



Illinois Department of Transportation

Memorandum

To: ALL BRIDGE DESIGNERS 10.1
From: Ralph E. Anderson *Ralph E. Anderson*
Subject: Bridge Painting Policy
Date: April 27, 2010

This memorandum is to inform you of the latest cleaning and painting policies and the special provisions related to this work. It also gives direction in the creation of paint only contracts, cost analyses for different types of cleaning and painting, and general paint information and terminology. This memo supersedes the previously issued Bridge Memoranda 02.1 and 04.2.

Bridge painting serves two purposes; aesthetic treatment and corrosion protection. In order to choose a bridge paint system that is functional, durable, and aesthetically pleasing, the following information must be determined:

- Cleaning and Painting Strategy
- Required type of cleaning
- Appropriate paint system
- Desired color

These decisions should be coordinated with the District Bridge Maintenance Engineer and/or the District Paint Technician. Once these aspects have been determined, a cost analysis can be calculated, the appropriate pay items and notes can be chosen, and plans can be generated.

For new steel structures, the portions of this memorandum related to the areas of the bridge to be painted and required type of cleaning are not applicable.

- 1) Determining the cleaning and painting strategy for existing structures.** There are three strategies that can be employed for cleaning and painting existing structural steel. The structure can be zone painted, overcoated, or the entire coating can be completely removed and replaced.
 - a) Zone painting typically has a higher square foot cost because of fixed mobilization costs and low productivity, but a low total project cost because the total square footage cleaned and painted is usually small. Zone cleaning and painting only addresses specific problem areas of the bridge, removing the coating to bare metal in those areas, while leaving the rest of the bridge

untouched. It is typically used to address corrosion problems under joints in the deck and/or the aesthetics of the fascia girders. The Districts typically use this zone strategy to stretch their painting budget to cover as many bridges with minor problems as they can.

The following are some general rules for zone cleaning and painting:

- Areas near deck joints will typically be painted five feet on each side of the joint. Exceptions may be made if there is evidence of corrosion outside of this area or if the bridge has a very large (greater than 40 degree) skew.
 - Structures over water and railroads will typically be cleaned and painted only at the deck joints and the fascias. The underside should not be painted unless justification is submitted to the Bureau of Bridges and Structures. Typical justification for painting the underside includes excessive corrosion or widespread breakdown of the existing coating on the interior girder surfaces, etc.
 - Zone painting of trusses, arches, bascules, or other complex structures should be evaluated on a case by case basis to determine the best painting strategy. Typically, as a minimum, the splash zone (bottom cord to 12 ft above the deck) should be blast cleaned, the remainder power tool cleaned, and overcoated if in good enough condition to support an overcoating system. In addition, trusses are normally painted in combination with a rehabilitation contract. The Bureau of Bridges and Structures should be consulted for concurrence on the scope of work.
- b) Overcoating typically will have a lower unit cost than zone painting because the mobilization costs are amortized across the entire surface, and less effort per square foot over the entire structure is required for overcoating, compared with the effort required to remove the coating to bare metal. This strategy basically addresses the rest of the structural steel not covered by the zone strategy and may be utilized when the existing coating is in relatively good condition. See the attached Overcoating Guide for further assistance in evaluating the existing coating. The Districts have not been using this strategy on structures with lead based paint because of the overall age and marginal to poor condition of that paint system on our current bridge inventory. In addition, vinyl coated structures have been found to be difficult to overcoat because of the nature of the vinyl paint system. It is anticipated that our acrylic coated inventories, and when the time comes, our zinc/epoxy/urethane and moisture cured urethane inventories, will be excellent candidates for overcoating.
- c) Complete or full removal and replacement of the existing coating is the preferred strategy for dealing with lead based painted structures. However, this strategy also has the highest per square foot cost because of the containment and

cleaning effort required. A bridge should be fully cleaned and painted when the extent of the damage to the paint system is widespread and budget constraints are not an issue.

For new structural steel on rehabilitation contracts, painting may be placed on a separate contract if the following criteria are met:

- Existing structural steel requires repainting, and
- There is little or no new steel being added, or
- There is a major amount of new structural steel added to the existing, but the steel is not subjected to salt spray from the below (i.e., bridges over railroads and streams). A major amount of new structural steel is defined as at least one entire new beam line.

2) Cleaning method requirements. Illinois commonly uses three types of cleaning. These cleaning types are defined by the Society for Protective Coatings (SSPC) and are as follows: Power Tool Cleaning (SSPC SP-3 Mod) with which IDOT also includes pressure washing, Near White Blast Cleaning (SSPC SP-10), and Commercial Grade Power Tool Cleaning (SSPC SP-15).

