Illinois Department of Transportation

Memorandum

To:	ALL BRIDGE DESIGNERS	19.7
From:	D. Carl Puzey	
Subject:	Cleaning and Painting Existing Steel Structures	
Date:	August 1, 2019	

ALL BRIDGE DESIGNERS (ABD) Memorandum 19.7 details the latest policies for cleaning and painting existing steel structures and the special provisions related to this work. It also gives direction in the creation of paint-only contracts and general paint information and terminology. ABD Memorandum 19.7 supersedes the applicable portions of the previously issued ABD Memorandum 10.1. The remainder of ABD Memorandum 10.1 addressing coating strategies for new structures is addressed in ABD Memorandum 19.6.

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

- Required areas to be cleaned
- 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, or the Owner for Local Public Agency (LPA) structures. Once these aspects have been determined, a cost estimate can be calculated, the appropriate pay items and notes can be chosen, and plans can be generated.

This memorandum contains two sections. In the first, the cleaning and painting strategies are outlined, and guidance is given to the designer to aid in the choosing of the correct strategy. In the second, plan-specific items such as pay items, General Notes, and plan details are discussed.

Determining the cleaning and painting strategy for existing structures

1) Determination of Areas to be Cleaned and Painted

Two strategies may be employed for cleaning and painting existing structural steel. The structure may be zone cleaned and painted, which involves painting only the beam ends and/or fascia girders, or it may be fully cleaned and painted. Whether the structure is zone cleaned and painted or fully cleaned and painted is dependent upon the quality of the existing paint coating and the difference of cost of each option.

Zone cleaning and painting addresses specific problem areas of the bridge and involves removing the coating to bare metal in those areas only. The rest of the structure coating remains intact. Zone cleaning and painting typically has a higher cost per square foot compared to full cleaning and painting because of fixed mobilization costs and lower productivity per square foot. However, the total project cost is usually lower because the total square footage to be painted is much less than cleaning and repainting the entire structure. Typically, the problem areas of the bridge consist of beam ends under joints. Fascia girders are often repainted for aesthetic purposes.

The following are general rules for determining cleaning and painting areas:

- For typical slab-on-beam structures, areas near deck joints will typically be cleaned and painted a minimum of five feet on each side of the joint. The distance may be increased to the extent of evidence of corrosion outside of this area.

- Aesthetic painting of fascia girders is required when determined necessary by the District Bridge Maintenance Engineer and/or the District Bridge Paint Technician.

- 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 chord to 12 feet above the bridge deck surface) and the areas near the deck joints should be cleaned and painted. Trusses are typically repainted in combination with a rehabilitation contract. The Bureau of Bridges and Structures should be consulted for concurrence on the scope of work.

- A bridge should be fully cleaned and painted when damage to the existing paint system is widespread.

Estimates of square foot costs can vary greatly depending upon location and amount of painting required. The Bureau of Bridges and Structures maintains average square foot costs for cleaning and painting that are available upon request.

2) *Cleaning Method Requirements*

Illinois commonly uses two types of cleaning. These cleaning types are defined by the Society for Protective Coatings (SSPC) and are as follows: Near White Blast Cleaning (SSPC SP-10), and Commercial Grade Power Tool Cleaning (SSPC SP-15).

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 complex containment system that includes dust collection but reduces the chance of delamination of the new paint system since the new paint system is being applied to clean, bare steel. Near White Blast Cleaning (SSPC SP-10) should be used for zone painting near joints, for complete coating removal and replacement, and may be specified for fascias in lieu of Commercial Grade Power Tool Cleaning (SSPC SP-15) when desired.

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. This system is primarily used when cleaning fascias over traffic or spans over active railroads where rapid removal of the containment system may be required.

These two cleaning methods may be used in conjunction with each other on projects. For example, in a grade separation with zone painting of bridge joints and fascia beams, the areas under the bridge joints will be cleaned using Near White Blast Cleaning (SSPC SP-10), and the fascia beams will be cleaned using Commercial Grade Power Tool Cleaning (SSPC SP-15). The standard general paint notes found later in this memorandum give preferred configurations of cleaning methods.

