

Maintenance Painting- Protective Coatings and Coating Systems For Bridges

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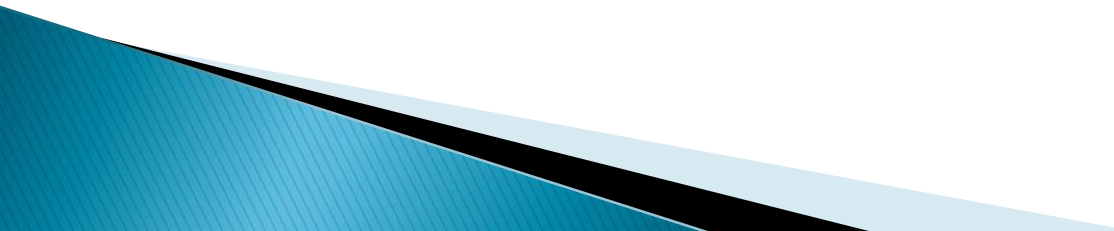


Transportation System Preservation
Technical Services Program

Bridge Preservation



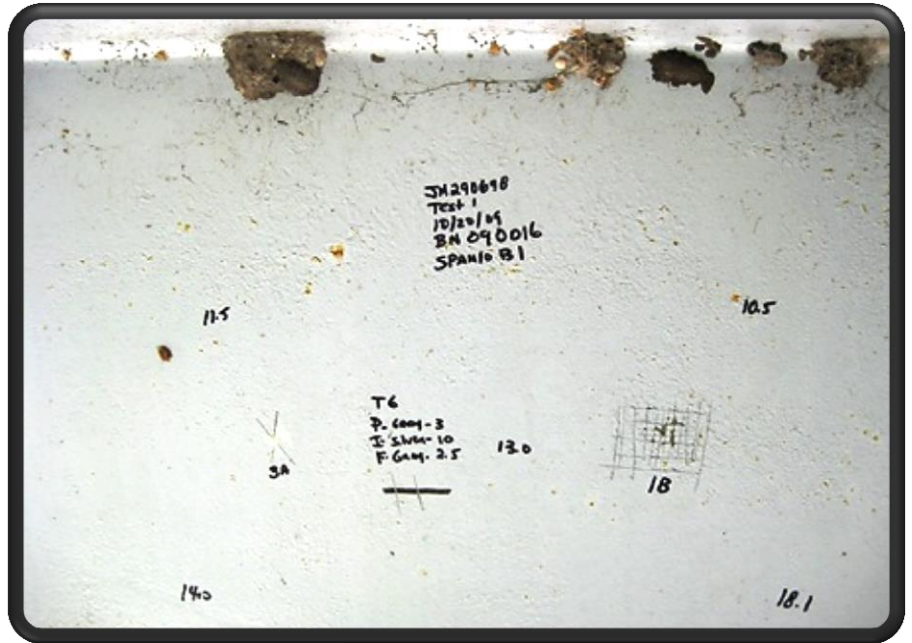
Goals – Bridge Preservation

- Cost effective maintenance protection of the structure to extend the design's life
 - Aesthetics
 - New generation of structures for maintenance strategies
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- New Generation of Structures
- Inorganic, Zinc Rich Primers
- Acrylics, Urethane Top Coats



IZ primer



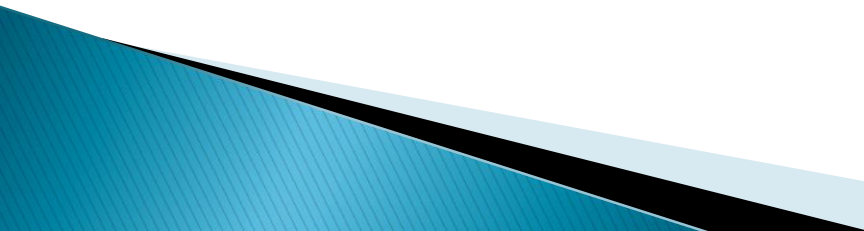
Test data

How is Corrosion Protection Assured?

