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Introduction

To simplify the application parameters for a system based on an inorganic AASHTO M 300 or similar zinc-rich primer on new steel bridges, a series of charts have been developed. These charts provide a convenient summary listing the detailed requirements for surface preparation, environmental conditions, coating application, curing, and verification testing.

This specification is intended for previously uncoated steel and includes the proper preparation of the steel surfaces and the application, drying, and cure of coatings. This specification covers three coating systems as described in the following table.

<table>
<thead>
<tr>
<th>System Identification</th>
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<th>Intermediate</th>
<th>Topcoat</th>
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<td>Shop</td>
<td>Shop</td>
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<td>Field</td>
<td>Field</td>
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</table>
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Section 1
Definitions

1.1 Applicator (“Shop”)
A fabricator, paint contractor, or other entity which prepares the surfaces and applies the coatings.

1.2 Best Effort
Actions expected of a reasonably knowledgeable person to properly perform an activity.

1.3 Breaking the Corner (Corner Chamfering)
A process by which a sharp corner is flattened by passing a grinder or other suitable device along the corner, normally in a single pass.

1.4 Checking
Small cracks in the coating, extending only partially through the dry film.

1.5 Conformance Certification
A verification issued by the coating manufacturer confirming that a particular batch of product was produced in accordance with the manufacturer’s standard. This standard of performance for the product must have previously been approved or accepted by the Owner.

1.6 Corner
The intersection of two surfaces.

1.7 Edge
An exposed, through-thickness surface of a plate or rolled shape. This may be the as-rolled side face of a beam flange, channel flange or angle leg, or may result from thermal cutting, sawing, or shearing. Edges may be planar or rounded, and either perpendicular or skewed to adjacent faces.

1.8 Edge Grinding (Edge Conditioning)
Very shallow grinding or other pre-blast cleaning preparation of thermal cut edges (TCEs) to remove a thin, hardened layer left by resolidification. Does not include grinding required by the D1.5 Bridge Welding Code or ASTM A 6 to remove cutting, handling or material anomalies.

1.9 Fastener
A mechanical device used to attach two or more items together; e.g., a bolt, nut and washer.

1.10 Flats
Flat faces of bolt heads and nuts. Bolt heads and nuts are normally hexagonal, each containing six flat surfaces or “flats.”

1.11 Hackles, Fins, Scabs, Etc.
Hackles, fins, scabs, etc., are as-received defects in the steel surface. Usually, they affect only a thin (less than 1/16" or 2 mm) layer. They are often apparent after blast cleaning because the abrasive impact causes a loose edge to rise from the plane of the surface. They may normally be removed by use of a grinder, sharp scraper or chisel. Sometimes gouging is necessary for deep scabs.
1.12 **Inaccessible Areas**
Partially or completely enclosed surfaces, the majority of which are not visible without the use of special devices such as mirrors.

1.13 **Mist Coat**
Also called a fog coat or tack coat. (a) A thin, mist-spray application of a coating to improve adhesion and uniformity of the subsequent full application of the same coating. (b) A light coat of unspecified DFT to temporarily inhibit corrosion (see Section 3.4.2).

1.14 **Mudcracking**
A surface condition characterized by cracks that extend into the body of the zinc-rich primer. The appearance is that of a dried mud puddle.

1.15 **Sharp**
An acute corner or prominence that is able or appears to be able to cut human flesh.

1.16 **Snipe**
The clip removed at a corner to clear a weld or rolled fillet.

1.17 **Spot Prime Coat**
Application of primer paint to localized spots before priming where adequate coverage may not otherwise be achieved, or after priming where either the substrate is not adequately covered or where the prime coat is damaged.

1.18 **Stripe Coat**
An additional coat of paint applied to edges, outside corners, and areas difficult to coat by spray, such as welds, before or after a full coat is applied to the surface. The stripe coat is intended to give those areas the specified dry film thickness and coverage to resist corrosion.

1.19 **Visible Coating Defects**
Imperfections that may be detected by the unaided eye. These include runs, sags, lifting, chipping, cracking, spalling, flaking, mudcracking, pinholing, and checking.

1.20 **Visual Coverage**
Acceptable coating of inaccessible areas or surfaces inaccessible to manual spray painting equipment and dry film thickness (DFT) gages. DFT requirements are waived; however, surfaces may be inspected for visual coverage by the unaided eye, video monitoring or inspection mirror.

1.21 **Weld Spatter, Tight**
Small weld metal droplets expelled during exposed-arc welding with adequate thermal energy to adhere on base metal adjacent to the weld area. The droplets retain their individual shape but have sufficient fusion to resist removal by hand scraping with a putty knife, per SSPC-SP 2.
Section 2
Reference Standards

Unless otherwise noted in the contract, the latest edition of the following standards and regulations in effect at the time of Contract letting form a part of this specification. A copy of applicable reference standards shall be available at the painting facility.