- a) Power Tool Cleaning (SSPC SP-3 Modified) is typically used in conjunction with overcoating. It involves removing loose paint, loose rust, loose mill scale, etc. from the surface, but leaving the tight paint intact. Illinois refers to this type of cleaning as "modified SP3" because the entire surface to be painted must be worked by the power tool and then tested to insure all loose materials have been removed (rather than only cleaning the visibly rusted areas). In conjunction with this Modified SP3 cleaning, the entire surface to be painted must also be pressure washed to remove chlorides and other soluble contaminants. It is the least removal-intensive of the three systems and requires the simplest of containments of the three systems. However, it also carries the highest risk of future delamination of the paint system, because the old coating is allowed to remain on the surface. When determining whether overcoating is appropriate, the coating on the bridge should be tested for adhesion using ASTM D3369, Method A. The results of this test will give the risk of delamination of the new paint system. See the attached Overcoating Guide for more guidance in analyzing the results of this test. Typically overcoating will only be economical for bridges where the total amount of corrosion does not exceed 15% of the steel surface area of the bridge. The total amount of corrosion can be found in the latest NBI inspection report. It is not recommended to overcoat existing lead-based or vinyl topcoat systems.
- b) Near White Blast Cleaning (SSPC SP-10) involves the use of an abrasive blast to remove all existing paint, rust and mill scale from the area to be cleaned. It requires a more complex containment system that includes dust collection, but gives the least chance of delamination of the new paint system since it is being applied to

clean, bare steel. Near White Blast Cleaning should be used for zone painting near joints, for complete coating removal and replacement, and may be specified in lieu of SSPC SP-15 for fascias when desired.

- c) Commercial Grade Power Tool Cleaning (SSPC SP-15) involves the use of power tools to remove all existing paint, rust and mill scale from the area to be cleaned. It typically involves the use of vacuum-shrouded power tools and requires a containment system similar to that for SSPC SP-3. This system is primarily used when cleaning fascias over traffic or spans over active railroads where the rapid removal of the containment system may be required.

These three cleaning methods may be used in conjunction with each other on projects. For example, in a grade separation with bridge joints, the areas under the bridge joints will be cleaned using Near White Blast Cleaning, the fascia beams will be cleaned using Commercial Grade Power Tool Cleaning, and the rest of the bridge will be cleaned using Modified Power Tool Cleaning. The standard general paint notes found later in this memorandum give preferred configurations of cleaning methods.

- 3) Determining the appropriate paint system.** The naming convention used for the paint systems below is primer/intermediate coat/top coat. For your convenience, a Paint System Selection Flow Chart has been attached to assist the designer in selecting the appropriate paint system.

For painting new steel, there are two approved systems that may be used:

- Inorganic Zinc/Acrylic/Acrylic (IZ/AC/AC)
- Organic Zinc/Epoxy/Urethane (OZ/E/U)

For painting existing steel cleaned to bare metal there are three approved systems:

- Epoxy Mastic/Epoxy Mastic/Acrylic (EM/EM/AC)
- Organic Zinc/Epoxy/Urethane (OZ/E/U)
- Moisture Cured Urethane (MCU)

For overcoating existing coated steel there are two approved paint systems:

- Penetrating Sealer/Epoxy Mastic/Urethane (PS/EM/U).
- Penetrating Sealer/Epoxy Mastic/ Acrylic (PS/EM/AC).

Each of these systems has its advantages and disadvantages. Since these paint systems are tested and approved as a system, intermixing of materials from one system with another is not permitted. Also, only the specific products that have been tested and approved by the Bureau of Materials and Physical Research can be used.

The paint systems for new steel are a function of the primer used. The inorganic zinc (IZ) is the preferred primer for new structures. The Department has had over 20 years of experience with this primer. When compared to the organic zinc (OZ), it provides the best corrosion protection, but IZ requires exposure to humidity to complete its curing and thus is problematic when a full shop applied system is desired. The OZ primer has a quicker recoat window and cures independent of the ambient humidity. Therefore, for new steel, the IZ primer should be used where full shop applied painting is not required – i.e., used in all cases when only the primer is applied in the shop. The OZ primer should be used where a full shop applied system is desired.

Several issues combined resulted in the Department choosing the more tolerant OZ over IZ for priming of existing steel. Basically the IZ primer is very sensitive to substrate cleanliness and this cleanliness can be difficult to control in the field. In addition, the IZ is more difficult to apply, especially under field conditions. The OZ primer is now preferred for priming existing SP10 cleaned steel.

