SAVE LIVES:
HIGH FRICTION SURFACE TREATMENTS
Marquette Interchange Wisconsin
Marquette Interchange West to North Ramp Crashes Before & After High Friction Surface Treatment (HFST)

- **219 Crashes** before HFST applied from 11/08 to 8/11 (2 years, 10 months).
- **9 Crashes** after HFST applied from 10/11 to 8/14 (2 years, 11 months).

**TOTALS**
- Before HFST: 2 years, 10 months - 219 crashes
- After HFST: 2 years, 11 months - 9 crashes
Kentucky HFST Program

(As of 6/22/2015)

Crash Reduction %

<table>
<thead>
<tr>
<th>Annual</th>
<th>ALL</th>
<th>RAMPS</th>
<th>CURVES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Avg.</td>
<td>90%</td>
<td>90%</td>
<td>84%</td>
</tr>
<tr>
<td>Dry Avg.</td>
<td>77%</td>
<td>78%</td>
<td>80%</td>
</tr>
<tr>
<td>Total Avg.</td>
<td>87%</td>
<td>95%</td>
<td>87%</td>
</tr>
</tbody>
</table>
Where to Use HFST:

- Wet weather crash locations
- Curves
- Intersections
- Ramps

Generally applied in short sections to improve spot locations where friction demand is critical.
What is a HFST?

- Extremely polish resistant aggregate
  - Calcined Bauxite
- Polymer Binder with high shear resistance
  - 2 part epoxy
  - Polyester
  - Acrylic

www.atssa.com/Resources/HighFrictionSurfacing/StateSpecifications.aspx
Epoxy Binder Materials

Thin layer that allows for 50% aggregate embedment
HFST Aggregate

Calcined Bauxite
Why Calcined Bauxite?

In-place friction characteristics:

- 65 FN40R
- AASHTO T 242

Some States are using values greater than 65
Reclaim Excess Aggregate
Semi-Automated Installation
HFST Finished Surface
Application Concept for Enhance Friction Surface Treatment

Product to meet the minimum friction demand when $FD = FC$
FHWA Sponsored Evaluation Sections:
NCAT West Curve Epoxy HFST Sections
Asphalt Based Enhanced Friction Treatment

Enhanced Friction micro slurry at NCAT Test Track
Enhanced Friction Micro Slurry

- **Agg Coarse Fraction (+#4)**
  - 50% Limestone / 50% Calcined Bauxite

- **Agg. Fine Fraction (- #4)**
  - Limestone Screenings

- **Binder**
  - Highly Polymer Modified Emulsion
  - Shear resistance
Friction Lifespan

- HFST Bauxite Epoxy
- Reapplied
- HFST Bauxite Epoxy

Conventional Aggregate(s) Epoxy

Conventional Dense Graded Asphalt
# Friction Engineering Toolbox

<table>
<thead>
<tr>
<th>Technology</th>
<th>Pavement Preservation Life</th>
<th>Application</th>
<th>Cost (Estimate)</th>
<th>Friction Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epoxy HFST</td>
<td>N/A</td>
<td>Spot treatment</td>
<td>$20-$30/sy</td>
<td>Very High</td>
</tr>
<tr>
<td>Asphalt Based Enhanced Friction Surface Treatment</td>
<td>5-10 yrs (est)</td>
<td>Spot treatment or Total length of Roadway</td>
<td>$5-$10/sy</td>
<td>High</td>
</tr>
<tr>
<td>High Friction Thin Lay</td>
<td>10-15 yrs (est)</td>
<td>Total Length of Roadway</td>
<td>$3-$5/sy</td>
<td>Medium</td>
</tr>
</tbody>
</table>

Figures in this table are for illustrative purposes
State DOT HFST Status

(* Active implementation as of 9/1/2016)

- No curves
- One curve
- 2 – 10 curves
- 11 – 50 curves
- 51 – 100 curves
- Over 100 curves

Map showing the distribution of curves across different states, with stars indicating active implementation.
Questions?

• www.fhwa.dot.gov/innovation/everydaycounts
• www.atssa.com

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