HIGH FRICTION SURFACE TREATMENT - LESSONS LEARNED

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NJ DOT High Friction Surface Treatment Update

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NJ DOT HIGH FRIC TIO N SURFAC E TREAT MENT (HFST)

- WHAT IS HFST?
- LESSON LEARNED & C HALLENG ES
What is High Friction Surface Treatment (HFST)?

- HFST is a safety countermeasure
- polish-resistant calcined bauxite aggregate (grit)
- bonded to the pavement surface using a polymer resin binder (glue)
Why do we need HFST?

- Targeted Solution to Roadway Departure Crash Reduction - curve location only
- Friction Crashes
- Distracted Driving? - HFST does not need to communicate with the driver to work
- Speeding? - HFST does not enhance driver comfort or promote higher speeds
- It’s a Proven, Effective Solution.
Textures that affects friction

Microtexture

Amplitude 0.001-0.5 mm

Macrotexture

Wavelength 0.5-50 mm
Amplitude 0.01-20 mm
NJ DOT SPEC. Surface Quality
Skid Resistance Acceptance

- RE performs visual inspection of HFST
- RE can reject HFST based on visual assessment and require corrective action
- If RE visually approves HFST, then NJ DOT Pavement Management performs Skid Resistance Testing using ASTM Test Method E 274 for Initial Acceptance
  - Average Minimum SN ≥ 65
HFST Quality Acceptance Skid Test Video
HFST Limitations

- Are NOT designed as:
  - Pavement preservation methods
  - Pavement repair methods
  - Bridge deck overlays
  - Educational or driver alert systems (not rumble strips)
  - Only wet weather systems

- HFSTs ARE: Designed to act mostly invisibly, under all times of the day or night, in all weather conditions to dramatically enhance the friction and reduce or eliminate roadway departure crashes.
Where to Install HFST?

- Horizontal Curves
- Intersections
- On and Off Ramps—especially with elevation change (loop ramps)
- Steep Grades
- Line of Sight problem locations
- High Speed connectors/Merge locations
- Where there are high crash clusters, roadway departures or poor roadway friction conditions
HFST Pilot Program Start

2016 Lane Departure Serious Injuries and Fatalities in New Jersey

- Safety Programs and NJ FHWA requested Pavement Design assistance for HFST Specification
- Goal: Reduce Roadway Departures on Horizontal Curves
  - 336 Fatalities
  - 517 Serious Injuries
- Need NJ DOT Spec. for HFST
- Other products being used as HFST by Locals
- Pavement Design provided Safety Programs HFST Specification in March 2016
FOLLOW NJ DOT HFST GUIDELINES

- **Good Pavement**
  - Newer pavement with adequate Remaining Service Life
  - Distress free or repair/resurface
  - Smooth
  - Structurally adequate
  - Quality material
Apply HFST ONLY on GOOD Pavement
FOLLOW NJ DOT SPECIFICATION

- MATERIALS
- EQUIPMENT
- EXPERIENCE
- WEATHER LIMITATIONS
- CONSTRUCTION REQUIREMENTS
- QUALITY ASSURANCE
- MAINTENANCE BOND (3 YEARS)
TRUCK MOUNTED HFST APPLICATION EQUIPMENT VS. MANUAL APPLICATION
Manual HFST Placement or Mechanically Assisted Installation = Premature Failure
Automated Equipment Installation = Best Opportunity for Success

Automated Equipment = Binder + Aggregate placed by machine without manual spreading or leveling
Pavement Condition Matters
Pavement Condition Matters
HFST Failure Forensic Investigation - Conclusions

- Asphalt pavement was significantly aged or contained high amounts of RAP when placed in 2014
- Areas within the project showed excessive amounts of epoxy binder thickness and high variability of thickness
- Combination of poor asphalt and excessive epoxy binder caused accelerated delamination failures in the asphalt substrate
Products Advertised as HFST, but Not HFST = Inadequate Skid Resistance

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Products Advertised as HFST

NOT HFST (as per NJDOT specification)
Route 68 High Friction Chip Seal (HFCS) Case Study
Route 68 High Friction Chip Seal (HFCS) Case Study

- What if we tried high friction aggregate with a highly modified asphalt binder?
  - Stellarflex PG 82-22 FR
    - True Grade PG 88-22
    - 7.5% Polymer

- Try some other aggregates? Locally sourced
  - TRI Diabase (NJ)
  - Calcined Bauxite (Great Lakes Minerals)
  - Flint Rock (Oklahoma)
Route 68 High Friction Chip Seal (HFCS) Case Study

PG 82-22 FR Binder Appl.  Aggregate Spreading
High Friction Chip Seal Installation Video
LESSONS LEARNED

- Automated equipment matters - properly functioning and calibrated
  - Consistent binder thickness

- Make sure pavement condition is GOOD!
  - Visual condition assessment NOT ADEQUATE!

- Not all products advertised as HFST meet NJ DOT specification or FHWA/AASHTO requirements

- Experience and workmanship matters

- NJ DOT still in the pilot phase with HFST

- Researching HFCS. Stay Tuned!
Challenges – Aggressive Snow Operations
Challenges – Aggressive Snow Operations + Improper HFST Equipment
Challenges – Maintenance Bond Enforcement

Stay Tuned!
Questions?

High Friction Surface Treatment Can Save Lives!

- When done properly
- In appropriate locations

Thank you!
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