The Epoxy Mastic (EM) primer is the oldest current primer used for painting existing steel. This primer is the most tolerant of surface preparation, but serves only as a barrier coat and offers little undercutting corrosion protection once the coating is compromised. When the steel is blast cleaned to SP10, this system should only be used when major new steel with an acrylic top coat is being added to an existing bridge. In these cases it is important to preserve continuity of the top coat between the new and existing steel. In all other cases where the steel is blast cleaned to SP10, OZ primer should be used.

The Moisture Cured Urethane System (MCU) was developed for painting structures primarily where the weather conditions are expected to be very humid and/or the temperatures are cool. This system should only be used on existing SP10 cleaned steel where night time painting is dictated to minimize disruptions to traffic and during times of the year when high humidity is expected and/or the temperatures are cool.

There are two paint systems for overcoating existing painted structural steel: the Penetrating Sealer/Epoxy Mastic/Urethane System (PS/EM/U), and the Penetrating Sealer/Epoxy Mastic/Acrylic (PS/EM/AC) system. Both are designed to go over pressure washed and power tool cleaned surfaces. The only difference is the top coat. The two different topcoat choices exist so that continuity between the new and existing steel may be preserved. (i.e.- if new steel is being added to the existing steel, the top coat of the overcoating system used should match that of the new steel)

4) Determining Bridge Color. IDOT uses four standard colors for bridge fascias. They are:

- Interstate Green (Munsell No 7.5G 4/8)
- Reddish Brown (Munsell No 2.5YR 3/4)
- Blue (Munsell No 10B 3/6)
- Gray (Munsell No 5B 7/1)

For ease of inspection, all interior surfaces shall be Gray.

5) Estimating Cost. The following costs may be used in estimating. The square foot cost given is for the combination of containment, disposal, and the paint system. The average cost is based on a range which varies depending on the type, size, location, degree of difficulty, etc. of the project.

- a) Power Tool Cleaning per Modified SSPC-SP3 and paint with PS/EM/U or PS/EM/AC estimated cost range: \$4.00 - \$7.00 per sq. ft. This cost is multiplied by the entire surface painted, not just the areas spot cleaned.
- b) Near White Blast Cleaning per SSPC-SP10 and paint with OZ/E/U, EM/EM/AC, or MCU Systems estimated cost range: \$7.00 - \$12.00 per sq. ft. This cost is multiplied by the entire surface painted. For zone cleaning and painting or for complex bridges, the high end of the cost range would typically be used.
- c) Commercial Power Tool Cleaning per SSPC SP-15 and paint with OZ/E/U, EM/EM/AC, or MCU Systems estimated cost range: \$5.00 - \$8.00 per sq. ft. This cost is multiplied by the entire surface painted, not just the areas cleaned to bare metal.

Large surface areas may justify the use of the lower unit costs.

On rehabilitation projects where the structural steel is being evaluated for replacement, the painting costs should be included in the analysis between complete superstructure removal vs. reusing some or all of the existing structural steel.

6) Choosing the appropriate pay items and Special Provisions. There are three main pay items used when painting an existing bridge: one for cleaning and painting, one for containment and disposal of residues, and one for a warranty (usually only for complete removal and repainting projects and only at the request of the district). Normally, cleaning and painting new steel or contact surfaces between

new and existing steel is included with the furnishing and erecting pay items and not paid for separately. Each item of work has a Guide Bridge Special Provision as follows:

- GBSP 21 for Cleaning and Painting Contact Surfaces Areas of Existing Steel Structures
- GBSP 22 for Cleaning and Painting New Metal Structures
- GBSP 25 for Cleaning and Painting Existing Steel Structures
- GBSP 26 for Containment and Disposal of Lead Paint Cleaning Residues
- GBSP 60 for Containment and Disposal of Non-Lead Paint Cleaning Residues

The special provision for paint warranties is available upon request

As per Section 506 of the Standard Specifications, painting of new structural steel is included in the pay item Furnishing and Erecting Structural Steel. If the contract is divided into separate fabrication and erection contracts, payment for the painting of the structural steel is as specified by Article 506.05(c). Painting of existing structural steel is paid for as specified by GBSP 25. Dual structures should have two pay items one for each bridge.

If the existing structure paint system contains lead, the pay item Containment and Disposal of Lead Paint Cleaning Residues at the location specified shall be used. If the existing structure does not contain lead, the pay item Containment and Disposal of Non-Lead Paint Cleaning Residues at the location specified shall be used. Whether or not the existing structure contains lead can be determined from structure reports (PONTIS). Multiple bridges may be covered by one containment pay item with no individual location specified.