2.1 American Association of State Highway and Transportation Officials (AASHTO)
   2.1.1 AASHTO M 160, Standard Specification for General Requirements for Rolled Steel Plates, Shapes, Steel Pilings, and Bars for Structural Use
   2.1.2 AASHTO M 300, Standard Specification for Inorganic Zinc-Rich Primer

2.2 American Society for Testing and Materials (ASTM)
   2.2.1 ASTM A 6, Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
   2.2.2 ASTM D 3359, Standard Test Methods for Measuring Adhesion by Tape Test
   2.2.3 ASTM D 4138, Standard Test Method for Measurement of Dry Paint Thickness of Protective Coating Systems by Destructive Means
   2.2.4 ASTM D 4285, Standard Test Method for Indicating Oil or Water in Compressed Air
   2.2.5 ASTM D 4414, Standard Practice for Measurement of Wet Film Thickness by Notch Gages
   2.2.6 ASTM D 4417, Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel
   2.2.7 ASTM D 4541, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers

2.3 The Society for Protective Coatings (SSPC)
   2.3.1 SSPC-AB 1, Mineral and Slag Abrasives
   2.3.2 SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives
   2.3.3 SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasive
   2.3.4 SSPC Guide 13, Guide for the Identification and Use of Industrial Coating Material in Computerized Product Databases
   2.3.5 SSPC-PA 1, Shop, Field, and Maintenance Painting of Steel
   2.3.6 SSPC-PA 2, Measurement of Dry Film Thickness with Magnetic Gages
   2.3.7 SSPC-QP 1, Standard Procedure for Evaluating Painting Contractors (Field Application to Complex Industrial Structures)
   2.3.8 SSPC-QP 3, Standard Procedure for Evaluating Qualifications of Shop Painting Contractors
   2.3.9 SSPC-SP 1, Solvent Cleaning
   2.3.10 SSPC-SP 2, Hand Tool Cleaning
   2.3.11 SSPC-SP 3, Power Tool Cleaning
   2.3.12 SSPC-SP 10, Near-White Blast Cleaning
   2.3.13 SSPC-SP 11, Power Tool Cleaning to Bare Metal
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2.3.14 SSPC-SP 12, Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating
2.3.15 SSPC-SP COM, Surface Preparation and Abrasives Commentary, SSPC Painting Manual, Volume 2, “Systems and Specifications”
2.3.16 SSPC-TU 4, Field Methods for Retrieval and Analysis of Soluble Salts on Substrates
2.3.17 SSPC-VIS 1, Visual Standard for Abrasive Blast Cleaned Steel

2.4 Research Council on Structural Connections (RCSC)
   Specification for Structural Joints Using ASTM A325 or A490 Bolts, Section 5(b), endorsed by the Research Council on Structural Connections.

2.5 American Institute for Steel Construction (AISC)
   2.5.1 Sophisticated Paint Endorsement (SPE)
   2.5.2 Manual of Steel Construction Manual

2.6 Related Reference Documents
   2.6.1 Applicable Ordinances and Regulations
   2.6.2 Equipment and Coating Manufacturer’s Published Instructions and Product Data Sheets.
Section 3
General

3.1 Qualification
When the contract requires painting more than 1,500 square feet of steel surface, the organization(s) performing coating application must demonstrate qualification by obtaining either the American Institute of Steel Construction (AISC) Sophisticated Paint Endorsement (SPE) or The Society for Protective Coatings (SSPC) QP 1 or QP 3 certification. This qualification must be maintained throughout the painting portion of the project. If it expires or is revoked for any reason, the owner may require that a qualified organization complete the coating portion of the project.

3.2 Quality Control
The application contractor is required to conduct and document quality control inspection of the cleaning and painting operations including, at a minimum, measurements of ambient conditions, surface profile, surface cleanliness, coating material acceptability, dry film thicknesses, and visual inspection for coating defects. The data shall be recorded in an applicator log maintained at the painting site and be available for the Owner’s review during working hours.

3.3 Written Procedures
The applicator(s) shall maintain written standard procedures, submitted to the Engineer upon request, covering such items as verifying and maintaining paint manufacturer data, measuring and recording dry film thickness and cure time, protection and treatment of faying surfaces, and other information needed to successfully document and apply all coats of paint.

3.4 Miscellaneous
3.4.1 All sharp corners shall be broken prior to final cleaning (profiling) and prime painting.
3.4.2 Surfaces to be painted and the coating system to be used shall be as indicated on plans and/or contract documents. Unless otherwise noted, paint is not required on flange surfaces that will be embedded in concrete, on shear studs, or inside bolt holes, but overspray or a mist coat is permitted on those surfaces.
3.4.3 Areas inaccessible to spray priming shall be spot primed immediately prior to or after the prime coat to assure adequate coverage.

