Polyaspartic Coatings for Reducing Bridge Maintenance Painting Costs, a Case Study in Virginia

Ahren Olson & Todd Williams - Covestro LLC
Mark Hudson – The Sherwin-Williams Company
Wayne Fleming – Virginia Department of Transportation

Agenda

- Polyaspartic Coatings
- Virginia Case Study
- Additional DOT Projects

Evolution of Protective Coatings

What's next for the evolution of coatings?

Oil-based coatings with lead and chromium for 100+ years

1960s

The use of zinc in coatings for galvanic protection

1970s – 1990s

Vinyl coatings used over zinc

1990s – today

Epoxy and polyurethane used over zinc

2000s – today

Polyaspartic urethanes over zinc

Polyaspartic coatings are aliphatic polyureas based on polyaspartic esters + aliphatic isocyanates

Polyol resin
"A-side"

+

Polyisocyanate
"B-side"

→ Polyurethane Coating

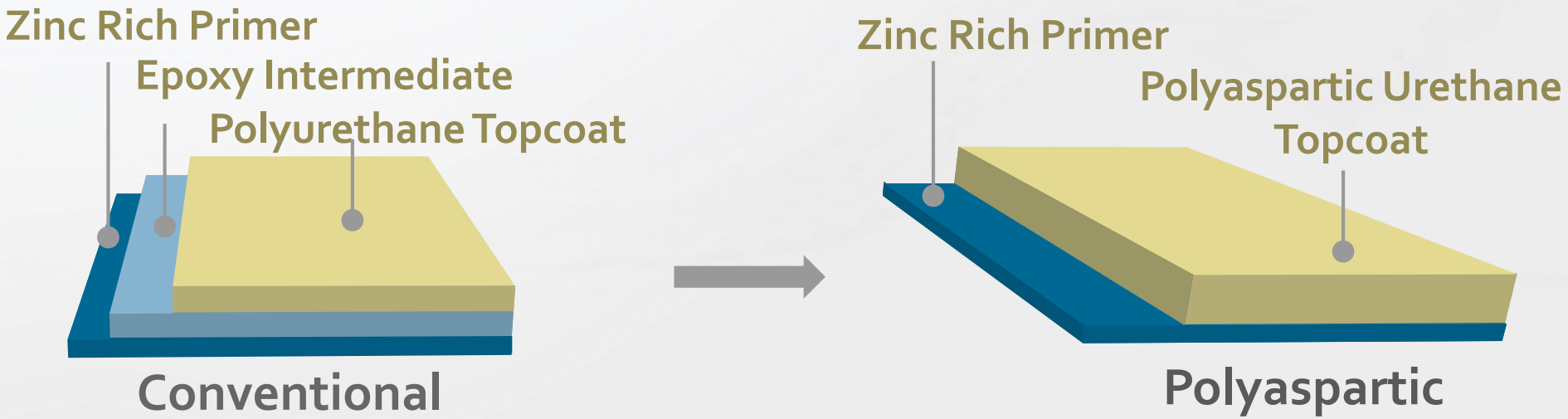
Polyaspartic resin
"A-side"

+

Polyisocyanate
"B-side"

→ Polyaspartic Coating

Polyaspartic urethanes allow for fewer coats with equal performance



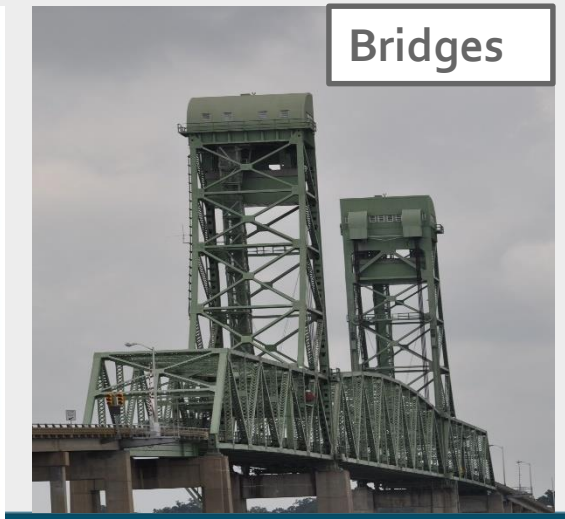
Industry standard for heavy duty corrosion protection

Decades of proven performance

Less coats for cost savings and increased productivity

15+ years of proven field performance

Polyaspartic urethanes are used in a variety of diverse applications



There are both application and physical property advantages

Application

- Fast cure with potlife
- High film build
- Spray, brush, and roll

Physical Properties

- Color and gloss retention
- Edge retention
- Corrosion resistance

Less Coats…Does This Really Work?
Validated through 3rd party accelerated testing

