Corrosion and Corrosion Protection of Steel Bridges

WV-LTAP and WVDOH
March 7, 2024

SHERWIN-WILLIAMS®

Corrosion:

- The natural process that converts a refined metal into a more chemically stable oxide.

- The gradual deterioration of materials by chemical or electrochemical reaction with their environment.

Addressing Corrosion

New Steel

- Weathering Steel
- Protective Coating System
- Hot Dipped Galvanized
- Thermal Spray Metallized

Maintenance Steel

- Condition Assessments
- Overcoat
- Blast and Repaint

New Steel

Weathering Steel

- Often perceived as the lowest cost steel option
- Has its place, just not everywhere
- Design considerations
  - Atmospheric exposure
  - Limit time of wetness and details that trap moisture
  - Minimize joints
- NSBA Uncoated Weathering Steel Reference Guide

New Steel

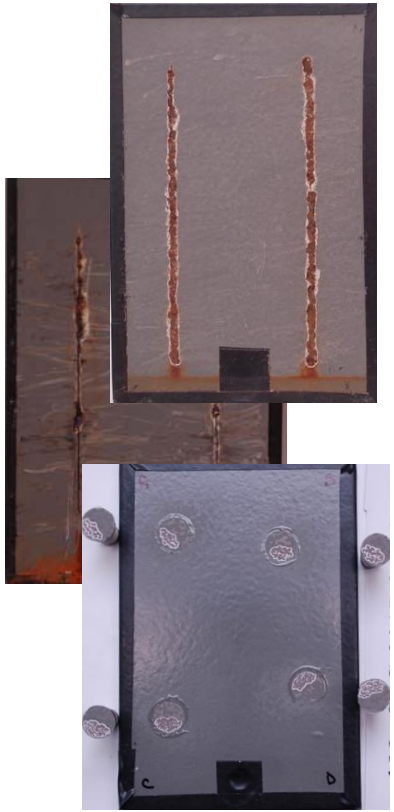
Protective Coatings Systems

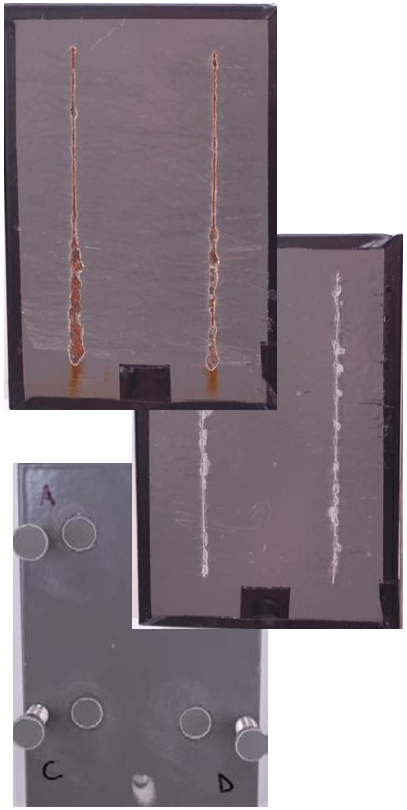
- Traditional 3-Coat System
- High Performance 2-Coat System
- Single Coat Zinc Rich System
- Compliance for Class B Slip Critical Connection Requirements
- Volume 19 of the NSBA Steel Bridge Design Handbook

Performance of Zinc Rich Coating Systems

IOZ/Epoxy/Urethane

- Cyclic Weathering
  - Creep 1.3mm Avg
  - Blistering 10
- Salt Fog
  - Creep 1.5mm Avg
  - Blistering 10
- Adhesion
  - 2,750psi Avg
  - 40% Cohesive Primer