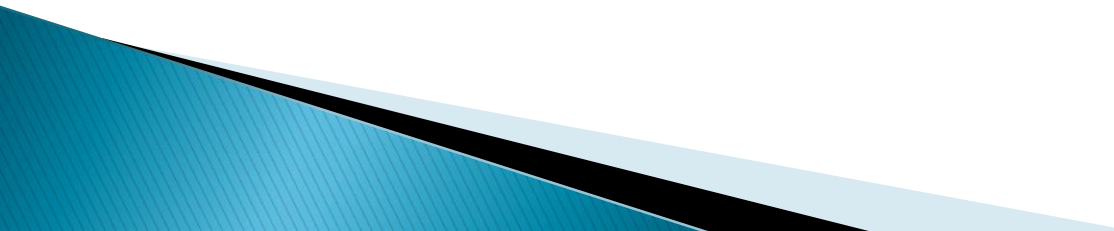
- Proper surface preparation and installation of the coating system is critical, but
- Proper testing and selection of the coating system is equally important, whether for:
 - spot painting,
 - zone painting, or
 - full overcoat

All three are considered maintenance options.

Coating System Selection

- Despite how well a surface is prepared and how well a coating system is applied it will not protect the substrate or underlying layers if it is incompatible with the base coatings.
 - Adhesion of the maintenance coatings are dependent on the adhesion of the base coats to the substrate and the amount of curing stresses applied by the new coatings.
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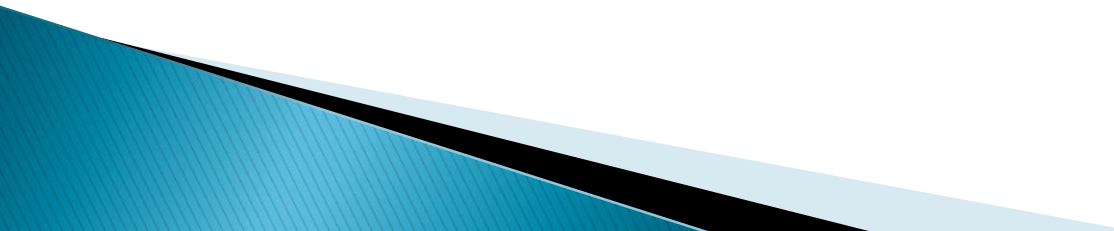
Coating System Selection (cont)

- Several coating systems are recognized by the coatings industry as having a track record of successful performance in maintenance coating situations.
 - Test patches are recommended of different systems to evaluate for adhesion after a freeze thaw cycle.
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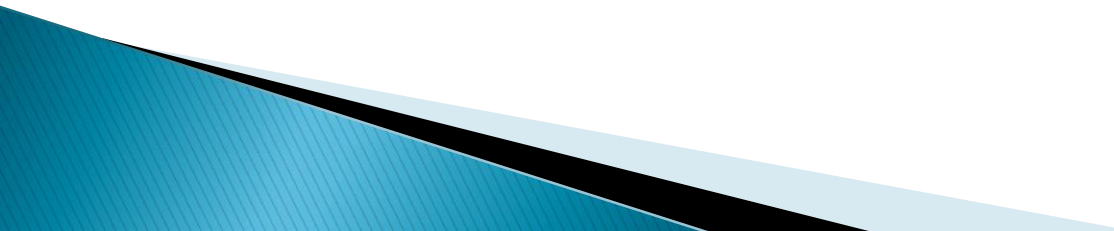
Coating System Selection (cont)

- System selection is based on:
 - The prevailing service environment
 - The intended life of the structure
 - The level or degree of surface preparation possible
 - The desired service life of the coating
 - Economics
 - SSPC-TU 3 Overcoating
 - Aesthetics

Performance Evaluation of Protective Coatings

- All coating types or coating systems within the same generic category are not created equal.
 - Experience and testing are used to evaluate coating system performance prior to selection.
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Agency Performance Evaluations

- Candidate systems are applied to bridges or to test panels that are exposed on bridges, followed by evaluation months later.
 - Experiences are evaluated with the same systems elsewhere in the state or in neighboring states.
 - National Transportation Product Evaluation Program (NTPEP) test systems
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Bridge Performance Evaluations

- The American Association of State Highway and Transportation Officials (AASHTO) oversees a material testing branch known as NTPEP.
 - Comprised of project panels (people) for the evaluation of products, materials, and devices commonly used by AASHTO members
- Coatings are included in NTPEP