3.5 Protective Coating System
3.5.1 Only Owner-approved and qualified paint products shall be used.
3.5.2 All coatings shall be supplied by the same coating manufacturer unless otherwise approved by the Engineer.
3.5.3 Dry film thickness ranges shall be as specified in Table 3.1, unless the Engineer approves a variance in writing. If the coating manufacturer’s recommended thickness ranges differ, written documentation may be submitted for the Engineer’s approval, demonstrating that the manufacturer’s proposed ranges will satisfy the Owner’s performance requirements.
Table 3.1. Film Thickness Requirements

<table>
<thead>
<tr>
<th>Coat</th>
<th>Material</th>
<th>Dry Film Thickness (DFT)¹</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primer</td>
<td>Zinc-Rich</td>
<td></td>
<td>3 mils (75 µm)</td>
<td>5 mils (125 µm)</td>
</tr>
<tr>
<td>Stripe Coat</td>
<td>As Specified</td>
<td>Uniform Coat</td>
<td>Uniform Coat</td>
<td></td>
</tr>
<tr>
<td>Intermediate</td>
<td>As Specified</td>
<td></td>
<td>2 mils (50 µm)</td>
<td>4 mils (100 µm)</td>
</tr>
<tr>
<td>Topcoat</td>
<td>As Specified</td>
<td></td>
<td>3 mils (75 µm)</td>
<td>5 mils (125 µm)</td>
</tr>
<tr>
<td>Total DFT</td>
<td>As Specified</td>
<td></td>
<td>8 mils (200 µm)</td>
<td>14 mils (350 µm)</td>
</tr>
</tbody>
</table>

¹ Dry film thickness for primer on faying surfaces for joints connecting primary, load carrying members shall be in accordance with Contract requirements and the coating manufacturer’s certified test data.

² Intermediate stripe coat may be applied before or after intermediate coat.

3.6 Coating Repairs

Minor coating defects, handling damage and other occasional nonconformances, and destructive test sites shall be repaired in accordance with SSPC-PA 1 and/or the manufacturer’s written recommendations. The applicator shall submit repair procedures for substantial damage, significant defects, or widespread (gross) nonconformances in the coating for the Engineer’s approval. Repairs to the topcoat must result in an acceptable, uniform gloss and color on visible surfaces. The Engineer shall have final authority concerning the coating’s uniformity and acceptable appearance.

3.7 Paint Storage

Paint shall be stored in accordance with SSPC-QP 3, Section 3.2.4.f.

3.8 Steel Storage After Painting

Steel members shall be handled with care to minimize damage to or contamination of the coating. Large members shall be handled with synthetic slings, padded chains and lifting clamps, or other non-injurious methods, and stored on padded blocking or otherwise protected. Small assemblies may be bundled utilizing cushioners to avoid or minimize metal-to-metal contact of painted areas or shall be protected by other means. Paint must be adequately cured before lifting or placing on supports to avoid paint damage or foreign material adhering to painted surfaces.

3.9 Final Acceptance

After all shop coats have been applied, repaired as required and cured, the Engineer may conditionally accept the coating. Final coating acceptance will be given at the jobsite. Shop coatings will be evaluated upon arrival for “fabricate and deliver” contracts. After steel is erected, damaged coatings are repaired, and field bolted or welded connections are fully coated, assessment of the entire paint system for “fabricate and erect” contracts or the field applied coat(s) for field painting contracts will be completed.
Section 4
Material Acceptance

4.1 Paint
4.1.1 The applicator shall verify that all paint materials satisfy composition and testing requirements, are in conformance with the owner-approved qualified products list or other applicable requirements, and will not exceed the manufacturer’s specified shelf life before use.

The applicator shall instruct the coatings supplier to provide liquid batch samples of all coating materials to the Owner if required or requested.

4.1.2 Materials will be rejected if the material arrives at the application site in other than original, unopened containers; if a container has a break in the lid seal or a puncture; or if the coating materials have begun to polymerize, solidify, gel, or deteriorate in any manner.

4.2 Abrasive Media Condition
The applicator shall verify that abrasive cleaning material meets the requirements of SSPC-AB 1, “Mineral and Slag Abrasives,” SSPC-AB 2, “Cleanliness of Recycled Ferrous Metallic Abrasives,” or SSPC-AB 3, “Newly Manufactured or Re-Manufactured Steel Abrasive,” and check the condition and cleanliness of recycled abrasives daily or as otherwise directed by the Engineer.
Section 5
Surface Preparation

5.1 Material Anomalies
5.1.1 Corner Condition – Remove all sharp corners prior to painting by creating a small chamfer. Corners less acute than the definition of “sharp” need no further treatment prior to final cleaning (profiling) and painting. Sharp corners may usually be removed by a single pass with a grinder.
5.1.2 Preparation of Thermal Cut Edges – Thermal cut edges (TCEs) to be painted shall be conditioned before blasting to achieve proper profile. This may be required to ensure the TCEs obtain the required profile during blast cleaning.
5.1.3 Base Metal Surface Irregularities – Remove all visually evident surface defects in accordance with ASTM A 6 or AASHTO M 160 prior to blast cleaning steel. When material defects exposed by blast cleaning are removed, the profile must be restored by blast cleaning or by using mechanical tools in accordance with SSPC-SP 11.
5.1.4 Weld Irregularities or Spatter – Remove or repair all sharp weld prominences, weld deficiencies (overlap; rollover; excessive concavity, convexity, or roughness), and all heavy, sharp, or loose weld spatter. Occasional individual particles of rounded tight weld spatter may remain, but widespread, sharp, or clustered particles of tight weld spatter must be removed.

