

NCHRP Domestic Scan 15-03

“Successful Preservation Practices For Steel Bridge Coatings”

Paul Vinik, P.E.

Greenman-Pedersen Inc.

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:

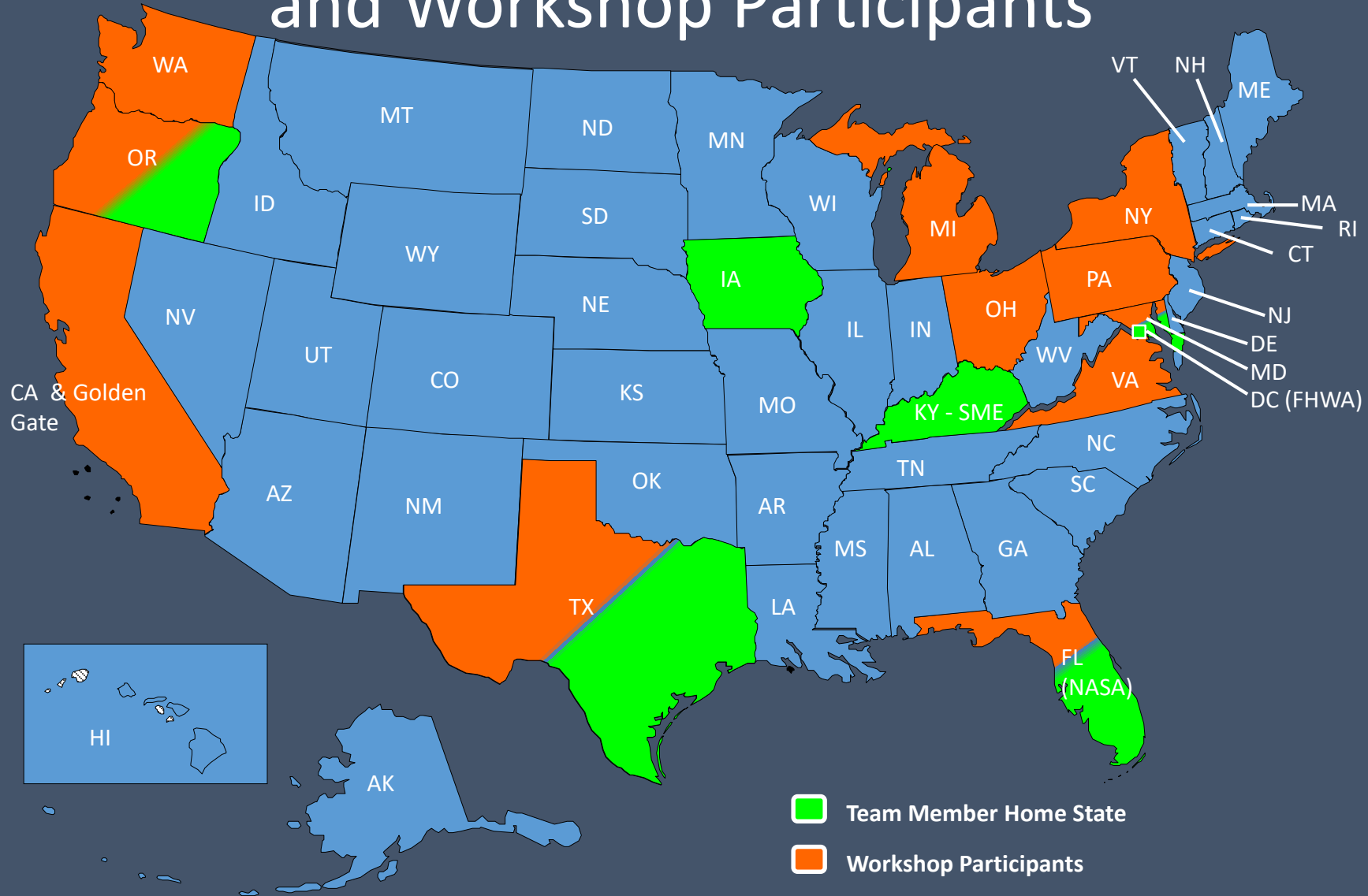
- Funding Levels
- Evaluation Practices For In Situ Coatings
- Surface Preparation
- Coating System Decision Making
- Warranties
- Coating Inspection Requirements
- Inspector Qualifications
- Contractor Qualifications
- Scan Team Recommendations

