“SUCCESSFUL PRESERVATION PRACTICES FOR STEEL BRIDGE COATINGS”

Prepared By Paul Vinik, Florida DOT

Presented to SCOM, Jeff Milton, Virginia DOT
How Much Does Corrosion Cost?

- Total Direct Cost ~ $276 Billion in 1998 – 2001
- $8.3 billion just for bridges
- Highway Trust Fund (HTF) income 2001 = $29.1 billion
Scope of Domestic Scan:

- Funding Levels
- Evaluation Practices For In Situ Coatings
- Surface Preparation
- Coating System Decision Making
- Warranties
- Coating Inspection Requirements
- Inspector Qualifications
- Contractor Qualifications
- Scan Team Recommendations

Shop coating specifically excluded!
Acknowledgements

• Domestic Scan 15-03 Team Members
  • Paul Vinik – Chair – Florida SHA
  • Charlie Brown – Maryland SHA
  • Ray Bottenberg – Oregon SHA
  • Justin Ocel – FHWA
  • Tom Schwerdt – Texas DOT
  • Mike Todsen – Iowa DOT

• 12 Workshop Participating SHAs and Owners
Scan 15-03 Team Members Home State and Workshop Participants

- Team Member Home State
  - CA & Golden Gate
  - TX
  - FL
  - KY - SME
  - WA

- Workshop Participants
  - OR
  - NV
  - UT
  - AZ
  - CO
  - NM
  - NV
  - CA
  - Golden Gate
  - NY
  - PA
  - VA
  - DC (FHWA)
Agency Funding Levels

- All 13 agencies have preventive maintenance programs
- 6 agencies have dedicated steel bridge preservation programs
- Most organized / effective implementers seem to be based on inventory size

Maryland Mandates - no more repairs to beam ends!!
Painting

- In FHWA Bridge Preservation Guide paint is listed as Preventive Maintenance (PM) action along with debris cleaning, bridge washing, etc.

- Due to cost and reparability, paint is considered a bridge “element”
Evaluation Practices for In-Situ Coatings

• All SHAs performed assessments before making maintenance painting decision by following NBIRegs
• Two year frequency – Bi-annual in-service bridge safety inspections
Selecting Coating Candidates

- Triage using NBI or element-level inspection data
- Conduct special coating inspection
- Prioritize
Selecting Coating Candidates

Triage using NBI or element-level inspection data

Conduct special coating inspection

Prioritize

Leverage agency-defined elements!
(AASHTO Element 515 isn’t a panacea)

Oregon
- Condition of entire superstructure coating system

Virginia
- Condition of beam ends
- Beam end coating systems
Overcoating

- Agencies moving away from overcoating
  - Environmental and safety regulations
  - Cost advantages with total removal and replacement
- California SHA
  - In-house painting crews to perform overcoating
  - Extend service life of lead based coatings thru overcoating
Surface Preparation

- All agencies specified SSPC SP-10 for total removal and replacement
Surface Preparation

- Varied for spot and overcoating
- All utilized SSPC Guide 6 for containment
Surface Preparation

Oregon

- UHP washing (>20,000 psi) to remove pack rust

Texas

- Water blast (SSPC SP WJ4) before any mechanical surface preparation

New York

- Hot pressure washing (180 °F) at 3,000 psi to remove surface contaminants
Coating Option Decision Making

3-coat, zinc-rich is the workhorse
• Expect 15-30 years for total removal and replacement
• General satisfaction with these systems

Ultra-weatherable coating systems
• Siloxane, Polyurea, Fluoropolymer
• Lack of data to justify cost, none submitted to AASHTO NTPEP

Metalizing
• New York and Ohio have multi-decade experience
• No rusting, though not aesthetic, cost
Warranties

Maryland / Michigan
- 2 yr. / 25% total project value

Oregon
- 3 yr. / 90% of coating line items

Golden Gate
- 5 yr. (contracted labor and materials)

Virginia
- 1 yr.