A 2 year painting warranty may be used on projects for cleaning and painting of existing structures (not new structures), with or without lead paint. The warranty may only be used when full removal and replacement of the existing coating is specified. Use of this warranty requires the pay item Bridge Cleaning and Painting Warranty at the location specified. There should be only one bridge per pay item.

- 7) **General Notes.** The following general notes shall be placed on plans for contracts involving bridge painting:

Painting existing steel of highway grade separation structures including over coating underside (interior surfaces):

“Cleaning and painting of the existing structural steel shall be as specified in the special provision for “Cleaning and Painting Existing Steel Structures”. All beams, bearings and other structural steel within 5 ft (measured along the beam) of either

side of deck joints shall be cleaned per Near White Blast Cleaning – SSPC-SP10. The exterior surfaces and bottom of the bottom flange of the fascia beams shall be cleaned per Commercial Grade Power Tool Cleaning – SSPC-SP15. All remaining structural steel shall be cleaned per Power Tool Cleaning – Modified SSPC-SP3.

The designated areas cleaned per Near White Blast Cleaning and per Commercial Grade Power Tool Cleaning shall be painted according to the requirements of Paint System 1 - OZ/E/U. The designated areas cleaned per Power Tool Cleaning – Modified SSPC-SP3 shall be painted according to the requirements of Paint System 2 - PS/EM/U. The color of the final finish coat for all interior steel surfaces shall be Gray, Munsell No 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be (**)."

Painting existing steel of railroad and stream crossings structures or grade separations when underside (interior surfaces) away from the joints are not to be painted:

"Cleaning and painting of the existing structural steel shall be as specified in the special provision for "Cleaning and Painting Existing Steel Structures". All beams, bearings and other structural steel within 5 ft (measured along the beam) of either side of deck joints shall be cleaned per Near White Blast Cleaning – SSPC-SP10. The exterior surfaces and bottom of the bottom flange of the fascia beams shall be cleaned per Commercial Grade Power Tool Cleaning – SSPC-SP15.

The designated areas cleaned per Near White Blast Cleaning and per Commercial Grade Power Tool Cleaning shall be painted according to the requirements of Paint System 1 - OZ/E/U. The color of the final finish coat for all interior steel surfaces shall be Gray, Munsell No 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be (**)."

Painting of existing steel when entire structure will be blast cleaned:

"Cleaning and painting of the existing structural steel shall be as specified in the special provision for "Cleaning and Painting Existing Steel Structures". All existing steel shall be cleaned per Near White Blast Cleaning – SSPC-SP10. All existing steel shall be painted according to the requirements of Paint System 1 - OZ/E/U. The color of the final finish coat for all interior steel surfaces shall be Gray, Munsell No 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be (**)."

Note to designers regarding paint systems: Paint System 3 – EM/EM/AC may be substituted for Paint System 1 and, Paint System 4 – PS/EM/AC may be substituted for Paint System 2. Do not mix the Acrylic and Urethane systems on the same structure. When inorganic zinc primed steel exists in substantial quantity

use Paint System 3 and 4 respectively for the entire structure. Paint Systems 5 and 6 – MCU may be specified when night time painting is required or when late season painting is anticipated.

On large complex projects (spans over 200 ft, trusses, etc.) where the containment will be supported by the bridge, add this additional note:

“The Contractor shall submit calculations and details demonstrating the structural integrity of the bridge is maintained under the additional imposed loads of the containment system. See special provisions.”

On bridges where sensitive receptors are within the greater of 1000 feet or 5 X bridge height, add this note:

“A minimum of (see note below) air monitor(s) will be required to monitor abrasive blasting operations at this site. See special provision for “Containment and Disposal of Lead Paint Cleaning Residues.”

Note to designers: (between 1 and 4 monitors may be required between the bridge and the sensitive receptors based on the proximity and uniqueness of the sensitive receptors around the bridge. Sensitive receptors are defined as schools, homes, businesses, livestock, etc. For example, if at one end of the bridge there are two homes, one 500 ft away, one 900 ft away, and one school 700 ft away from the bridge, two monitors would be required, one at the home in the direction of the prevailing wind and one at the school. Please note that vehicular traffic is considered transient and not exposed for a long enough period to be considered a sensitive receptor.

On non-lead, Near White Blast Cleaning projects, add this note:

“Containment of cleaning residue is required to control nuisance dust. See special provisions.”

Painting new steel (shop prime/field finish) as part of F&E structural steel:

“The Inorganic Zinc Rich Primer / Acrylic / Acrylic Paint System shall be used for shop and field painting of new structural steel except where otherwise noted. The color of the final finish coat for all interior steel surfaces shall be gray, Munsell No 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be (**). See Special Provision for “Cleaning and Painting New Metal Structures.”