3) *Determination of Appropriate Paint System*

A Paint System Selection Flow Chart is provided in Figure 1 to assist the designer in selecting the appropriate paint system. Considerations include matching topcoats of existing steel and anticipated weather conditions. The naming convention used for the paint systems below is primer / intermediate coat / topcoat.

There are three approved systems for painting existing steel cleaned to bare metal:

- Organic Zinc-Rich Primer/Epoxy Intermediate Coat/Urethane Topcoat (OZ/E/U)
- Epoxy Mastic Primer/Epoxy Mastic Intermediate Coat/Acrylic Topcoat (EM/EM/AC)
- Moisture Cured Urethane (MCU)

The OZ/E/U system is the preferred system for repainting steel. The department maintains the other two systems for special cases as noted below. The zinc-rich primer is seen as providing a level of cathodic protection that the other two systems do not provide.

The EM/EM/AC system is the oldest current system used for painting existing steel and is found on many existing structures. It is seen as less durable than the OZ/E/U system because the primer serves only as a barrier coat and offers little corrosion protection once the coating is compromised. This system should only be used when new steel is being added to an existing bridge with an acrylic topcoat. In these cases, it is important to preserve continuity of the topcoat between the new and existing steel.

The MCU system is a three-coat system consisting of an MCU primer, MCU intermediate coat, and an aliphatic topcoat. It was developed for painting structures primarily where the weather conditions are expected to be very humid and/or the temperatures are cool. This system can be cured in very low temperatures (20 degrees Fahrenheit). This system should only be used during times of the year when high humidity is expected, and/or the temperatures are cold on existing steel prepared using Near White Blast Cleaning (SSPC SP-10).