Single-Coat Research

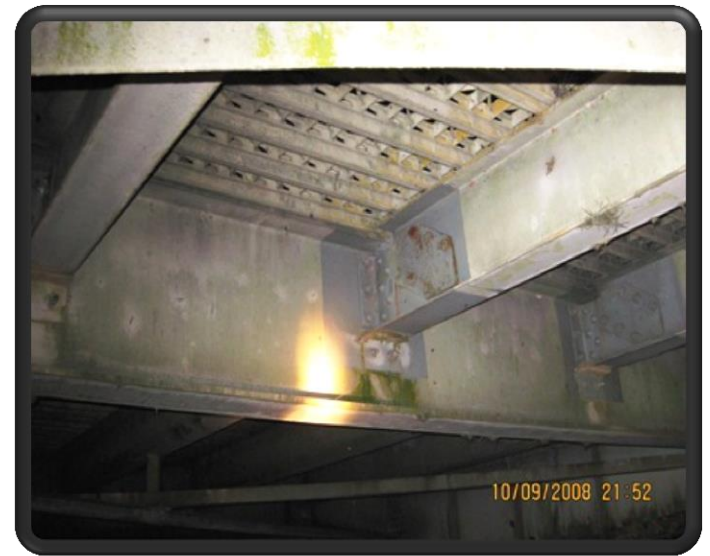
- 2003 “Proof of Concept” Study Funded
 - Funded by FHWA through the Connecticut Department of Transportation
- 2004–2005 “Proof of Concept” Testing
 - Coating manufacturers contacted with “Wish List” of performance criteria. Fifteen (15) materials submitted.
 - Materials reduced to 3 for testing in the “Proof of Concept” phase – polyaspartic and water borne epoxy
 - Used NTPEP evaluation protocol and outdoor weathering
- Results – Primer and single topcoat systems in use today for rapid return-to-service projects

Example Bridge Coating Systems – Overcoating

- Alkyd
 - Calcium Sulfonate Alkyds
 - Epoxy Mastic/Urethane
 - Moisture Cured Urethane
 - Waterborne Acrylic
 - 100% Solids Penetrating Sealers/Urethane
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Coating Maintenance Options

- Coating is 15 to 20 years old and showing degradation:
 - Do nothing at this time
 - Inspect and examine painting repair options
 - Spot repair
 - Zone repair
 - Overcoat the existing coating
 - Replace the existing coating



Do Nothing at This Time

- Because of budgetary concerns, defer a detailed inspection until a later date
 - Bi-annual inspections show minimal structural deficiencies
 - The coating system, while showing rust has not lost its protective qualities
 - Perhaps other bridges are in more immediate need
- *However, without a more detailed inspection, the above premises may not be correct*



Inspect, and Defer Painting

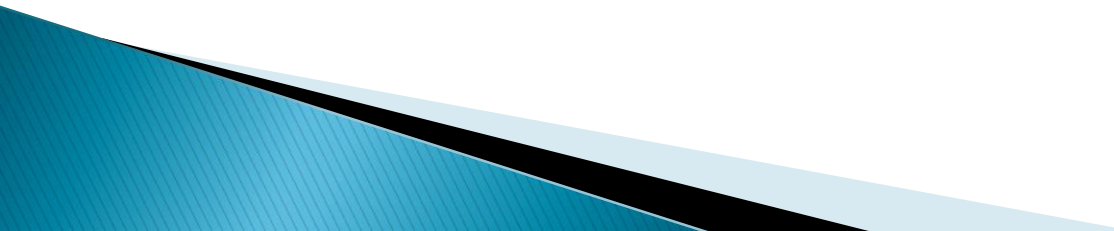
- A brief relatively inexpensive inspection (without snoopers access or traffic control) may be made of known areas of corrosion:
 - Areas below scuppers, joints, expansion dams
 - Readily accessible piers and abutments
 - Areas visible with binoculars
- Based upon the information obtained, a conscientious decision may be made regarding the need for subsequent painting.

