New Bridge Painting Specifications
Incorporating Lessons Learned

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Western Bridge Engineers Seminar
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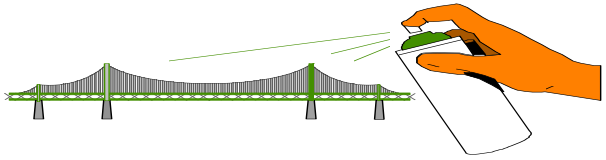
Washington State Department of Transportation



Presentation Outline

- Steel bridge inventory & typical coatings
- Contract lessons
- New contract specs
- Early lessons from the field
- Preservation program

US 12 Black River Bridge No. 12/76

Washington State

WSDOT Steel Bridge Painting Program

Painted Steel Bridges	276
Oregon - Washington Border Bridges	7
Tacoma Narrows Bridges	2

Total	285

Steel Structures Painting Council

"*All coating systems will fail eventually.*"

The question is – "When?"

SR 141 White Salmon River Bridge (21 years)

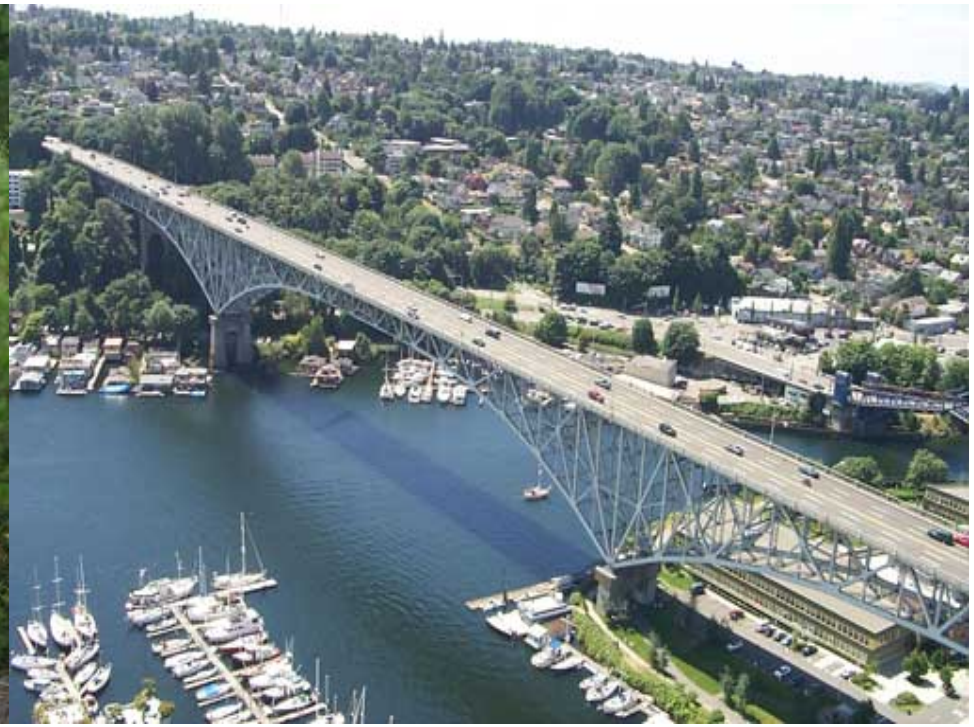
WSDOT Steel Bridge Painting Program

Lead / Alkyd Paints	– Prior to 1992
Zinc Phenolic / Vinyl	– 1971 to 1991
Zinc / Moisture Cured Urethanes	– 1992 to present

WSDOT Steel Bridge Painting Program

Lead Alkyd Paint system
(used on new bridges and overcoat existing)

- 95 bridges
- Paint age is 16 - 34 years
- 75% need to be repainted



WSDOT Steel Bridge Painting Program

Zinc Phenolic / Vinyl Paint system (new construction)

- 21 bridges
- Paint Age is 17 - 38 years
- All but three still in good condition

