

By the end of this lesson, you will be able to: • Explore current and emerging technology and trends that affect steel and coating systems This lesson will take approximately 30 minutes to complete.

Can the Higher Toughness of HPS Preclude In-Service Fracture?

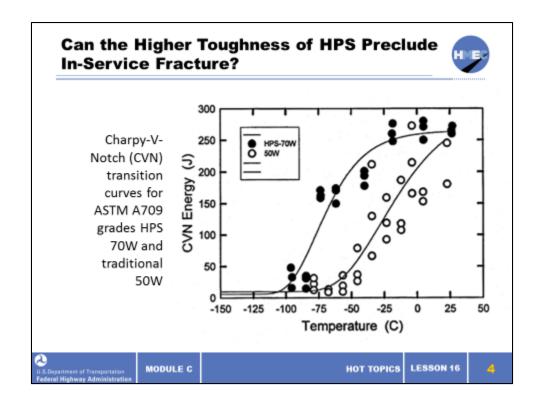


LESSON 16

HOT TOPICS

- The AASHTO toughness requirements for fracture-critical members (FCMs) and non-FCMs of Lesson 2 are based upon decades old studies
- The levels of toughness economically available were limited by the steelmaking processes
- With the development of high-performance steels (HPSs) introduced in Lesson 1, higher levels of toughness are economically available
- Several studies are underway to assess whether the FCM requirements other than those related to material toughness (in other words, design, fabrication, and in-service requirements) can be relaxed if higher levels of toughness are required
- If these projected higher material toughnesses can be reliably achieved, the other FCM requirements (the most onerous of which is biennial inservice, hands-on inspection) can be relaxed or eliminated

MODULE C



Construction-Grade Stainless Steels



- Traditional stainless steels have not proven cost-effective for bridge construction
- ASTM A1010, a 12% chromium, 50-ksi grade, is being introduced into the bridge-construction market
- · Four bridges of A1010 steel are in service (CA, PA, and two in OR)

110-ft. span Oregon DOT Highway 138 over Dodge Creek Bridge

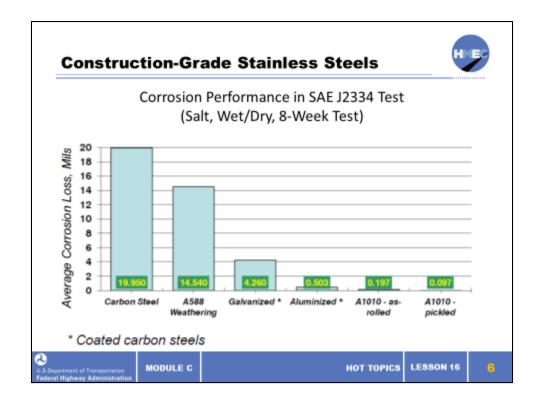


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Zinc-Rich Primers - The Great Debate!



Inorganic Zinc (IOZ)

- · Zinc with ethyl silicate binder
- · Typically greater zinc loading than OZ ·
- Zinc-to-zinc and zinc-to-steel contact
 greater than OZ
- Very common for shop use (new steel); field use rare
- Requires skilled applicators
- · Class B Slip coefficient common
- More difficult to apply and topcoat than OZ

MODULE C

Organic Zinc (OZ)

- Zinc in an epoxy or urethane binder
- Lower zinc loading than IOZ
- Zinc-to-zinc and zinc-to-steel contact somewhat insulated by the binder
- Common for field use (existing steel); becoming more common for shop painting
- Requires skilled applicators
- Class B slip coefficient possible, not as common as IOZ (Class A common)
- · Easier to apply and topcoat than IOZ

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Zinc-Rich Primers - The Great Debate!