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 Todsén – Iowa DOT
- 12 Workshop Participating SHAs and Owners

Scan 15-03 Team Members Home State and Workshop Participants



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”

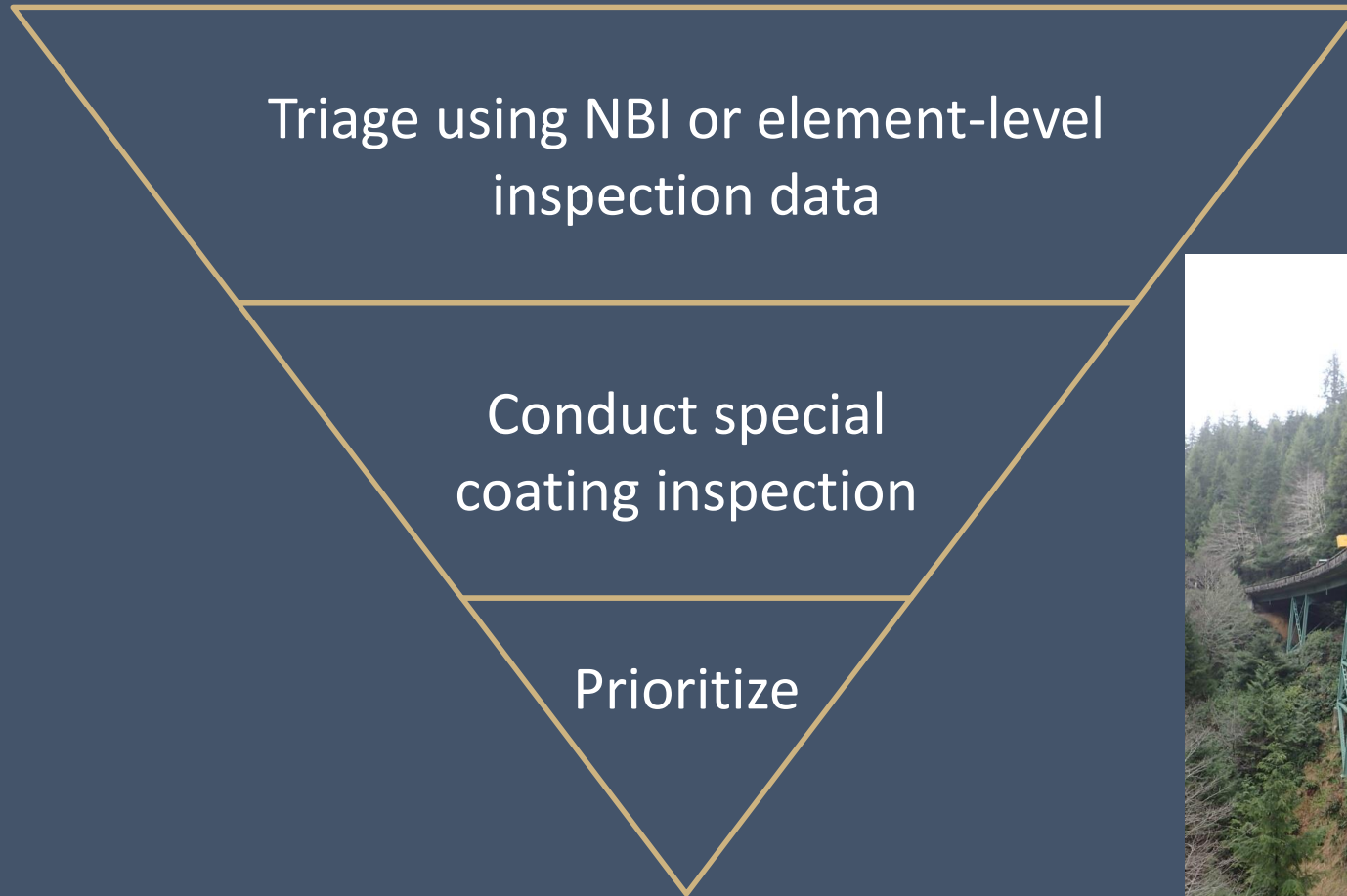


Evaluation Practices for In-Situ Coatings