WSDOT Steel Bridge Painting Program

Zinc / Moisture Cured Urethane Paint system

New bridges

- 35 bridges
- Paint Age is 1 - 16 years
- All OK

Overcoat existing bridges

- 75 bridges
- Paint Age is 3 - 17 years
- 10 bridges need to be repainted

Contract Lessons

Typical Past Maintenance Painting

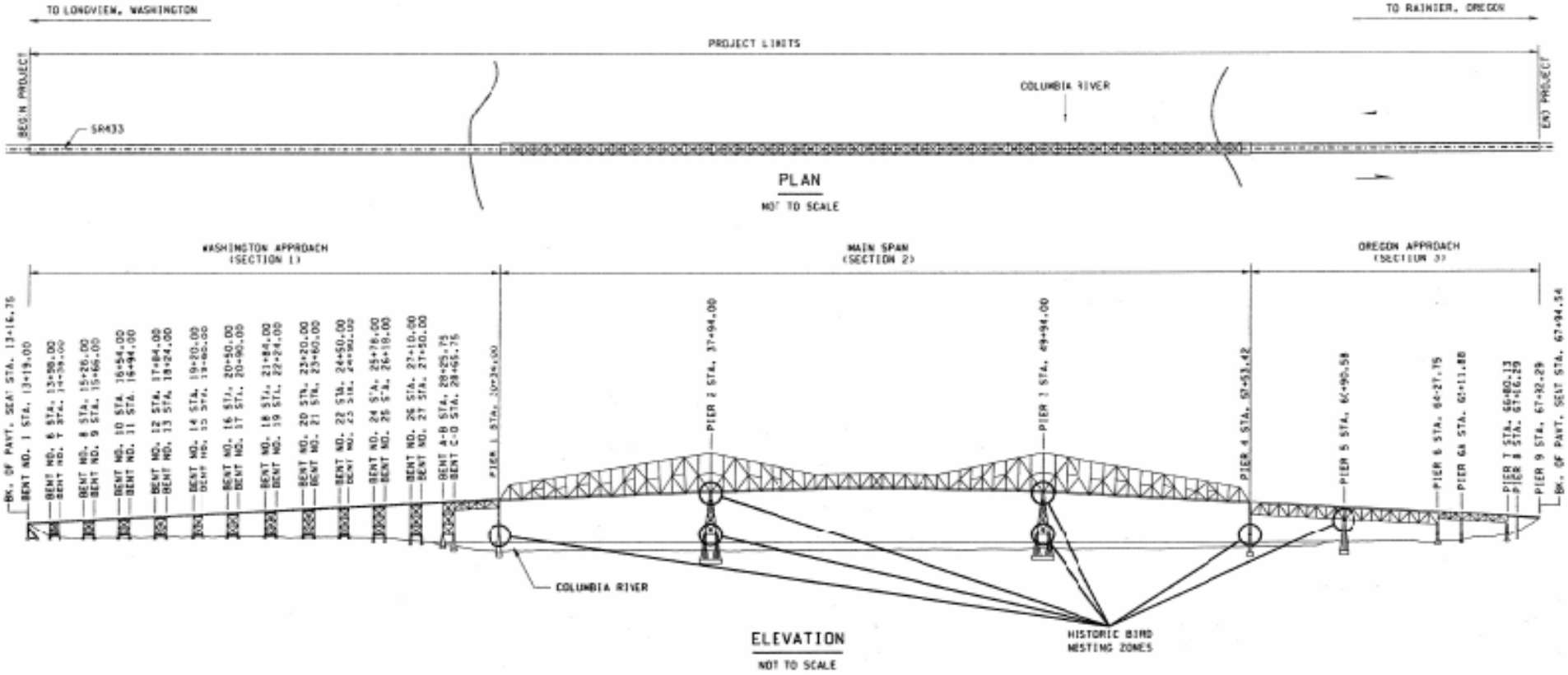
1. Dry clean, then bird guano/fungus removal using 5.25% sodium hypochlorite solution
2. Either pressure flush @ 3,000psi or SSPC-SP7 *Brush-Off Blast Cleaning*
3. Spot abrasive blast exposed metal surfaces to SSPC-SP6 *Commercial Blast Cleaning*
4. Hand clean inaccessible areas (to satisfaction of the Engineer)

Note: SSPC = The Society for Protective Coatings

Story of the Lewis and Clark Bridge 2006 Maintenance Painting

- Existing condition
  - Intact mill scale coated by lead paint
  - Numerous overcoatings (~4+)
  - 14,236 tons steel, approx 2.14 million s.f.
  - 5,478 ft total bridge length
- Contract conditions
  - Cleaning/painting was <u>One Lump Sum Item</u>
  - Contract provided weight of steel; Contractor was responsible to inspect the site
  - Pressure flush at min 5,000psi; no sweep blasting

Length = 5,478 ft



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Washington State Department of Transportation

SR433
LEWIS AND CLARK BRIDGE PAINTER

BRIDGE 4331 LAYOUT


Main spans (looking northwest toward Washington)

Selected Contract Issues

1. Overcoating adhesion
2. Exposed steel before pressure flush
3. Chasing brittle paint
4. Merging spot blast areas
5. Member topsides in worse condition
6. Excessive paint removal for overcoat

Overcoating adhesion

- Numerous overcoats; harsh environment
- Paint suppliers did pre-bid adhesion testing
- Surface preparation changes condition
- Potential for chemical incompatibility

Lessons: Overcoating adhesion

- Provide available existing coatings information
- Make site available to prospective contractors & paint suppliers
- For large project scoping, consider coatings consultant site investigation
- Expect & specify action for repair of minor curling of paint around edges of spot repairs