5.2 Pre-Cleaning
Remove all oil, grease, and other adherent deleterious substances from areas to be painted, in accordance with SSPC-SP 1, prior to abrasive blast cleaning.

5.3 Abrasive Blast Cleaning
5.3.1 Abrasive blast clean the entire surface in accordance with SSPC-SP 10 using the shot or shot/grit types for automated blast cleaning units per Table 3 in SSPC-SP COM. The blast cleaning shall produce a surface profile of 1 to 3 mils (25 to 75 µm).
5.3.2 If previously heavily rusted or pitted steel is used, measure the chloride level using the swab method described in SSPC-TU 4. The chloride level on the blast-cleaned surface shall not exceed 7 µg/cm² in accordance with SSPC-SP 12, SC-2.

5.4 Assessing Conformance with Blast Cleaning Standards
The appearance of the final blast-cleaned surface shall be in conformance with SSPC-VIS 1, Photograph A SP-10, B SP-10, C SP-10, or D SP-10. Conformance with the corresponding SP-5 photographs is also acceptable. The profile shall be assessed with replica tape per ASTM D 4417, Method C.

5.5 Bolts (Fasteners)
5.5.1 Bolts installed before shop priming shall be prepared as necessary so that after the steel is abrasive blast cleaned, exposed bolt surfaces will satisfy the requirements outlined in Table 5.1. Black bolts, nuts and washers, including flats facing adjacent material, may require spot blast cleaning or other surface preparation before general blast cleaning to assure adhesion of the primer.
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Table 5.1. Surface Preparation Requirements for Fasteners/Bolts

<table>
<thead>
<tr>
<th>Item</th>
<th>Shop-Installed Prior to Primer Application</th>
<th>Shop- or Field-Installed After Primer Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Iron Bolts</td>
<td>OZ or IOZ</td>
<td>Section 5.5.1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galvanized (Mechanical or Hot Dip)</td>
<td>OZ or IOZ</td>
<td>SSPC-SP 1</td>
</tr>
</tbody>
</table>

OZ= Organic Zinc-Rich Coating  IOZ= Inorganic Zinc-Rich Coating

5.5.2 If the zinc coating on shop-installed mechanically or hot-dip galvanized bolts is damaged during shop abrasive blast cleaning or tightening, it may be left as is if the entire coating system will be applied over the fasteners.

5.5.3 Any dye remaining on galvanized nuts after weathering or the required surface preparation is not believed to be detrimental to subsequent coating performance or appearance. A white cloth wipe test can be used to confirm that all lubricant and non-absorbed dye has been removed, leaving only the residual “stain” on the surface.

The Fabricator shall obtain the identity of solvents and methods needed to remove the lubricant. The Fabricator will also consult with the coating supplier to assess the compatibility of the intermediate coat with any lubricant residue. The Fabricator shall supply to the General Contractor, shop and field painters, the Owner and other interested parties the information concerning the lubricant removal and the cleanliness necessary for intermediate coat adhesion.

5.5.4 When zinc-coated tension control bolts are used, the sheared end of each fastener shall be completely sealed with non-silicone-type sealing compound conforming to the provisions in Federal Specification TT-S-230, Type II. The sealant shall be applied to the non-rusted surface on the same day that the bolt is installed. The sealant shall be compatible with adhesion of the subsequently applied coating.

5.6 Summary

Table 5.2 summarizes the requirements for pre-cleaning, cleaning, profile, and surface cleanliness of structural steel.

Table 5.2. Surface Preparation Summary Table

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Basis for Acceptance</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Frequency/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Pre-Clean</td>
<td>Visual</td>
<td>SSPC-SP 1</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>2. Degree of Cleaning</td>
<td>Visual</td>
<td>SSPC-SP 10</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>3. Profile – Replica Tape (ASTM D 4417)</td>
<td>Test</td>
<td>1 mil (25 µm)</td>
<td>3 mils (75 µm)</td>
<td>once every shift</td>
</tr>
<tr>
<td>4. Surface Cleanliness (SSPC-TU 4)</td>
<td>Test</td>
<td>N/A</td>
<td>7 µg/cm²</td>
<td>Varies</td>
</tr>
</tbody>
</table>

1 Only needed on heavily rusted or pitted steel as described in SSPC-VIS 1 Conditions C and D.
6.1 General

6.1.1 Coatings shall be applied in accordance with the Contract requirements, SSPC-PA 1, and the manufacturer’s instructions. The system shall consist of prime coat, intermediate stripe coat, intermediate coat, and topcoat.

6.1.2 The applicator or a designated representative is required to conduct and document an on-going quality control inspection of the prepared surface, and the prime, intermediate, and topcoat painting per Tables 6.1 to 6.3 (presented at the end of Section 6).