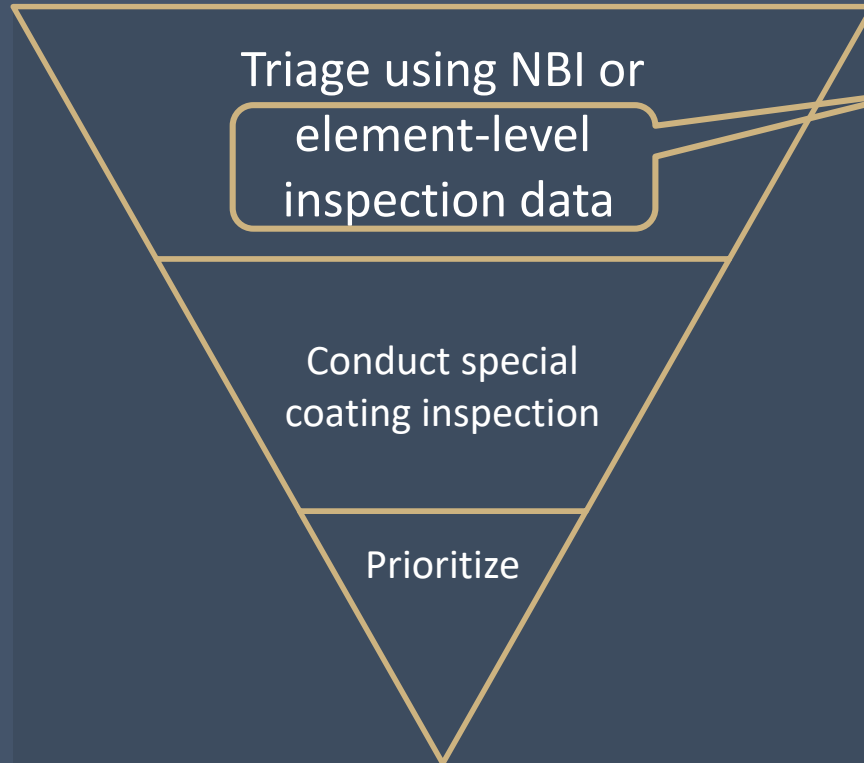
- All SHAs performed assessments before making maintenance painting decision by following NBI Regs
- Two year frequency – Bi-annual in-service bridge safety inspections



Selecting Coating Candidates



Selecting Coating Candidates



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:

In-house Personnel QA Inspections

- 1 agency

Consultant Personnel QA Inspections

- 5 agencies

Blended In-house/Consultant QA Inspection

- 6 agencies

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

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



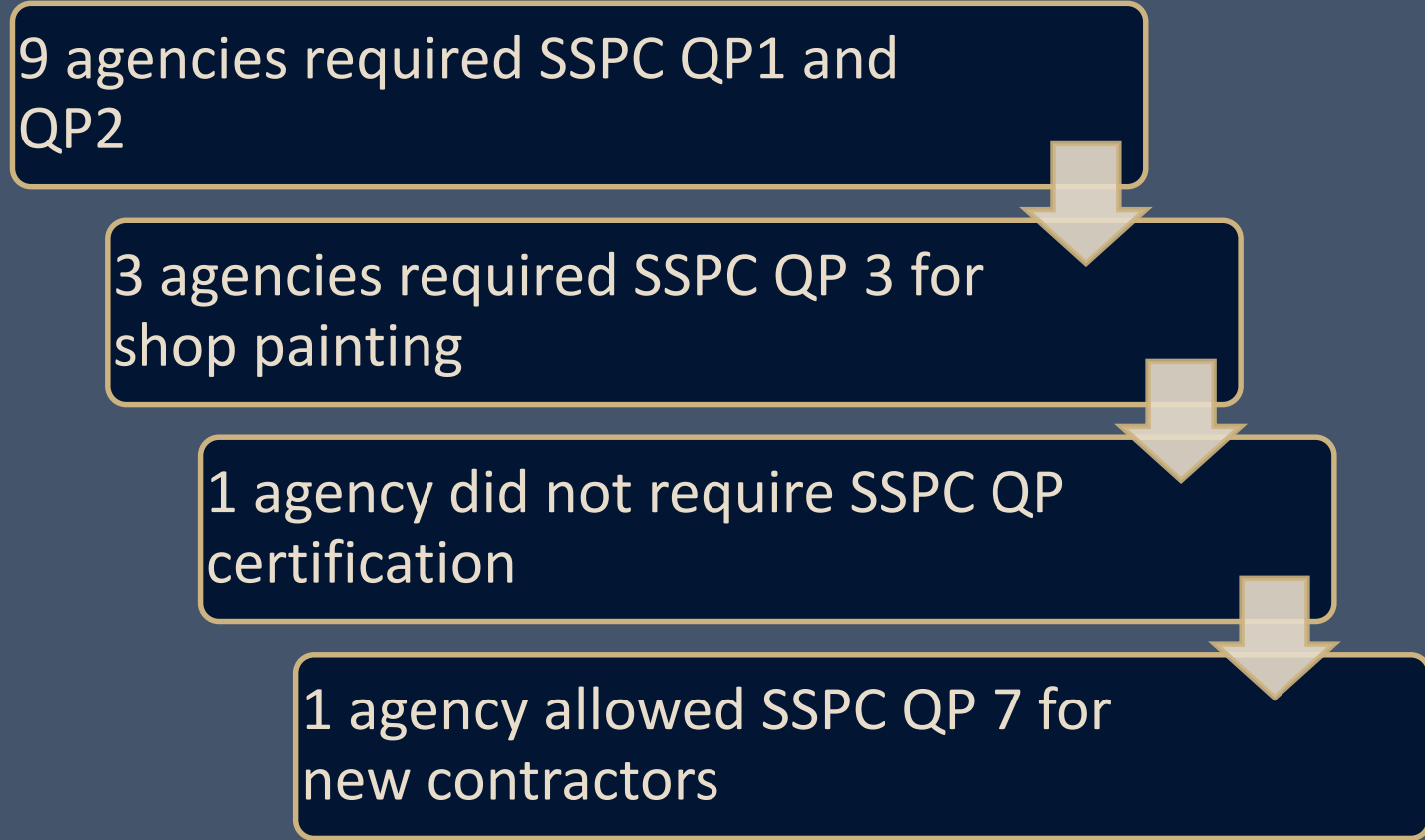
Industry-based (NACE or SSPC)
training



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

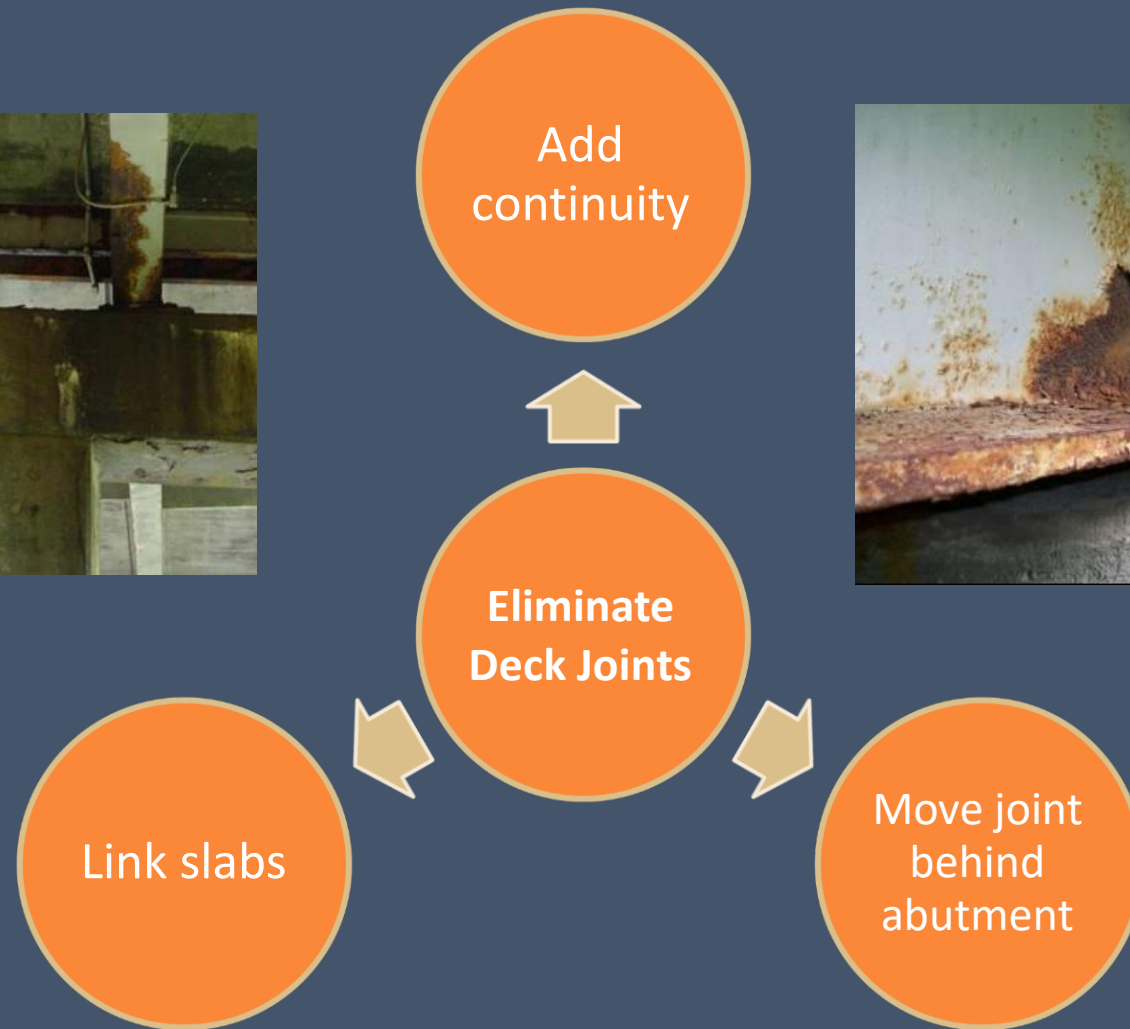
QP 1 = Prepare and apply coatings in field