Exposed steel before pressure flush

- Required pressure flush at 5,000 psi
- Difficult to estimate surface area for spot abrasive blasting based on pre-bid visual inspection

Lessons: Exposed steel before pressure flush

- Overcoating
  - Explicitly state exposed steel to be spot blasted is that steel exposed by the pressure flush or sweep blast
  - Estimate blast area; use typical contract mechanism to over/under-run
- Full removal
  - If likely blast area exceeds ~ 15-20%, consider full removal (SSPC TU-3 *Overcoating*)

Chasing brittle paint

- Spot blast exposed metal
- Feather edges to ‘sound’ paint; how to evaluate sound coating?

Lessons: Chasing brittle paint

- Overcoat
  - Use dull putty knife (not rigid 5-in-1 tool) to determine sound paint per SSPC-SP COM 4.3.8 & SSPC-PA 1 16.9
  - Consider coating compatibility with all previous paints exposed when spot edges are feathered
- Full removal by abrasive blast
  - Excessively brittle or thick coating
  - Incompatible with new coatings

Merging spot blast areas

- If spots are small & close, spot blasting will yield full or large area blast
- Paint may be damaged by blast ricochet

Lessons: Merging spot blast areas

- Allow de minimis sized (~ 1.5” diameter) coating failure (corroded or non) to remain provided other similar failures are more than 4” away
- Require protection of adjacent members from ricochet blast media

Member topsides in worse condition

- Walking/binocular inspection by Contractor
- Paint condition varies by exposure
- Typical bad paint – member top sides, water retaining surfaces, difficult access (it was difficult for previous painters as well…)

Lessons: Member topsides in worse condition

- Schedule mandatory pre-bid site visit
  - Notify all bidders
  - Provide access to representative locations
- Discuss access issues and potential for varying conditions in the contract

Excessive paint removal for overcoat

- Some areas had >35% removal; others <5%
- Paint condition varied along length of bridge (worse in-water & near industrial plant)

Lessons: Excessive paint removal for overcoat

- Scope contracts with zone painting, if any locations permit less costly overcoat
- Use SSPC during contract scoping
  - SSPC-TU 3 *Overcoating*
  - SSPC-PA 1 *Shop, Field, and Maintenance Painting of Steel*
  - SSPC-PA COM *Commentary on Paint Application*

Incorporation of Lessons Learned

- Created in-house ‘expert’ task group:
  - Bridge Construction, Design, & Management
  - Materials & Fabrication
  - Experienced paint contract inspectors

- Revised standard specifications
- Implemented just-in-time inspector training

Highlight of New Washington State DOT Bridge Maintenance Painting Contract Specifications

Transition to SSPC Documents

- SSPC: The Society for Protective Coatings
- Replace other standards
- Purchase Painting Manual for Contract work
- Use Coatings Glossary for standard terminology

Require Contractor Qualifications

- Contractor Qualification (SSPC-)
  - QP 1 *Field application to complex structures*
  - QP 2 *Field removal of hazardous coatings*
- Detailed painting plan, approved & discussed at pre-activity meeting

Monitor Work Quality

- Contractor quality control (QC)
  - Daily quality control log completed by onsite qualified & designated QC Inspector
  - QC inspections per SSPC-PA 1
- Paint manufacturer represented onsite
- Holds points for Owner quality assurance (QA) inspections

Specify Containment Performance

- SSPC Technology Guide No. 6
  - *Guide for Containing Surface Preparation Debris Generated During Paint Removal Operations*
  - Containment Class 2, high level of emission control
  - Assessed by Method A visible emissions
- Secure site storage of materials and waste


Containment for Full Removal - Lewis & Clark Br No. 433/1


Lewis & Clark
Br No. 433/1

Surface Preparation

- Full removal of all paint/mill scale (typical)
  - Dry clean, then fungicide
  - SSPC-SP 10 *Near-White Blast Cleaning*
- Overcoat (may be part of zone coating)
  - Dry clean, then SSPC-SP 1 Solvent Cleaning
  - Waterjetting (SSPC-SP 12 WJ-4/LP WC) or Brush-off Blast (SSPC-SP 7)
  - Spot Blast to SSPC-SP 6, w/min 2” boundary to sound coating (tested by dull putty knife)


Blasting for Full Removal - Lewis & Clark Br No. 433/1

Typical New Field Coating Application

- Prime same day as blast
- Paint system, using contrasting colors
  1. Primer, zinc-filled, single component, moisture-cured polyurethane
  2. Primer (stripe coat)
  3. Intermediate (stripe coat)
  4. Intermediate, single component, moisture-cured polyurethane
  5. Top coat, single component, moisture-cured aliphatic polyurethane
- Repair coating defects