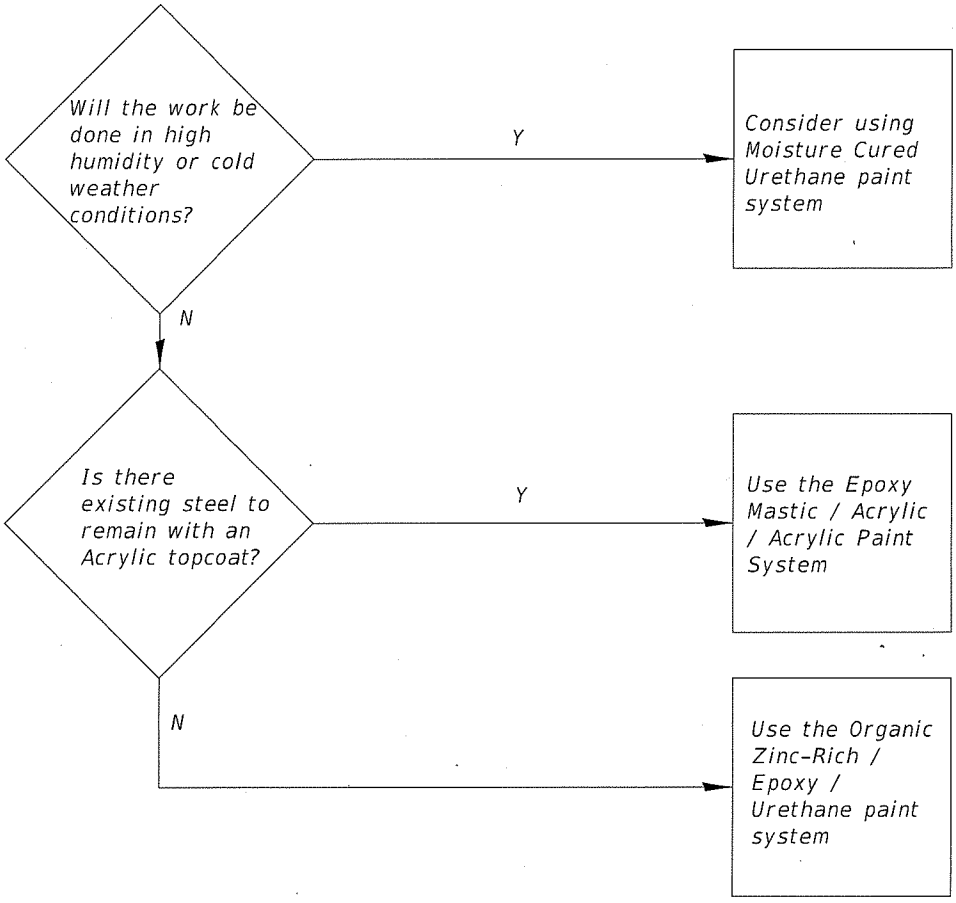

Figure 1

4) *Determination of Bridge Color*

Bridge color is determined via district/owner preference.

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) *Caulking of Connections on Existing Structures*

Caulking of connections (splices, gusset plates, etc.) may be utilized at the request of the District Bridge Maintenance Engineer and/or Bridge Paint Technician, or the Owner's representative for LPA structures. Caulking has been successfully used on truss rehabilitation contracts. It is seen as a viable method of extending the life of coatings in locations where corrosion is known to have occurred.

6) Cleaning and Painting Existing Steel Structures in Conjunction with Bridge Repairs

Structures with a reduced load capacity due to section loss will require cover plates to restore strength to the damaged areas. This is typically provided in a steel repair contract. Paint-only contracts should not include items such as plating that are not germane to cleaning and painting existing steel. Painting on bridge repair contracts should utilize the same policies as those used in a paint-only contract.

7) Cleaning and Painting of Existing Weathering Steel Structures

Cleaning and painting of existing weathering steel has been successfully accomplished utilizing the standard details, pay items, and special provisions. There are no separate details, pay items, or special provisions required for cleaning and painting an existing weathering steel bridge.

Required Pay Items, Special Provisions, General Notes, and Plan Details

1) Required Pay Items

Three main pay items are used when painting an existing bridge: one for cleaning and painting, one for containment and disposal of residues, and one for a warranty. For projects including bridge repairs, 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 using paint pay items.

Cleaning and painting of existing structural steel shall be paid for as CLEANING AND PAINTING STEEL BRIDGE, at the location specified. The number of locations corresponds with the number of bridges on the contract. Dual structures require two pay items, one for each bridge, even though they technically are in the same location.

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 PAINTING RESIDUES, at the location specified, shall be used. The Master Structure Report from Structure Information Management System (SIMS) will show if the existing structure coating contains lead for State-owned structures. In general, structures erected prior to 1986 are coated with lead paint. Multiple bridges may be covered by one containment pay item with no individual location specified.

A two-year painting warranty may be used on projects for cleaning and painting of existing 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 warranty pay item.

When caulking of structures is required, a separate pay item is not used, and the item is paid for via Section 109.04 of the Standard Specifications for Road and Bridge Construction.

2) *Required Special Provisions*

The following Guide Bridge Special Provisions (GBSPs) are used when applicable:

- GBSP21: Cleaning and Painting Contact Surface Areas of Existing Steel Structures
- GBSP25: Cleaning and Painting Existing Steel Structures
- GBSP26: Containment and Disposal of Lead Paint Cleaning Residues
- GBSP60: Containment and Disposal of Non-Lead Paint Cleaning Residues
- GBSP94: Warranty for Cleaning and Painting Steel Structures

The following Bureau of Design & Environment (BDE) special provision is used when applicable:

- Moisture Cured Urethane Paint System

3) *Required General Notes*

The following General Notes shall be placed on plans for contracts involving bridge painting.

When painting existing steel structures:

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 (*) 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 (SSPC- SP10) and per Commercial Grade Power Tool Cleaning (SSPC- SP15) shall be painted according to the requirements of (**). 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 (***).