6.1.3 The applicator shall record the daily storage temperature range for coating materials and verify conformance with the coating manufacturer’s product data sheet. Inventory control must be used to ensure that components are used within the shelf life prescribed by the manufacturer. The coating batch numbers from the mixed components, the amount and type of thinner used, along with the date applied shall be recorded in the application log.

The applicator shall verify that the coating has been applied to provide a continuous, uniform film of the specified thickness; is well bonded to the metal or previously applied coating; is free of laps, streaks, sags, or other visually evident defects; and was applied within the manufacturer’s specified pot life.

An example of a coating inspection form is provided in Appendix 1.

6.1.4 Areas which fail any required tests shall be subject to the nonconformance disposition procedure outlined in Section 3.6.

6.1.5 Tables 6.1, 6.2, and 6.3 show information related to ambient conditions; surface cleanliness; and mixing, application, and cure. The charts show the specific source of relevant control information, as well as minimum and maximum tolerances. Also indicated are inspection frequency requirements.

6.2 Prime Coat

Coatings applied to contact surfaces of bolted connections between primary members shall satisfy RCSC requirements (see Section 2.4). Prior to shop bolting, verify that the coating on faying surfaces is properly cured in accordance with ASTM D 4752 and the manufacturer's requirements. Verify that the dry film thicknesses on shop and field slip critical bolted faying surfaces are within the range previously validated by testing.

6.3 Intermediate and Topcoat

The color of the topcoat shall be as specified in the contract documents. The intermediate coat color shall contrast with both the primer and final coat, as approved by the Engineer. Stripe coats may be tinted as necessary to assure proper coverage. Coating materials used to apply piecemarks shall be compatible with the coats beneath and above (if any).
## Table 6.1 Inorganic Zinc Prime Coat Inspection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Basis for Acceptance</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Frequency/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Current Painter Qualification Verified</td>
<td>Applicator QC Plan</td>
<td>As req’d by AISC/SSPC</td>
<td>N/A</td>
<td>Every painter/project</td>
</tr>
<tr>
<td>2 Ambient Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours(^1)</td>
</tr>
<tr>
<td>3 Dew Point &amp; Humidity</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours(^1)</td>
</tr>
<tr>
<td>4 Surface Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours(^1)</td>
</tr>
<tr>
<td>5 Primer Component Batch Number</td>
<td>Owner Approved Batch Numbers(^2)</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Paint Kit</td>
</tr>
<tr>
<td>6 Verification of Surface Cleanliness</td>
<td>SSPC-SP 10</td>
<td>N/A</td>
<td>24 hrs and before Rust Bloom</td>
<td>Examine visually and with cloth w/in 1 hour prior to priming</td>
</tr>
<tr>
<td>7 Date and Time</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>8 Piece Mark or Bundle</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work(^3)</td>
</tr>
<tr>
<td>9 Temperature of Mixed Primer</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>When mixing components(^5)</td>
</tr>
<tr>
<td>10 Proper Mixing and Straining</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Every Pot Mix(^4)</td>
</tr>
<tr>
<td>11 Primer Induction Time(^5)</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Pot Mix</td>
</tr>
<tr>
<td>12 Primer Pot Life(^5)</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>As Allowed</td>
<td>Every Pot Mix</td>
</tr>
<tr>
<td>13 Primer Cure Time</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>14 Primer Cure Test(^6)</td>
<td>ASTM D 4752</td>
<td>4 Rating</td>
<td>N/A</td>
<td>Daily or Once / Shift</td>
</tr>
<tr>
<td>15 Dry Film Thickness</td>
<td>Table 3.1</td>
<td>As Required</td>
<td>As Required</td>
<td>SSPC-PA 2</td>
</tr>
<tr>
<td>16 Visual Inspection</td>
<td>SSPC-PA 1</td>
<td>No defects</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>17 Primer Coat Evaluation and Repair(^7)</td>
<td>SSPC PA 1 &amp; Appr. Procedure</td>
<td>As Required</td>
<td>N/A</td>
<td>Visual, 100% of each element</td>
</tr>
<tr>
<td>18 Primer Recoat Time</td>
<td>Product Data Sheet</td>
<td>Full Cure(^6)</td>
<td>Acceptable(^7)</td>
<td>Each lot of work</td>
</tr>
</tbody>
</table>