- Some States are moving away from the exclusive use of IOZ in shops when the intermediate and/or finish will also be shop-applied
 - Low humidity for IOZ can cause extended recoat times that aren't conducive to production schedules, leading to insufficient cure prior to overcoating and excessive handling and erection damage in the field, if not extensive peeling
 - Drying and curing are different
 - Dry spray and mudcracking are common application defects with IOZ
 - Outgassing when overcoating IOZ is common unless mist coat is properly applied
- "Lesser" galvanic protection is viewed as an acceptable tradeoff for the forgiveness during application offered by OZ
- Slip coefficient class may limit OZ choices





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High Solids and Edge Retentive Coatings High solids" is marketing and technical terminology Typically in the range of 65–90% solids by volume (bridge coatings) Driven in part by VOC regulations Higher film builds allows for two-coat systems with the cumulative thickness of three coats Lower shrinkage during cure promotes edge retention SSPC-PA Guide 11 Protecting Edges, Crevices and Irregular Steel Surfaced by Stripe Coating JUESTICATE BOOM edge retention Assessing edge retention MODULE C HOT TOPICS LESSON 16

Polysiloxane Coatings



- · Hybrids of inorganic and organic chemistries, typically 90% solids content
- · If formulated with an epoxy backbone, produce a very hard film
- · Exhibit excellent exterior durability
 - Increased long-term color and gloss stability, abrasion resistance
 - Corrosion and chemical resistance
- · High solids characteristic can eliminate need for mid-coats

Wailua Cane Haul Bridge in Kauai, Hawaii





Roosevelt Island Bridge in New York City

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Polyaspartic Coatings



- · Formulated with aliphatic isocyanate and polyaspartate
- · Qualities include color and gloss stability, fast cure, and long pot life
- · Very low VOC (approaching 100% solids), yet low viscosity
- Humidity acts as a catalyst in the curing reaction
- · High build: 6-9 mils DFT in a single coat
- Can be the topcoat of a two-coat system



Polyaspartic topcoat on I-84 overpass in Danbury, CT



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Fluorourethane Coatings



- · Fluorinated polymer provides excellent color and gloss retention
 - Outperforms polyurethane, polysiloxane, and polyaspartic finishes
- · Non-reactive with solar radiation (ultraviolet light from the sun)
- Material costs may limit use to smaller structures (e.g., pedestrian bridges or overpasses)
- Eliminates need for clear coat (labor and material savings)
- Advantageous when use of darker colors (e.g., red, royal blue) is desirable



Topeka Boulevard Bridge Topeka, Kansas

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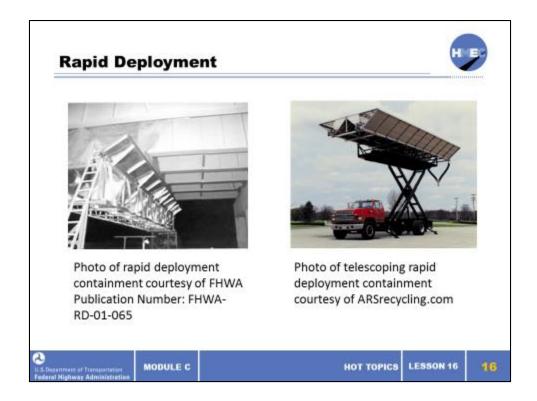
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 New technology—not yet adopted by the bridge industry 	
 Part of the family of "smart coatings" 	0.38rm
 Use of carbon nanotubes (or others) in coating formulations 	1-2 nm 2-25 res
 Properties enhanced include: Scratch resistance Hydrophobicity Anti-graffiti Corrosion resistance 	Coated Not coated

Rapid Deployment



- Use of mobile blast cleaning equipment and containment to completely enclose the area to be cleaned and coated
- Suitable for low-rise overpass bridges located in high-traffic areas that cannot be shut down for long periods of time
- · Typically involves a fast-cure, two-coat system
- Contractor mobilizes, prepares, and applies two coats in an overnight shift, then demobilizes by morning, minimizing the impact on the traveling public
- Cost savings include a reduction in contractor labor hours and a single lane-only closure
- Concept first adopted by Pennsylvania DOT in 1998 and Ohio DOT in 1999
- · Popular among multiple DOTs today



You are now able to:		
Explore current an affect steel and co	d emerging technology and trends t ating systems	hat