*5 ft. minimum or as required to repair damaged coatings

**See flowchart for correct paint system

***See "Determining Bridge Color" above. The Munsell Numbers are required to be added to the General Notes.

On large projects with spans greater than 200 feet, truss bridges, or moveable bridges, containment systems are required to be analyzed and sealed by an Illinois Licensed Structural Engineer. This requirement is found in the special provisions above. For these cases, the following note shall be added to the General Notes:

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.

Air monitors are required for all structures with lead abatement that have sensitive receptors within 1000 feet or five times the bridge height. One air monitor may be required for each cardinal direction, for a maximum of four. 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 1200 ft. away, and one school 700 ft. away from the bridge, two monitors would be required, one in the direction of the home 500 ft. away and one in the direction of the school. The special provisions give detailed instructions as to the exact placement of the monitors, and the plans only need to state the number required. Vehicular traffic is considered transient and not exposed for a long enough period to be considered a sensitive receptor. When air monitors are required, the following note shall be added to the General Notes:

A minimum of (*) 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."

*Number as determined by Department Policy.

For structures that do not contain lead, the containment requirements are reduced because the containment is only to abate nuisance dust instead of lead residues. For these structures, the following note is required:

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

For all paint contracts, IDOT requires SSPC QP1 Certification. For all contracts that involve lead abatement, IDOT requires SSPC QP2 Certification in addition to SSPC QP1. These requirements are listed in the special provisions, but the following General Note is typically added to restate them:

SSPC QP1 (and SSPC QP2) Certification is required for this Contract.

Some Districts have district-specific notes involving overspray, bridge washing, cleanup, re-seeding, etc. These notes are intended to address specific issues noted by District Paint Technicians. These notes should be added as required.

4) Required Plan Details

For contracts containing cleaning and painting of existing steel, all details of the steel to be painted shall 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 shall also be added to inform the Contractor of work conditions.

Because there are numerous details, and each contract is different, listing all the required details would be tedious and unhelpful. Rather, a checklist is provided as an attachment to this memorandum. This checklist may be used by designers to determine if all the correct details have been added to the Contract plans.

Implementation

If you have questions or specific situations that need to be addressed, please contact the Paint Technician for the District involved and/or Mark Shaffer of the Bureau of Bridges and Structures at (217) 785-2914 or Mark.Shaffer@illinois.gov.

Checklist for Bridge Painting Contracts:

1. Are the required General Notes stated above included in the contract?

2. Has the existing structure's paint coating been verified with data in SIMS?

3. Are applicable district-specific notes included? Verify the need for district-specific notes with the District Paint Technicians.

4. Are the existing (For Information Only) plans legible? Sometimes existing plans do not scan well. If there is an issue with obtaining legible, current plans, contact the Bureau of Bridges and Structures.

5. Are the correct bridges shown on the plans? This is typically only a concern in contracts with large interchanges where there are many structures in close proximity.

6. Is a General Plan and Elevation sheet included for each structure to be painted in the contract?

7. Do the plans account for widening or other additions to the original steel square footage?

8. Does the framing plan show the lengths of the members? Sometimes the framing plan is populated with letters (e.g. "Segment L1, L2, etc."), which then require another chart (sheet) to be added to put the lengths of these members in the contract plans.

9. Do the plans show the framing plan and not the top of slab elevations plan? The two sheets are often very similar-looking.

10. Are the diaphragm and cross-frame sizes shown? Diaphragms and cross-frames can account for a large amount of square footage in larger structures.

11. Do the plans account for recent bearing replacements? There may be access issues if old rocker bearings have been replaced with steel extensions, and the Contractors should know this prior to bid.

12. Do the special provisions correspond with the plan notes? Often, special provisions are copied from old contracts and contain incorrect structure numbers, paint areas, etc. Are all structures in the contract shown in the special provisions?

13. Are the correct pay items shown in the Summary of Quantities? Section 506 pay items are for painting new steel structures.

14. Is a warranty only used when the entire structure is painted?

15. Does the required contractor certification shown on the plans match the special provisions?