Footnotes follow Table 6.3.
# Table 6.2. Intermediate Coat Inspection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Basis for Acceptance</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Frequency/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Current Painter Qualification Verified</td>
<td>Applicator QC Plan</td>
<td>As req’d by AISC/SSPC</td>
<td>N/A</td>
<td>Every painter/project</td>
</tr>
<tr>
<td>2 Ambient Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours¹</td>
</tr>
<tr>
<td>3 Dew Point &amp; Humidity</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours¹</td>
</tr>
<tr>
<td>4 Surface Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours¹</td>
</tr>
<tr>
<td>5 Intermediate Coat Component Batch Number</td>
<td>Owner Approved Batch Numbers²</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Paint Kit</td>
</tr>
<tr>
<td>6 Primer Coat Evaluation and Repair⁷</td>
<td>SSPC PA 1 &amp; Appr. Procedure</td>
<td>As Required</td>
<td>N/A</td>
<td>Visual, 100% of each element</td>
</tr>
<tr>
<td>7 Primer Recoat Time</td>
<td>Product Data Sheet</td>
<td>Full Cure⁵</td>
<td>Acceptable⁷</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>8 Verification of Primer Surface Cleanliness</td>
<td>SSPC-SP 1</td>
<td>As Required</td>
<td>N/A</td>
<td>Initial and Every 4 Hours of Painting</td>
</tr>
<tr>
<td>9 Date and Time</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>10 Piece Mark or Bundle</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work¹¹</td>
</tr>
<tr>
<td>11 Temperature of Mixed Inter. Coat</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>When mixing components⁶</td>
</tr>
<tr>
<td>12 Intermediate Coat Mixing &amp;/or Straining</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Every Pot Mix⁴</td>
</tr>
<tr>
<td>13 Intermediate Coat Induction Time⁵</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Pot Mix</td>
</tr>
<tr>
<td>14 Intermediate Coat Pot Life⁵</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>As Allowed</td>
<td>Every Pot Mix⁴</td>
</tr>
<tr>
<td>15 Stripe Coat⁸</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Applicable Areas</td>
</tr>
<tr>
<td>16 Intermediate Coat DFT</td>
<td>Table 3.1⁹</td>
<td>As Required</td>
<td>As Required</td>
<td>SSPC-PA 2</td>
</tr>
<tr>
<td>17 Visual Inspection</td>
<td>SSPC-PA 1</td>
<td>No Defects</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>18 Intermediate Coat Evaluation and Repair¹⁰</td>
<td>SSPC PA 1 &amp; Appr. Procedure</td>
<td>As Required</td>
<td>N/A</td>
<td>Visual, 100% of each element</td>
</tr>
<tr>
<td>19 Intermediate Coat Recoat Time</td>
<td>Product Data Sheet</td>
<td>Full Cure</td>
<td>As Allowed</td>
<td>Each Lot of Work</td>
</tr>
</tbody>
</table>

Footnotes follow Table 6.3.
## Table 6.3. Top Coat Inspection

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Basis for Acceptance</th>
<th>Minimum</th>
<th>Maximum</th>
<th>Frequency/Extent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Current Painter Qualification Verified</td>
<td>Applicator QC Plan</td>
<td>As requer’d by AIS/C/SSPC</td>
<td>N/A</td>
<td>Every painter/project</td>
</tr>
<tr>
<td>2 Ambient Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>3 Dew Point &amp; Humidity</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>4 Surface Temperature</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>Every 4 hours&lt;sup&gt;1&lt;/sup&gt;</td>
</tr>
<tr>
<td>5 Top Coat Component Batch Number</td>
<td>Owner Approved Batch Numbers&lt;sup&gt;2&lt;/sup&gt;</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Paint Kit</td>
</tr>
<tr>
<td>6 Intermediate Coat Evaluation and Repair&lt;sup&gt;10&lt;/sup&gt;</td>
<td>SSPC PA 1 &amp; Appr. Procedure</td>
<td>As Required</td>
<td>N/A</td>
<td>Visual, 100% of each element</td>
</tr>
<tr>
<td>7 Intermediate Coat Recoat Time</td>
<td>Product Data Sheet</td>
<td>Full Cure</td>
<td>Acceptable</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>8 Verification of Int. Coat Surface Cleanliness</td>
<td>SSPC-SP 1</td>
<td>As Required</td>
<td>N/A</td>
<td>Initial and Every 4 Hours of Painting</td>
</tr>
<tr>
<td>9 Date and Time</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>10 Piece Mark or Bundle</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>Each Lot of Work&lt;sup&gt;3&lt;/sup&gt;</td>
</tr>
<tr>
<td>11 Temperature of Mixed Top Coat</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>As Allowed</td>
<td>When mixing components&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>12 Top Coat Mixing &amp;/or Straining</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Every Pot Mix&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>13 Top Coat Induction Time&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>N/A</td>
<td>Every Pot Mix</td>
</tr>
<tr>
<td>14 Top Coat Pot Life&lt;sup&gt;5&lt;/sup&gt;</td>
<td>Product Data Sheet</td>
<td>N/A</td>
<td>As Allowed</td>
<td>Every Pot Mix&lt;sup&gt;4&lt;/sup&gt;</td>
</tr>
<tr>
<td>15 Stripe Coat&lt;sup&gt;8&lt;/sup&gt;</td>
<td>Product Data Sheet</td>
<td>As Required</td>
<td>N/A</td>
<td>Applicable Areas</td>
</tr>
<tr>
<td>16 Topcoat Dry Time</td>
<td>Product Data Sheet</td>
<td>Full Cure</td>
<td>N/A</td>
<td>Each Lot of Work</td>
</tr>
<tr>
<td>17 Top Coat DFT</td>
<td>Table 3.1&lt;sup&gt;9&lt;/sup&gt;</td>
<td>As Required</td>
<td>As Required</td>
<td>SSPC-PA 2</td>
</tr>
<tr>
<td>18 Visual Inspection</td>
<td>SSPC-PA 1</td>
<td>No Defects</td>
<td>N/A</td>
<td>100%</td>
</tr>
<tr>
<td>19 Adhesion</td>
<td>ASTM D 3359</td>
<td>3A Rating</td>
<td>N/A</td>
<td>3 Times per Job&lt;sup&gt;11&lt;/sup&gt;</td>
</tr>
<tr>
<td>20 Paint System Final Evaluation and Repair&lt;sup&gt;10&lt;/sup&gt;</td>
<td>SSPC PA 1 &amp; Appr. Procedure</td>
<td>As Required</td>
<td>N/A</td>
<td>Visual, 100% of each element</td>
</tr>
</tbody>
</table>