Ohio
- 3 yr. in the past

Sweet Spot
- Leverage in-service inspection
- Not so long you forget
- If quality bad, it will appear in 2 yrs.
- Defining “failure” is tricky
Coating Inspection Requirements:

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Agencies</th>
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<tbody>
<tr>
<td>In-house Personnel QA Inspections</td>
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**Minimum Consultant Certifications**
- All at least NACE CIP Level 1 / SSPC BCI Level 1
- Some used NACE CIP Level 3 / SSPC BCI Level 2

**Minimum In-House Certification**
- Varied

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**Minimum In-House Certification**
- Varied
Coating Inspection Requirements

Hold Points

- Maximize

100% QA inspection

- Verification leads to quality

Striping

- Tint the stripe
- Which coat varied by agency and coating
Inspector Qualifications

All agencies required training before assigned a bridge project

Primarily on-the-job training

Industry-based (NACE or SSPC) training

In-house instructor-led training
Contractor Qualifications

9 agencies required SSPC QP1 and QP2

3 agencies required SSPC QP 3 for shop painting

1 agency did not require SSPC QP certification

1 agency allowed SSPC QP 7 for new contractors

QP 1 = Prepare and apply coatings in field
QP 2 = Hazardous paint removal in field
QP 3 = Prepare and apply coatings in shop
QP 7 = Introductory program for contractor less than 6 months experience
Other Findings

- Eliminate Deck Joints
  - Add continuity
  - Move joint behind abutment
  - Link slabs
Other Findings

One-Coat IOZ

Agencies preferred IOZ to OZ
Scan Team Recommendations

- Agency Funding Levels
  - Dedicated Bridge Painting Funds
  - Evaluation Practices for In-situ Coatings Prior to Recoating
  - Inspection Elements

- Surface Preparation
  - Ultrahigh pressure washing to remove pack rust
  - Crevice sealer to inhibit corrosion

- Coating Option Decision Making
  - Duplex Systems (Painting over HDG) and Metalizing
  - Ultra Weatherable Coatings (investigative)
  - Un-topcoated IOZ
Scan Team Recommendations

• Use of Performance-Based Contracts
  • Warranties – Length of contract and bonding amount
  • Specification language

• Specifications for Coating Systems
  • SSPC SP 10 or better for total removal and replacement
  • Paint beam ends (Weathering steel)
  • Incorporate hold points for inspection
  • Full time inspection/inspectors
  • Stripe coating
Scan Team Recommendations

• Quality Control Inspection Qualifications and Contractor Qualifications
  • Specify NACE CIP and/or SSPC BCI
  • Specify SSPC QP1 or QP2 for contractors
• Agency Commitment to Support Future Preservation of Coatings
  • Track coating information on bridges
• Joint elimination
• Waste disposal – Specify as hazardous
TSP2 Bridge Preservation

- https://tsp2bridge.pavementpreservation.org/technical/coatings/

<table>
<thead>
<tr>
<th>Remove &amp; Replace</th>
<th>Pb</th>
<th>No Pb</th>
<th>Expected Service Life</th>
<th>Maintenance of Traffic Required (Days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spot Paint</td>
<td>10</td>
<td>7</td>
<td>4.5</td>
<td>30</td>
</tr>
<tr>
<td>Over Coat</td>
<td>5</td>
<td>3</td>
<td>9</td>
<td>75</td>
</tr>
<tr>
<td>Remove &amp; Replace</td>
<td>1</td>
<td>5</td>
<td>20</td>
<td>100</td>
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- Spot Paint: "Pb Present" and "No Pb Present" are input parameters, and "Expected Service Life" and "Maintenance of Traffic Required (Days)" are calculated parameters.

Example Conditions

- 650 Maintenance of Traffic Cost ($/day)
- 150,000 Area of Steel (ft²)
- 5% Pb Present
- 19% Corrosion
- 3% Annual Percentage Rate of Change (APR)
- 3 Average Motorist Delay (mins)
- 20,000 AADT (total)
- 3% AADT that is truck
- 0.5 Passenger vehicle pay factor
- 25 Average hourly wage ($/hr)

20 year Coating Maintenance Combinations

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<th>Overcoat</th>
<th>Spot Paint</th>
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<tbody>
<tr>
<td>1</td>
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</tr>
<tr>
<td>1</td>
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Example:

- Total Future Value Cost to Remove and Replace: $4,765,826.20
- Future Value of Use Delay Cost: $344,229
- Future Value of MOT at yr 20: $118,348
- Present Value Cost to Paint without MOT: $1,200,000
- Present Value Cost to Paint with MOT: $1,205,000
- Present Value User Delay Cost to remove and replace: $128,750
ANY QUESTIONS

- http://www.domesticscan.org/15-03-successful-preservation-practices-for-steel-bridge-coatings

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