Inspect, and Defer Painting (cont)

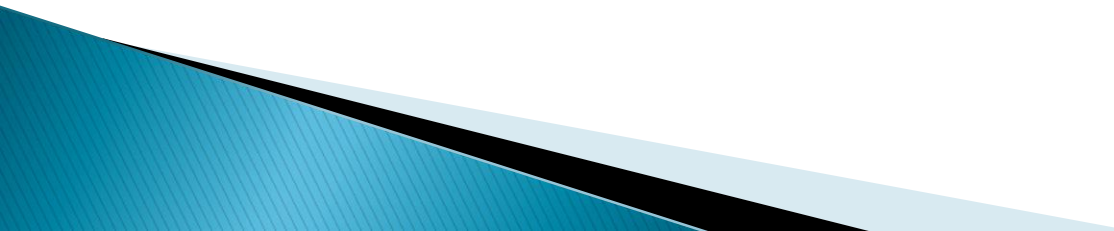
- Consider a more detailed inspection if:
 - Section loss is evident
 - Extensive coating deterioration is visible in specific problem areas (i.e. below expansion dams, scuppers, bearings)
 - Overall coating deterioration is readily apparent



Inspect, and Defer Painting (cont)

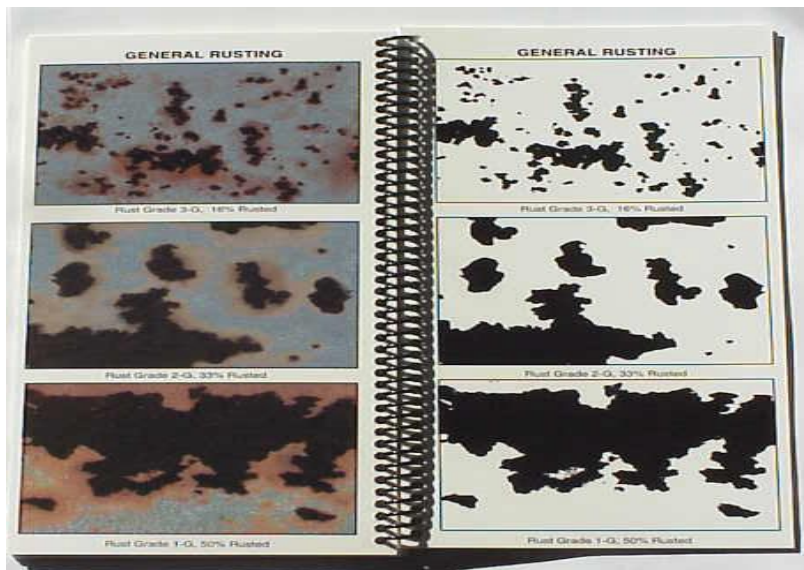
- If the brief inspection indicated “acceptable” rusting and coating deterioration, repainting can be deferred until a later time – another inspection may be scheduled in 2 or 3 years.
 - What is “acceptable” rusting and deterioration?
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Inspect and Defer Painting, “Acceptable Rusting”

- Most coating inspection programs categorize coating deterioration conditions into ranges from “good” to “acceptable” and “poor”.
 - One such system has a similar, but more detailed grading format.
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INSPECTION: Collect Coating Condition Data

Determine percentage of visible deterioration, peeling, disbonding using SSPC Vis 2:



INSPECTION: Sample Coating Grading System

Category A: Good Condition – No Rework

A+ Perfect	<0.03%
A Excellent	0.03 to 0.1%
A- Good	0.1 to 0.3%

Category B: Touch-Up Condition (spot repair)

B+ Slight TU	0.3 to 1.0%
B Average	1.0 to 3.0%
B- Considerable TU	3.0 to 10%

Category C: Repair/Replace (zone or full overcoat)

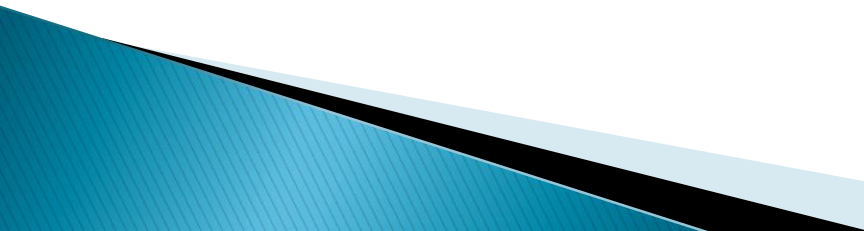
C+ TU/overcoat	10 to 16%
C Poor	16 to 33%
C- Poor	33 to 50%