2004 - NTPEP
(National Transportation Product Evaluation Program)
2006 - FHWA
(Federal Highway association)
2008 - CPTP
(Cooperative Paint Testing Program)
2014 - NTPEP

FHWA study confirms two-coat system as comparable performance to three-coat

Coating System	Accelerated 5000 hours – Scribe Creep	Sea Isle City, NJ – 2 years
MCU Zinc / MCU / Aliphatic PU	1.7 mm	1.0 mm
Epoxy Zinc / Epoxy / Aliphatic PU	1.4 mm	0.0 mm
IOZ / Epoxy / Aliphatic PU	2.8 mm	1.7 mm
Epoxy Zinc / Polyaspartic (1)	0.8 mm	0.0 mm
Epoxy Zinc / Polyaspartic (2)	1.6 mm	1.3 mm
MCU Zinc / Polyaspartic (1)	3.3 mm	0.0 mm
MCU Zinc / Polyaspartic (2)	3.3 mm	1.5 mm

FHWA - HRT-2006-006

CPTP evaluation of two-coat system validates performance

3015 hours of ASTM D5894 Cyclic Weathering

Primer	Midcoat	Finish Coat	Undercut
Reinforced Inorganic Zinc	Phenalkamine	Acrylic Polyurethane	1 mm
Organic Zinc	Epoxy Polyamide	Acrylic Polyurethane	1 mm
Reinforced Inorganic Zinc	None	Polyaspartic	1.5 mm
Organic Zinc	None	Polyaspartic	1 mm

O'Donoghue, M., et. al (2013) Innovative Coating Systems for Steel Bridges: A Review of Developments *Journal of Protective Coatings and Linings*, January 2013, 34-52.

NTPEP evaluation of polyaspartic system against NEPCOAT criteria

Test Method	Epoxy Zinc Primer Polyaspartic topcoat	NEPCOAT Performance Criteria
Salt Fog ASTM B117 5000 hours	Blister Conversion = 10 Avg Creep @ Scribe 0.1mm Max Creep @ Scribe 1.5mm	Blister Conversion = 7 Avg Creep @ Scribe ≤ 4.0mm Max Creep @ Scribe ≤8.0mm
Prohesion ASTM D5894 5000 hours	Blister Conversion = 10 Avg Creep @ Scribe 1.8 mm Max Creep @ Scribe 3.7 mm	Blister Conversion = 8 Avg Creep @ Scribe ≤ 4 mm Max Creep @ Scribe ≤8 mm

Value to Bridge Owners

Faster return to service, reduction in maintenance painting costs & increased throughput

Maintenance painting

Cost savings through reduction in labor and less traffic diversion / faster return to service

New construction / shop painting

Cost savings through reduction in labor / handling costs / increased throughput through fab shop

Maintenance Painting – I-84 Danbury, CT

31% improvement to productivity with PAS two-coat system

Bridge 1186: I-84 over Starr Ave.