---

1. Based on weather conditions, more or less frequent testing may be stipulated by the Engineer.
2. Owner-approval may be based on sampling and testing or the manufacturer’s certification acceptance that batch compositions conform to previously approved standards. Primer for faying (contact) surfaces of high strength bolted connections (for slip-critical, frictional transfer of load) must satisfy RCSC requirements for a Class B rating, based on certified tests by the coating manufacturer or applicator.
3. All items in each lot that were coated with the same batch of paint must be identified. Small items may be identified by bundle or shipping container number.
4 Every pot mixed should be verified. QC must document acceptance by initials or signature, and form must include time/date and batch component numbers.

5 Upon addition of the activator. Does not apply to single or multiple component coatings not utilizing a catalyst or other activator that reacts to modify the mixed coating and/or limit pot life.

6 Cure testing of primer is required prior to shop application of intermediate or stripe coat, or if adding extensive primer to increase initial DFT. (Not required for spot priming.) See manufacturer’s thinning requirements if repriming previously coated surface. For field-applied intermediate coat, the D 4752 cure test is not required, but adequate primer cure must be verified before handling and shipping.

7 Weathering can degrade the primer surface quality by the formation of “white rust” (zinc oxide) or rust stains from unpainted top flanges. Heavy staining, oxide build-up, dirt and other contaminants accumulated during prolonged exposure should be power-washed or otherwise treated to remove any non-adherent residue and better insure the intermediate coat’s bond with the primer.

8 Stripe coat(s) using the mixed coating may be applied either before or after the intermediate and/or the top coat to insure adequate coverage on outside corners, edges and other areas specified in the applicator’s coating plan. Stripe coats are primarily intended for use with the intermediate coat, but may be used with the topcoat as long as a uniform final finish is obtained.

9 Based on difference between average DFT of coats applied and previous readings for similar areas. For example, webs, stiffeners, flanges, cross frames, and bearings may each have different averages due to application patterns.

10 All repairs shall meet the requirements of Section 3.6. The recoat window shall follow the guidelines of this specification, the coating manufacturer’s recommendations, and good painting practice as dictated by SSPC.

11 The number of adhesion tests may be changed by Contract requirements or the Engineer’s approval, based on the project size, system selected, and anticipated conditions. Adhesion testing may be accomplished by performing tests on representative areas of members, or on steel coupons secured to permanent members and cleaned and coated simultaneously with those members.
C1.3 The breaking (flattening) of a sharp corner is sketched below:

approximately 1/16" (2 mm)

Extensive testing has proven shop grinding of corners is unnecessary for improving coating coverage and corrosion protection when employing ethyl silicate inorganic zinc-rich primer systems with a minimum zinc loading of 83%.

C1.8 Edge grinding can be used to remove martensite, a hardened form of steel that may occur due to rapid resolidification following thermal cutting. This layer is typically very thin, about 0.01" to 0.02" (0.25 to 0.50 mm) thick, and is dependent upon the steel’s chemistry and thickness. Light grinding is generally sufficient to remove this material, and is only necessary if the hardness interferes with achieving the desired profile during blast cleaning. The presence of martensite and/or the small grooves normally left by thermal cutting are not a fatigue or stress concentration problem.

C1.13 and C3.4.2 Mist Coat A mist coat may be applied to inhibit rusting on nominally “unpainted,” temporarily exposed areas later covered by concrete (i.e., the top of the top flange). While there is some evidence that inorganic zinc-rich coatings will react with fresh concrete, the reaction with a thin mist coat layer is not considered significant to the performance of the concrete.

C3.5.3 & C Table 3.1 DFTs in excess of those permitted, although constituting a specification nonconformance, should be considered on a case-by-case basis. Occasional excursions, especially at inside corners and other areas prone to high DFT due to pattern overlap, may be acceptable if the coating is well-adhered and free of the deficiencies listed in Section 6.1.3. Attempting to reduce DFT in an otherwise acceptable coating may result in significant problems or extensive, unnecessary rework. The applicator should be notified of the problem and amend procedures to avoid recurrences. QC and QA inspectors should document the deficiencies noted, any corrections required, and resulting changes in the applicator’s practices, consistent with the resolution of any other nonconformance item.