Category F: Removal/Replacement

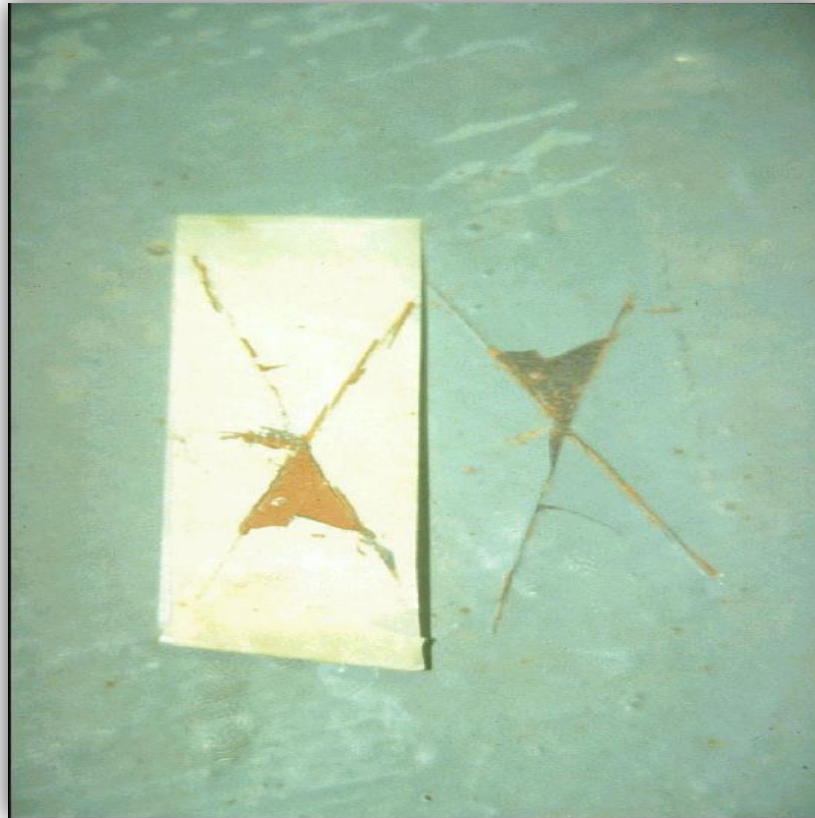
F Very poor, can't salvage	>50%
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INSPECTION:

Physical Tests on Representative Items

- Coating adhesion
 - Coating thickness
 - Condition of substrate
(mill scale, rusted, pitted)
 - Identification of substrate defects – if seen, not a structural analysis (pit depths, section loss, cracked concrete, etc.)
 - Removal of samples as needed for identification of generic type and hazardous metals
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INSPECTION: Coating Adhesion



CLASSIFICATION		SURFACE OF "X"- CUT FROM WHICH FLAKING/PEELING HAS OCCURRED		
5A	NO PEELING OR REMOVAL	NONE		
4A	TRACE PEELING OR REMOVAL ALONG INCISIONS OR AT THEIR INTERSECTION			
3A	JAGGED REMOVAL ALONG INCISIONS UP TO 1/16" ON EITHER SIDE			
2A	JAGGED REMOVAL ALONG MOST OF INCISIONS UP TO 1/8" ON EITHER SIDE			
1A	REMOVAL FROM MOST OF THE AREA OF THE X UNDER THE TAPE			
0A	REMOVAL BEYOND THE AREA OF THE X			

INSPECTION: Coating Thickness



Advantages and Disadvantages of Spot Painting

➤ ADVANTAGES:

- Minimal surface preparation—only rusted or damaged spots are repaired
- Minimum primer /intermediate/ topcoat application—application by brush
- Costs are less than more rigorous or thorough painting

➤ DISADVANTAGES:

- Costs are more expensive on a “sq ft” basis
- Inspection costs are greater – both the applicator and inspector must inspect to ensure all affected rusted or deteriorated spots are addressed.
- Access is still required – whether repainting one “spot”, or an entire area. However accessibility may be of a less expensive type (e.g., snooper versus full scaffolding).
- Short-term solution

Zone Repainting

- Zone repainting consists of surface preparation and coating application to a larger area, or zone, than spot painting. For example:
 - All structural steel within 10' of an expansion joint.
 - All steel within the splash zone (usually steel adjacent to, and 20' above the road deck).
 - End frames, bearings, pier caps.
 - The bottom face and tops of all bottom flanges
 - Selected areas subject to more intense corrosion or coating deterioration, or for aesthetics (outside fascia)