15 years in service <0.1% rusting

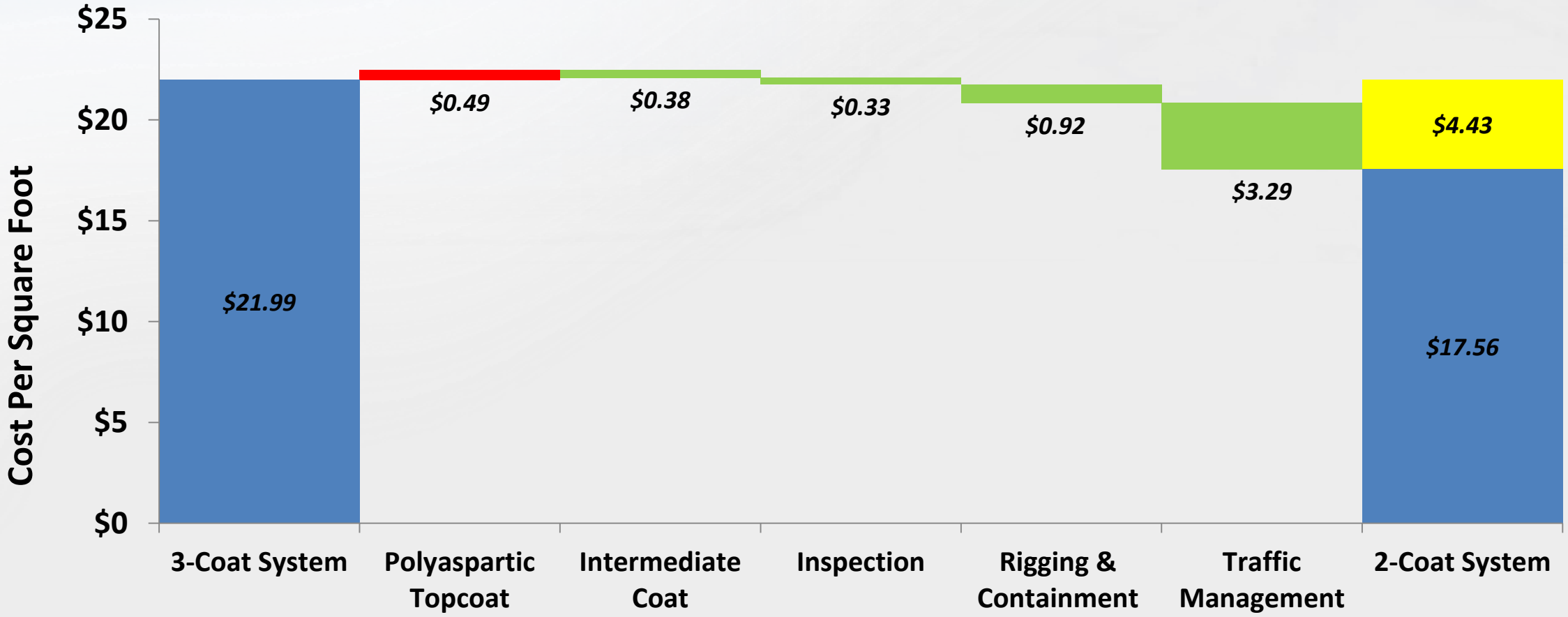
Bridge 1199: SR911 over I-84

15 years service ~ 3-5 % rusting

Castler, B. Rapid Deployment Technology a New Concept for Connecticut, PACE Conference 2003

Maintenance Painting Cost Savings Solution

Economic benefit confirmed – 20% reduction in direct cost



Castler, B. Rapid Deployment Technology a New Concept for Connecticut, PACE Conference 2003

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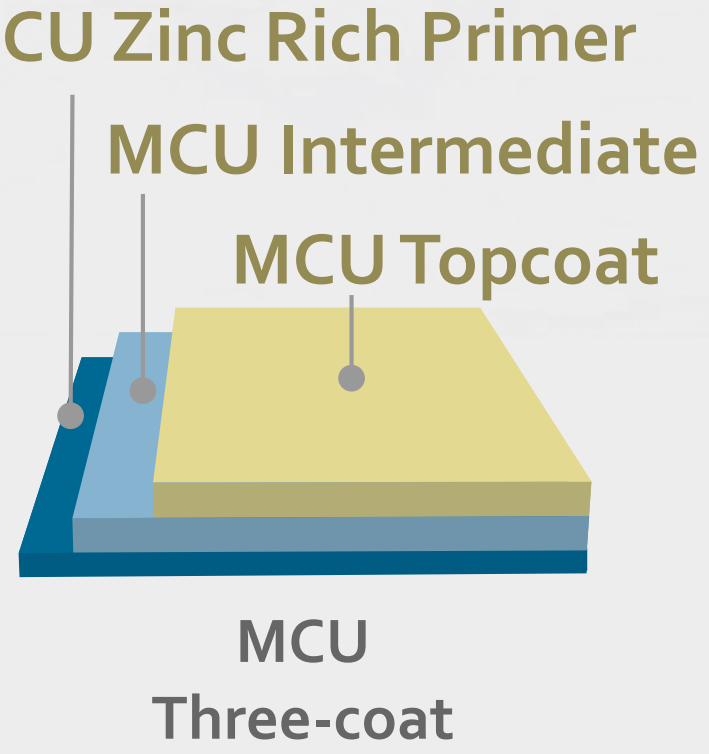
Comparing field performance of two-coat polyaspartic system against three-coat system

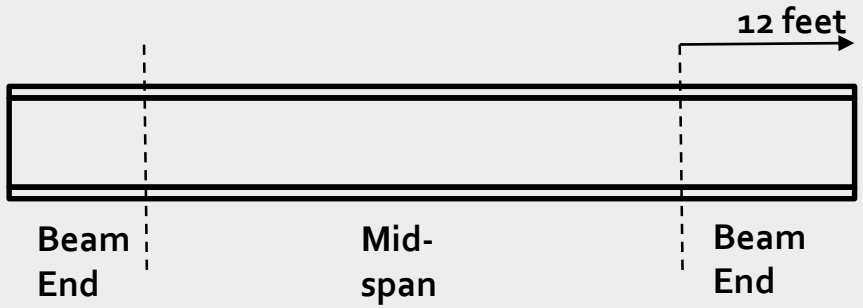
Project Overview:

- In 2005, VDOT completed the first PAS project
- After 10 years of service, 37 bridges visually inspected
  - 15 PAS and 22 MCU bridges as a comparison



Field inspections rating system based on SSPC-VIS 1

Rating	Description	Degree of Rusting
Very Good	Rust grade 10 and 9	Less than or equal to 0.03%
Good	Rust grade 8	Greater than 0.03% up to 0.1%
Fair	Rust grade 7 and 6	Greater than 0.1% up to 1%
Poor	Rust grade 5 and 4	Greater than 1.0% up to 10%
Very Poor	Rust grade 3, 2, 1 and 0	Greater than 10%



Myers, John J., Glenn Washer, and, Wei Zheng. "Structural Steel Coatings for Corrosion Mitigation," *Report NUTC R233 & R238* Center for Transportation Infrastructure and Safety/NUTC Program, Missouri University of Science and Technology, Oct. 2010

Bridge descriptions of the 24 concrete deckand 2 truss bridges inspected

22 simple spans
2 cantilever with suspended spans

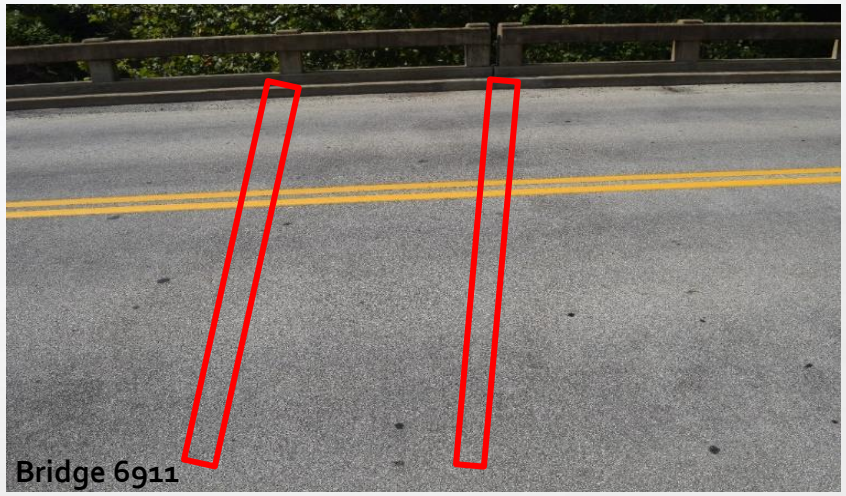
2 truss bridges

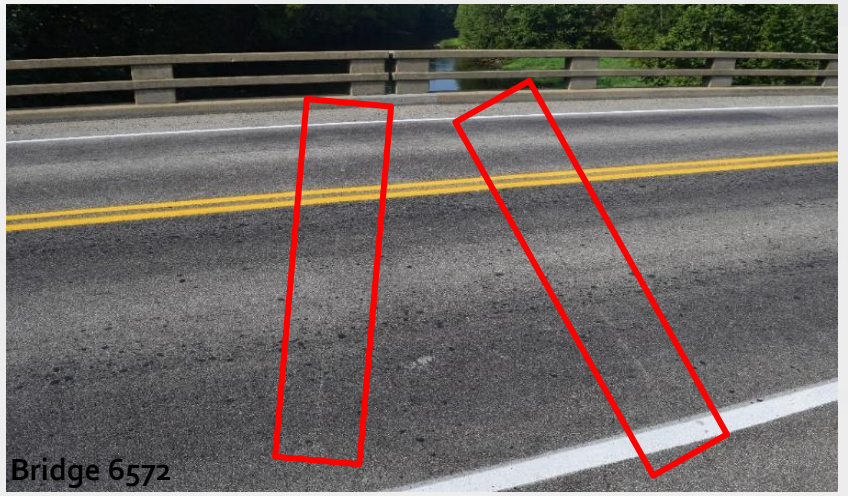
Bridges with concrete decks
Two-coat equivalent performance as three-coat

