Beam End Treatments for Steel Bridges

Bobby Meade
Sudhir Palle
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Problems at Beam Ends

- Debris build-up
  - Attracts/retains moisture
- Leaking joints
  - Deck run-off falls onto beam ends, bearings, etc.
    - Extended time of wetness
    - Exposure to deicing salts
- Results
  - Localized premature coating failures
  - Significant corrosion
  - Loss of section on steel members
Typical Beam End Issues
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Potential Beam End Treatments

- Cleaning of affected areas
  - Debris removal
  - Washing
- Surface preparation and coatings application
  - Rough/pitted steel and high chloride levels
    - Minimizes chances of success with barrier and inhibitive coatings
  - Blast/power tool cleaning and zinc coatings are somewhat effective
    - Expensive
    - Worker safety & environmental issues (lead coatings)
- Other options?
Desirable Characteristics of Beam End Treatments

- Effective beam end treatments
  - A 5-year service life (min.)
  - Applied with minimal surface preparation
  - Tolerant of rough surfaces/residual chlorides
- Application by state forces
  - Limited worker safety & environmental issues
  - No specialized skill requirements (painters)
  - Basic tools
Project Treatment Options

- KTC looked “outside the box” for solutions
  - Super barriers
    - Tapes (4 tested)
    - Adhesive sheets (3 tested)
    - Greases (2 tested)
  - Non traditional liquid-applied coatings (2 tested)
Coatings Field Application
I-64/75 Over US 68
March 2013
Steel Condition
Steel Coating Condition

1,200 psi

15 – 20 microgram/cm²
Surface Preparation
Surface Preparation
Surface Preparation
Surface Preparation
Surface Preparation
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Products Applied to Steel
Follow-on Evaluations
October 2015/September 2016

Aerospace Sealant
Paint
Grease
Follow-on Evaluations
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Aerospace Sealant
Paint

Grease

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Follow-on Evaluation
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Grease
Follow-on Evaluation
October 2015/September 2016

Gypsum/Caster Oil
Paint
Follow-on Evaluation
October 2015/September 2016

Gypsum/Caster Oil
Paint

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Aluminum Foil
Sheet
Aluminum Foil Sheet
Follow-on Evaluation
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Polyvinyl Fluoride Tape
Follow-on Evaluation
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Polyurethane Sheet

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Petrolatum/Siliceous Tape
Follow-on Evaluation
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Petrolatum/Siliceous Tape
Polymer Compound Tape
Follow-on Evaluation
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Aluminum Foil
Tape
Conclusions

- Effective beam end treatment materials have been identified
- They can be applied with low-tech surface preparation
- They can protect steel in a challenging environment
- The remaining issue will be their durability
Content from Two Research Studies

- KTC-16-03/SPR12-433-1F
  Thin Film Concrete Coatings

- KTC-16-08/SPR14-484-1F
  Chloride Contamination Remediation
  On Steel Bridges
Thank You!

Bobby Meade
bobby.meade@uky.edu
502-517-1257

- Bobby.meade@uky.edu
- Sudhir.palle@uky.edu
- Ted.hopwood@uky.edu