Painting new steel (entire system in the shop) as part of F&E structural steel:

“The Organic Zinc Rich Primer/Epoxy/Urethane paint system shall be used for painting of new structural steel except where otherwise noted. The entire system shall be shop applied, with the exception that the exterior surfaces and

bottom of the bottom flange of the fascia beams, masked off connection surfaces, and field installed fasteners, all of which shall be touched up and finish coated in the field. The color of the final finish coat for all interior steel surfaces shall be gray, Munsell No. 5B 7/1. The color of the final finish coat for the exterior and bottom flange of the fascia beams shall be (**). See Special Provision for "Cleaning and Painting New Metal Structures".

Repair painting/adjacent areas to new steel (only used if no other cleaning and painting is specified:

"Existing structural steel shall only be cleaned and painted as required by the Special Provision for "Cleaning and Painting Contact Surface Areas of Existing Steel Structures."

Painting new steel, on concrete structures, or where some new steel is being added to a primarily existing steel bridge:

"All new structural steel shall be shop painted with an inorganic zinc rich primer per AASHTO M 300, Type1."

Painting steel to be delayed to a separate paint contract:

"Field painting of structural steel shall be done under a separate painting contract."

****Colors for fascias:**

- Interstate Green, Munsell No 7.5G 4/8
- Reddish Brown, Munsell No 2.5YR 3/4
- Blue, Munsell No 10B 3/6
- Gray, Munsell No 5B 7/1

8) Plan Details. For contracts containing cleaning and painting of existing steel, all details of the steel to be painted should be shown on the plans. This includes a framing plan, beam details, diaphragm details, bearing details, and anything else necessary for the contractor to be able to accurately determine a bid. A General Plan and Elevation of the structure to be painted is also helpful, as it gives the contractor insight as to the conditions he may be working around.

9) Various Contract Requirements. The containment strategies can be subdivided for existing structures into lead and non-lead conditions. Both strategies are designed to protect the environment, public, and the workers from the hazards of paint removal.

- a) The existing coating contains lead. By specification, Class 1A containment is required. By specification, if the structure is within the greater of 1000 feet or 5 times the height above ground of any sensitive receptors (i.e. schools,

businesses, homes, etc.) air monitoring is also required. Please note that vehicular traffic is considered transient and not exposed for a long enough period to be considered a sensitive receptor.

- b) The existing coating does not contain lead. By specification, a Class 2A containment is required to contain nuisance dust from escaping into the environment.

10) Contractor Prequalification. The Department has transitioned to requiring SSPC Painting Contractor Certification for all painting work performed regardless of the size of the project. For new steel shop painting, the AISC Sophisticated Paint Endorsement or SSPC QP3 certification is required. For field painting of new and existing structural steel, the contractor is required to be SSPC QP1 Certified. For projects requiring lead abatement, SSPC QP2 Certification is also required. As part of the certification process, an active project is required to be audited. For that purpose, SSPC QP7 Certification will be accepted on a case by case basis depending on the size of the project. These requirements are covered by the Special Provisions.

If you have questions or specific situations that need to be addressed please contact the Paint Technician for the District involved and/or Gary Kowalski at 217-785-2914, or by email at Gary.kowalski@illinois.gov.

Attachments (2)

GMK/kktABD10.1bridgepaintingpolicy-20100427

Overcoating Guide

The most significant factors that affect the ability of an existing coating to be spot cleaned and overcoated are the amount of corrosion, the thickness of the existing coating, and the adhesion of the existing coating.

The amount of corrosion shall be estimated based on field observations. Typically it can be determined from the most recent Pontis inspection, where the amount of corrosion will be listed. The percent corrosion when totaling condition states 2 through 4 should be below 15%. If higher, it will not likely be economical to power tool clean and overcoat. In that case two options remain: do not paint the surfaces at all, or perform full removal by abrasive blasting or power tools and repaint.

The thickness of the coating should be measured with a calibrated film thickness gauge. The adhesion should be measured using ASTM D 3359, Method A (X Cut).

The following table should be used to assess the existing coating for over coating risk.

Adhesion Rating	Thickness (mils)			% Rust
ASTM D 3359, Method A	< 10	10-20	>20	> 15
5A	NR	NR	LR	NO
4A	NR	NR	LR	NO
3A	NR	LR	MR	NO
2A	LR	MR	NO	NO
1A	MR	NO	NO	NO
0A	NO	NO	NO	NO

NR = essentially no risk

LR = low risk

MR = moderate risk

NO = condition too poor to salvage

Paint System Selection Flow Chart