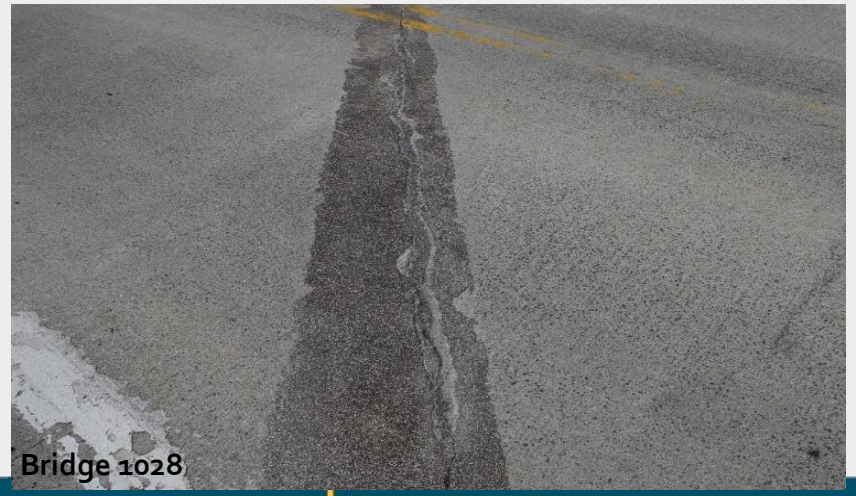
Rating	MCU	Polyaspartic
Very Good	4	4
Good	12	3
Fair	-	1
Poor	-	-
Very Poor	-	-

24 bridges inspected
16 MCU and 8 Polyaspartic

Bridges with Concrete Decks
Cracks in deck = more corrosion


Bridge 6911


Bridge 6572


Bridge 1028


Bridge 1028

MCU Three-coat

Bridge 1085 – Very Good

MCU Three-coat

Bridge 1110 – Good

Polyaspartic Two-coat
Bridge 6038 – Very Good




Polyaspartic Two-coat

Bridge 2058 –Good

Truss Bridges
Two-coat equivalent performance as three-coat

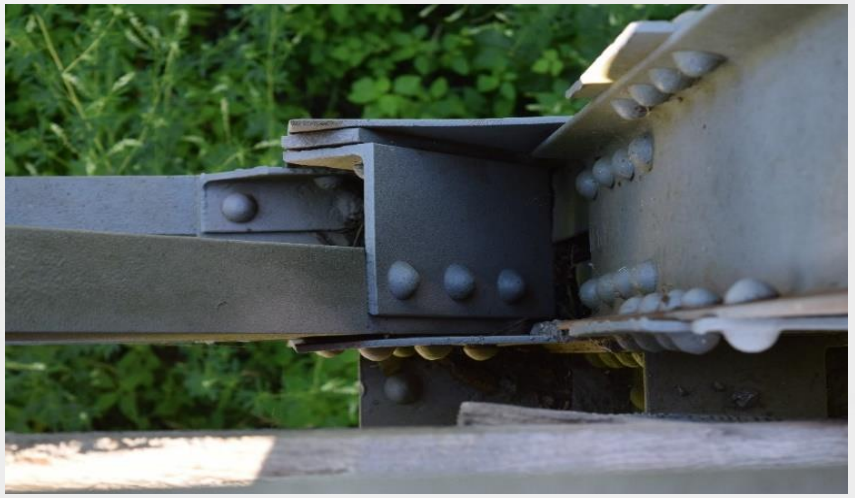
Rating	MCU	PAS
Very Good	-	-
Good	-	1
Fair	1	-
Poor	-	-
Very Poor	-	-

Note: Only the structure above the deck was rated

MCU Three-coat Truss

Bridge 6093 – Fair

Polyaspartic Two-coat Truss Bridge 6097 – Good



Complete Summary of Ratings

Polyaspartic two-coat showing equivalent performance

Rating	MCU	Polyasaprtic	MCU Truss	PAS Truss
Very Good	4	4		
Good	12	3		1
Fair		1	1	
Poor				
Very Poor				

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Michigan DOT – Project completed 2017

West Road over I-75 in Woodhaven, MI

Maine DOT - Project completed in 2016

Several structures outside Portland, ME

MDSHA - Project completed in 2017

MD648 over MD10 in Baltimore, MD

Polyaspartic two-coat showing equivalent field performance as three-coat

- Polyaspartic systems offer significant cost savings in maintenance painting without sacrificing performance
- More than a half a dozen states have completed projects with polyaspartic coatings systems

Questions?

Ahren Olson
412-335-2485
Ahren.olson@Covestro.com

Mark Hudson
724-272-0082
Mark.Hudson@Sherwin.com

Wayne Fleming
804-328-3126
Cw.fleming@vdot.Virginia.gov

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