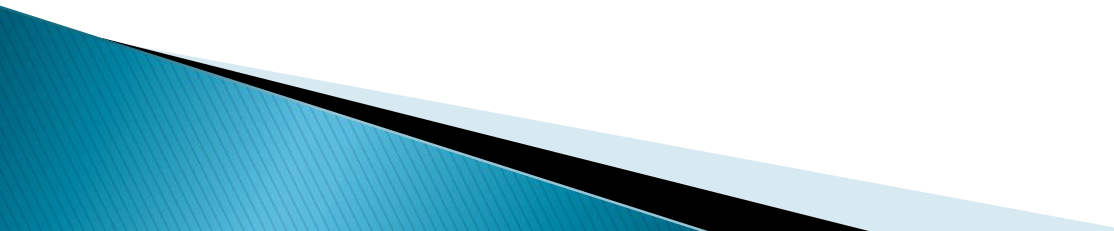
Zone Repainting (cont)

- Zone repainting operations require removal and replacement of the old coating in the affected zone, or thorough cleaning and overcoating.
- When replacing the existing coating, the new system need not be compatible with the existing coating, but special attention must be given to overlap areas.
 - For example, a zinc-rich/epoxy/urethane system may be used on a bridge with an alkyd coating
- When overcoating, the new system must be compatible with the existing coating.