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

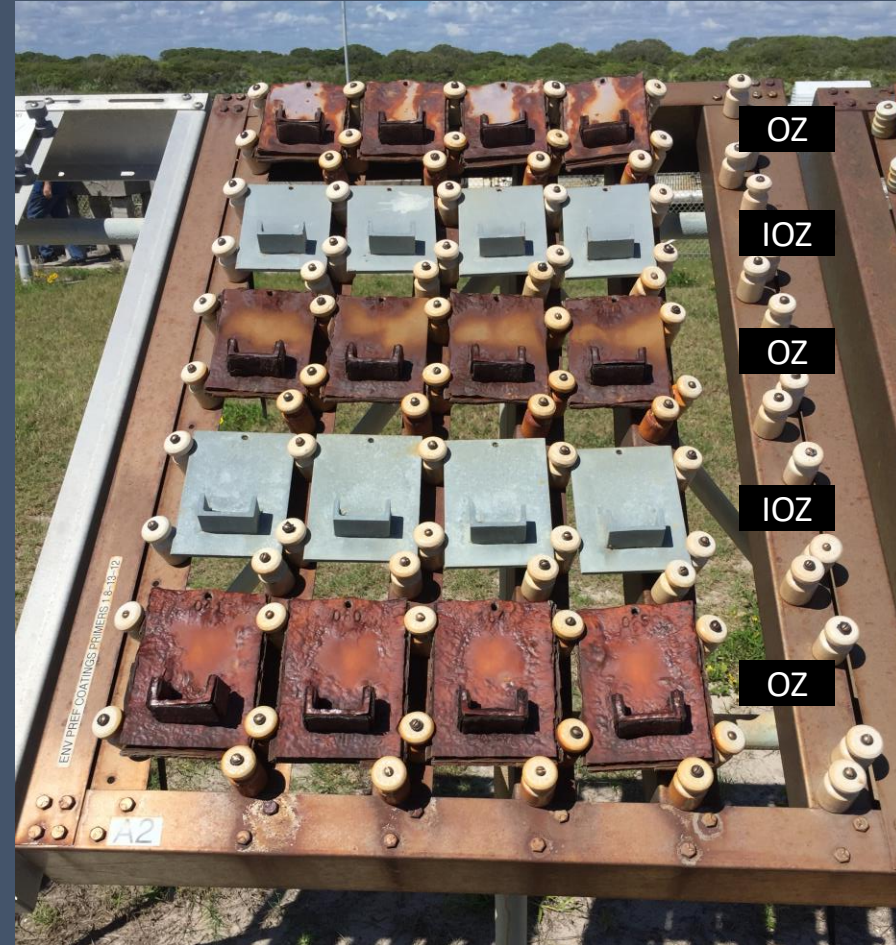
Other Findings



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

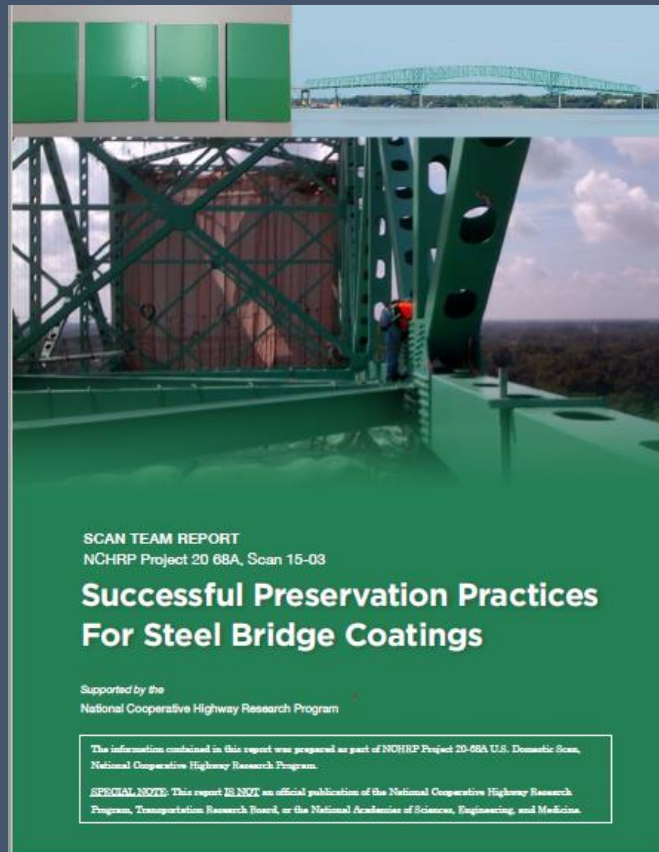
Scan Team Recommendations

- 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/>



Painting Costs \$/ft ²				Maintenance of Traffic
	Pb	No Pb	Expected Service Life	Required (Days)*
Spot Paint	10	7	4.5	30
Over Coat	5	3	9	75
Remove & Replace	8	5	20	100

Green = Input Parameters
Red = Calculated Parameters

20 year Coating Maintenance Combinations

Remove and Replace	Overcoat	Spot Paint
1	2	1
	1	3
		5

**The values in this table need to be specific to the structure.*

Example Conditions	
650	Maintenance of Traffic Cost (\$/day)
150,000	Area of Steel (ft ²)
yes	Pb Present
19%	Corrosion
3%	Annual Percentage Rate of Charge (APR)
3	Average Motorist Delay (mins)
20000	AADT (total)
3%	% AADT that is trucks
0.5	Passenger vehicle pay factor
25	Average hourly wage (\$/hr)

20 year analysis	
Remove and Replace	
Total Future Value Cost to Remove and Replace	(\$4,765,826.20)
Future Value of User Delay Cost	(\$2,344,222)
Future Value of MDT at yr 20	(\$118,349)
Present Value Cost to Paint without MDT	(\$1,200,000)
Present Value Cost to Paint with MDT	(\$1,265,000)
Present Value User Delay Cost to remove and replac	(\$1,287,500)

ANY QUESTIONS



- <http://www.domesticscan.org/15-03-successful-preservation-practices-for-steel-bridge-coatings>
- PVinik@GPI.net