Changes to Owner Behavior

- Defined owner (inspector) QA process
- Just-in-time, contract-specific QA inspector training
  - Review all contract language
  - Hands-on trial use of QA/QC equipment
  - Training by NACE certified inspectors; field inspectors are typically not NACE certified

Feedback from the field

Feedback - I

- Issue: QP1/QP2 certification is expensive for small painters that may otherwise be qualified & time-consuming to obtain
- Resolution: Allow work experience in lieu of certification for first year of new spec

- Issue: Full blast leads to frequent questions about “inaccessible” to blast or power tools
- Resolution: Question inaccessible versus difficult to access; discuss acceptance at pre-activity; review experience of blasters

Blasting for Full Removal - Black River Br No. 12/76

Feedback - II

- Issue: Difficult to abrasive blast, apply primer stripe, and full primer coat within 1 working day
- Resolution: Allow full primer before primer stripe

- Issue: Complaints with restriction on containment to max ½ span
- Resolution: Give option to assess bridge capacity for added containment/equipment

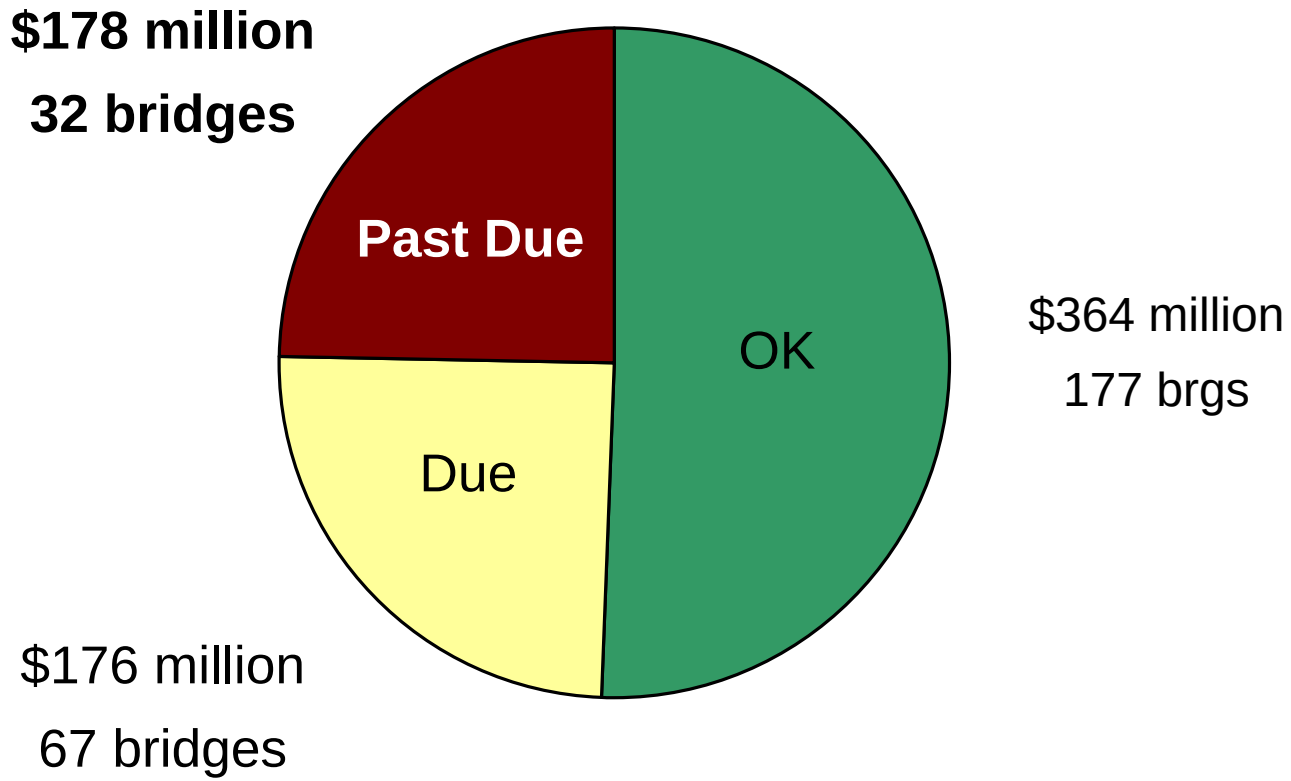
Feedback - III

- Issue: We specify dry millage thickness on intermediate coats
- Resolution: Evaluate wet millage and range of acceptable total dry millage

- Issue: Do we require lead-binding additive always or allow recycled media
- Resolution: We are assessing these cases in current contracts

WSDOT Steel Bridge Painting Program

Summary of WSDOT Steel Bridge Painting needs



http://www.wsdot.wa.gov/Design/ProjectDev/GSPAmendments.htm