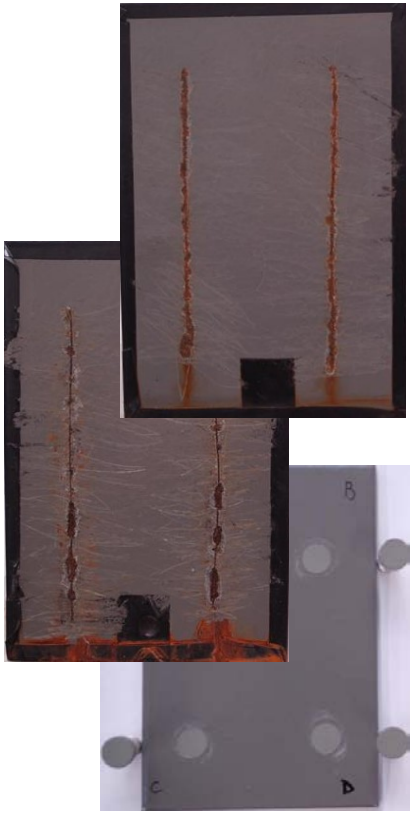
OZ/Epoxy/Urethane

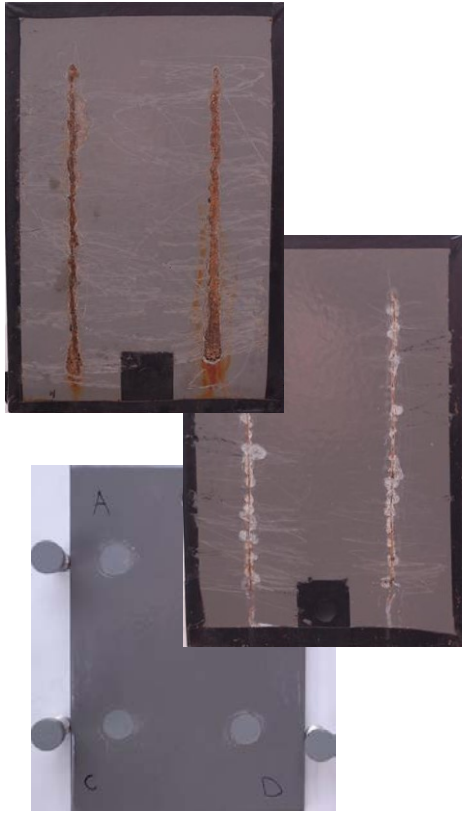
- Cyclic Weathering
  - Creep 0.9mm Avg
  - Blistering 10
- Salt Fog
  - Creep 0.9mm Avg
  - Blistering 10
- Adhesion
  - 2,300psi Avg
  - 100% Cohesive Primer

Performance of Zinc Rich Coating Systems

IOZ/Polysiloxane

- Cyclic Weathering
  - Creep 1.3mm Avg
  - Blistering 10
- Salt Fog
  - Creep 1.4mm Avg
  - Blistering 10
- Adhesion
  - 2,000psi Avg
  - 100% Cohesive Primer





OZ/Polysiloxane

- Cyclic Weathering
  - Creep 2mm Avg
  - Blistering 10
- Salt Fog
  - Creep 2.4mm Avg
  - Blistering 10
- Adhesion
  - 2,300psi Avg
  - 100% Cohesive Primer

New Steel

Hot Dipped Galvanized

- Size limitations of HDG kettles
- Proximity of galvanizer to fabricator
- Meets Class C Slip Critical Connection Requirements
- Volume 19 of the NSBA Steel Bridge Design Handbook

New Steel Bridges

Thermal Spray Metallizing

- Selection of alloy
  - 100% Zinc
  - 85/15 Zinc/Aluminum
  - 100% Aluminum
- Recommended to be seal coated
- Meets Class B Slip Critical Connection Requirements
- Volume 19 of the NSBA Steel Bridge Design Handbook

Rebar Coatings

- Greenbar
  - ASTM A775
- Textured Epoxy Coating (TEC)
  - ASTM A1124 (September 2023)

Maintenance Steel

Condition Assessments

- Historically – ‘worst first’
- Site based condition surveys
- Bridge triage
  - Too big to fail
  - Balancing maintenance costs to service life
  - Can’t save them all

Maintenance Steel

Overcoating

- Spot paint
- Zone paint
- Full overcoat
- Surface preparation
- Coating selection
  - Single coat overcoat
  - Multicoat system

Maintenance Steel

Blast and Repaint

- Surface preparation
  - AMPP SP10 vs AMPP SP6
- Coating Selection
  - Traditional 3-coat system
  - High performance 2-coat system
  - Single coat zinc rich system

Thank you

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