C3.9 Although the Engineer (through the QA Inspector) may accept the shop-painted fabricated items before shipment to the job site, final acceptance of the paint system by the Engineer on “fabricate and erect” or field painting contracts will typically occur following erection of the structure, after all field coats and paint repairs have been completed. The Engineer may elect to check the coated member at the fabrication/paint shop prior to shipping and approve the item, waiving field inspection and approval, especially on Type 1 (three shop coat) contracts or for the shop painting requirement of “fabricate and deliver” contracts.
NCDOT has adopted a “Coating Inspection Report” form which reflects some of the requirements of this document. That form is appended (see Appendix 1). The form is not a part of this specification and is added to the Commentary as an example.

C5.1.1 Some corner “softening” (flattening) occurs during blast cleaning; however, blast cleaning alone will not sufficiently break a sharp corner. Corners in the as-rolled condition are not normally in need of any treatment. However, corners resulting from shearing, burning, thermal cutting, or impact may be sharp and must be treated in accordance with Section 5.1.1. See also C1.3.

C5.1.4 While the removal of all weld spatter is recommended, it is recognized that absolute compliance would present difficulties, often leading to unnecessary rework. As a practical matter, occasional tightly adhered spatter may remain as long as paint coverage and adhesion are not adversely affected.

C5.5.1 This extra cleaning may be required because of surface hardness, limited blast media access, etc.

C Table 6.3, Line 19 and footnote 11– The adhesion test confirms that the coating system achieves satisfactory adhesion. The test is destructive, but the value inherent in assuring system adhesion outweighs the cost of performing and repairing occasional adhesion test sites. Due to the destructive nature of adhesion testing, alternate approaches are permitted to satisfy the requirement. If a steel coupon is affixed to a member and cleaned and painted along with the member, the coupon can be the location of the adhesion test, avoiding coating damage and repairs on the permanent member.
Appendix 1

COATING INSPECTION REPORT – Field or Shop

<table>
<thead>
<tr>
<th>Ref #</th>
<th>Parameter</th>
<th>Required</th>
<th>Frequency</th>
<th>Test Results</th>
<th>Initial</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Product Name/ID</td>
<td>This coat</td>
<td>This record</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Batch # Primer</td>
<td>This coat</td>
<td>Each Used</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Min. Surface Prep.</td>
<td>SP-</td>
<td>Each Piece</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Profile, Blast</td>
<td>1.0-3.0 mils</td>
<td>Daily</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mixing Temp.</td>
<td>Once Mixed</td>
<td>Each Batch</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Application Temp.</td>
<td>&gt;Min.&lt;Max.</td>
<td>Each 4 Hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Relative Humidity</td>
<td>&gt;Min.&lt;Max.</td>
<td>Each 4 Hrs.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Dew Point (DP)</td>
<td>5°F &gt; DP</td>
<td>Each 4 Hrs.</td>
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<td>Each Shift</td>
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## Guide Specification for Coatings with Inorganic Zinc Rich Primer

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<th>Frequency</th>
<th>Test Results</th>
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<td>Color (Std.__________)</td>
<td>Verify</td>
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</table>

### M&T Form 928 Instructions:

Fill in the blanks or circle either yes or no in the top portion of the report. The reference numbers offer guidance in completing the remaining fields in the report. The applicator’s quality control representative must initial and date each report entry.

1. Enter the product name such as “Zinc Clad – 11HS.”
2. Enter the lot number printed on the container.
3. Confirm the surface preparation requirements. Enter the SSPC Surface Preparation Standard and use this standard when determining the Test Results.
5. The mixing temperature is the temperature of the paint once mixing has been completed.
6. The application temperature is taken on the surface of the steel using a calibrated surface thermometer. Confirm that the temperature is within permissible ranges printed in the Standard Specifications and those listed in the manufacturer’s Product Data Sheet.
7. The relative humidity and dew point are measured using a sling psychrometer. The relative humidity must be within the range specified on the manufacturer’s Product Data Sheet. Specifications require the temperature of the steel to be 5°F above the dew point.
8. The drying/curing times specified for the respective paint products must be met before topcoating. The cure of inorganic zinc paints is determined by ASTM D4752.
9. Check the Product Data Sheet for a maximum recoat time. Record the time between coats and verify the maximum recoat time has not been exceeded.
10. The DFT (dry film thickness) requirements for each paint are listed in ________’s Standard Specifications. SSPC-PA 2 determines such thicknesses.

11. The adhesion of inorganic zinc paint must meet the 400 psi minimum requirement when determined by ASTM D4541. The adhesion of other paints must meet a minimum 3A requirement when tested in accordance with ASTM D3359. Verify the specification requirements before testing.

12. Record the paint color on the inspection document. Verify a uniform color and gloss.

13. Enter clean in the data field if the surface is clean, dry, and free of rust, dirt, moisture, oil, and other contaminants.

**General Requirements:**
The abrasive, compressed air, and painting equipment are inspected by the applicator on a routine basis to ensure functionality and cleanliness. A log is maintained to document that testing instruments are calibrated before use.