INDOT High Friction Surface Treatment
Special Provision

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Presentation Overview

- Background on High Friction Surface Treatments
- Special Provision
  - Polymeric Resin Binder
  - Calcined Bauxite Aggregate
  - Steel Slag Aggregate
  - Installation Requirements
- Conclusion & Questions
HFST Special Provision

**Background**

- High Friction Surface Treatments (HFST)
  - Consist of a high friction aggregate (primarily calcined bauxite) set in a polymer resin binder.
  - HFST was first developed in Europe in 1960’s
  - Currently HFST has been installed in over 43 states.

Source: Missouri Department of Transportation
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HFST Projects Across the U.S.

- **Blue**: No sites
- **Light Blue**: At least one site
- **Orange**: Multiple sites (5+)
- **Dark Red**: Aggressive sites
- **Red**: Aggressive sites
- **Black Star**: National Demo Project

[Map of the United States showing HFST projects across the U.S.]
HFST Special Provision

Background (Cont’d)

HFST Purpose

- Can reduce stopping distances by 40%
- Negotiating a sharp curve is much easier with a high friction road surface.

Source: Kentucky Transportation Cabinet
HFST Special Provision

Background (Cont’d)

- Applications for HFST
  - Horizontal Curves
  - High Volume Intersections
  - Interchange Ramps
  - Any location where stopping distances are an issue.

Source: Missouri Department of Transportation
Background (Cont’d)

HFST Project Expectations
- Service Life ~ 10 years
- Cost ~ $30 /syd
- Crash Modification Factor ~ 0.52
  (Some locations have a higher level of crash reductions)
Background (Cont’d)

HFST Aggregate:

- Research indicates that calcined bauxite is the most effective high friction aggregate.
- However, calcined bauxite is not mined commercially in the U.S.
- Other aggregates such as taconite, granite, steel slag, flint, emery, and basalt have been tried but have not been found to be as durable or effective.
- There is a JTRP research project underway (SPR-3832) which is comparing the durability of steel slag from electric arc and oxygenated blast furnaces.
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Polymeric Resin Binder

- Cure rate (dry through time) = 3 hrs max.
- Gel time for concrete surfaces = 10 minutes
- Ultimate tensile strength = 1,500 to 5,000 psi
- Mixing ratio per manufacturer (must be provided to INDOT at least 14 days before installation.)

Source: Kwikbond Polymers
Special Provision (Cont’d)

- Calcined Bauxite Aggregate
  - Aluminum oxide content = 87% min.
  - Gradation = 100% of aggregate is smaller than 4.75 mm and 95% of the aggregate is bigger than 3.35 mm
  - Hardness (Mohs Scale) = 8 min.
Steel Slag Aggregate
- Aluminum oxide content = 5% min.
- Gradation = 100% of aggregate is smaller than 4.75 mm and 95% of the aggregate is bigger than 1.18 mm
- Hardness (Moh’s Scale) = 7 min.
- The steel slag must be weathered for at least one year.
Special Provision (Cont’d)

Installation Requirements

- Contractor must use a truck mounted application machine.
- Polymeric resin binder minimum thickness = 50 mils
- Aggregate from a drop spreader at 11 lb/sys (min.)
- Minimum continuous application rate of 2300 sys/hr

Source: Dbi Services
Special Provision (Cont’d)

Surface Preparation & Weather Restrictions

- Surface must be clean with PCCP surfaces being cleaned by shot blasting and HMA surfaces cleaned with an air wash of compressed air.
- New pavement or crack sealing or PCCP/HMA patches must be applied at least 30 days before HFST installation.
- Application temperature range: 60°F to 105°F
- No rain forecast during application or curing
Clean-up and Acceptance

- Initial clean-up before opening to traffic.
- Second clean-up 3 to 5 days after installation.
- Field testing by INDOT
  - Mean profile depth of 1 inch min.
  - Dynamic friction > 0.90
- Any failing sections must be removed and replaced
Questions?

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