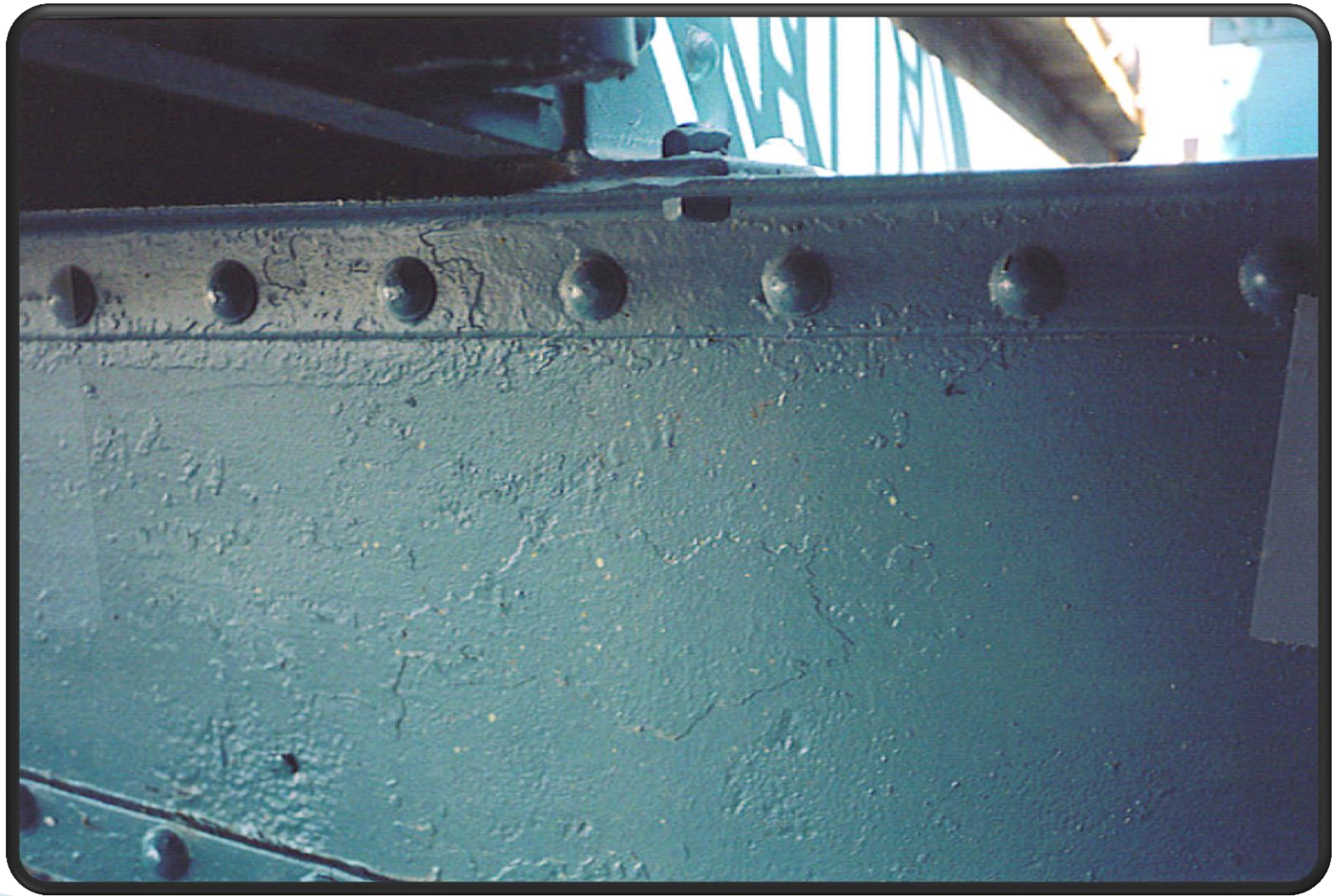
Zone Painting



Overcoating

- Overcoating consists of surface preparation and priming that is limited to degraded areas
 - Intact coatings are left in place, then the entire structure receives a tie coat and finish coat
 - Improved appearance over spot coating
 - Less costly than full removal and replacement
 - Tie coat must be compatible with existing coating
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Overcoating

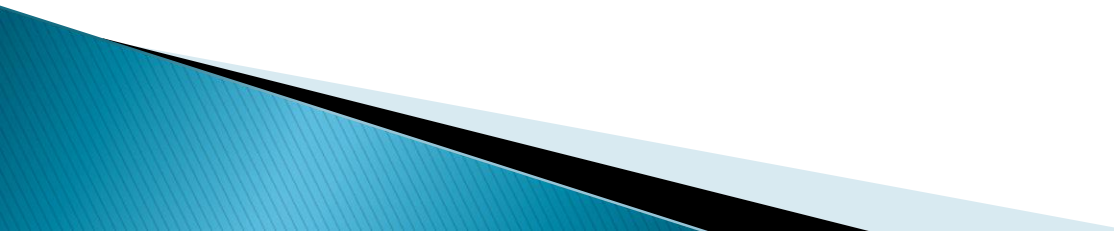


Overcoating Project

Before and After Full Overcoating Project



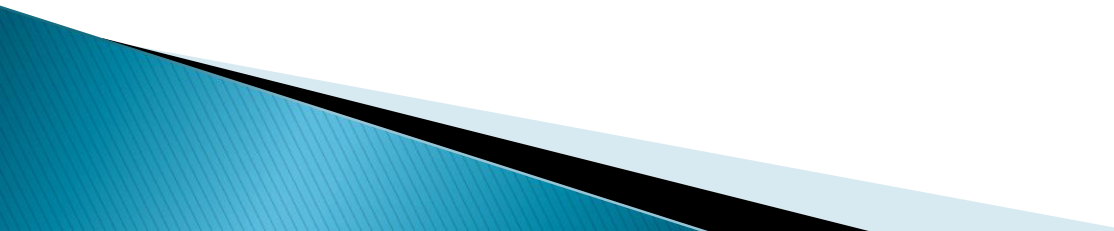
Coating Removal and Replacement

- When coating deterioration and corrosion are advanced, removal and replacement of the coating should be scheduled.
 - If structural deterioration is not eminent, recoating could perhaps be delayed further since complete removal and replacement of the coating will be required, regardless when it is scheduled.
 - If metal section loss will become advanced if coating is delayed, or for aesthetic reasons –schedule repainting operations within a year or so.
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Remove and Replace



General Painting Costs


- Spot Touch up - \$20 to \$30/sq ft of spot areas
 - Zone Painting - \$18 to \$22/sq ft/zone
 - Remove/Replace - \$13 to \$18/sq ft
 - Spot Repair & Overcoat - \$6 to \$8/sq ft
 - New Construction (Shop) - \$3 to \$5/sq ft
 - New Construction (Field) - \$2 to \$3/sq ft
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Other Coating Considerations

- Other considerations when repainting:
 - Chloride remediation in splash zone—especially where deicing salts are used
 - Edge striping—for additional coverage on sharp edges where the coating may draw thin
 - Weld and crevice striping—for rough welds, if they are not ground, and crevices, such as between lacing bars

Effective Maintenance Painting Program

SHOULD INCLUDE:

- Determination of useful life of structure based on traffic volume and anticipated loading
 - Regularly scheduled inspections and assessments
 - Plans for utilization of various levels of repairs and painting
 - Updates of new coating systems
 - Provisions for best use of available funds
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QUESTIONS?



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