Longitudinal Joint Seal Development & Implementation

Ohio Asphalt Paving Conference

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Illinois Dept. of Transportation
HMA Quiz

1. What is the leading HMA distress driving pavement rehabilitation in Illinois?
   a. Loss of Friction
   b. Wheel Path Rutting
   c. Raveling
   d. Premature Cracking
   e. Raveling & Cracking at the Centerline Joint
What is the leading HMA distress driving pavement rehabilitation?

a. Loss of Friction
b. Wheel Path Rutting
c. Raveling
d. Premature Cracking
e. Raveling & Cracking at the Centerline Joint
Why the Poor Performance?
Effect of In-Place Voids on Life
Washington State DOT Study

Percent Service Life

Compaction Level

93% 92% 91% 90% 89%
How many years?
How many years?
Maintenance - Disruptive and Dangerous
2001/2002 Longitudinal Joint Sealants

- IDOT worked w/ 2 companies to Develop a Longitudinal Joint Sealant (LJS)
- LJS is a Band of Asphalt Binder that Seals a lift of HMA from the Bottom Up.
- Here is How it Works:
Band melts up into the joint thus:

- Increasing density
- Decreasing permeability
- Increasing joint life

Joint Sealant

Unconfined

18 inches

Joint Sealant
Asphalt Materials/Hendy Quickseam
Longitudinal Joint Seal
Longitudinal Joint Seal 12 Yrs Later
Longitudinal Joint Seal 12 Yrs Later
Heavy Duty Pressure Distributor for Applying LJS
Heavy Duty Pressure Distributor for Applying LJS
Five Minutes After Placement
Paving over LJS
Licensed Subcontractor ≈ 11 Trucks
<table>
<thead>
<tr>
<th>Test</th>
<th>Test Requirement</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dynamic shear @ 88°C (unaged), G*/sin δ, kPa</td>
<td>1.00 min.</td>
<td>AASHTO T 315</td>
</tr>
<tr>
<td>Creep stiffness @ -18°C (unaged), Stiffness (S), MPa m-value</td>
<td>300 max. 0.300 min.</td>
<td>AASHTO T 313</td>
</tr>
<tr>
<td>Ash, %</td>
<td>1.0 - 4.0</td>
<td>AASHTO T 111</td>
</tr>
<tr>
<td>Elastic Recovery, 100 mm elongation, cut immediately, 25°C, %</td>
<td>65min.</td>
<td>ASTM D 6084 (Procedure A)</td>
</tr>
<tr>
<td>Separation of Polymer, Difference in °C of the softening point (ring and ball)</td>
<td>3 max.</td>
<td>ITP Separation of Polymer from Asphalt Binder”</td>
</tr>
</tbody>
</table>
Longitudinal Joint Spec

Implementation Goals:

- 2016 – 2 Projects per District
- 2017 – 50% of Projects per District
- 2018 – Full Implementation
2016 - LJS Projects

- Total of 20-plus projects statewide
- Average awarded cost $2.17 / lineal ft
- Observations:
  - Some minimal sporadic flushed spots < 25 feet in 10 plus miles (not a hindrance & shows migration is occurring)
  - Shear tear will occur if required tack not in place
  - Pressure Distributor Operators getting better
  - Adjustable Guide Chain on Distributor Beneficial
  - Mix will pull up over unbonded scabs
Cost Comparison

- **Inlay:** $8.00 / lineal ft
  - Includes: traffic control, mobilization, milling, priming, paving, pavement marking
Microsurfacing: $4.81 / lineal ft
- Includes: crack seal, traffic control, pavement marking/removal
Cost Comparison

- Route and Seal: $2.00 / lineal ft
  - Includes: crack seal, traffic control
Cost Comparison

- Longitudinal Joint Seal: $2.00 lineal ft
**LJS - Life Cycle Cost Analysis**

**Two Lane Road**

<table>
<thead>
<tr>
<th>Additional Service Life (Years)</th>
<th>Breakeven LJS Unit Price</th>
<th>Ave. Awarded LJS Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$6.51</td>
<td>$4.00</td>
</tr>
<tr>
<td>2</td>
<td>$6.84</td>
<td>$6.00</td>
</tr>
<tr>
<td>3</td>
<td>$7.64</td>
<td>$8.00</td>
</tr>
<tr>
<td>4</td>
<td>$8.83</td>
<td>$10.00</td>
</tr>
<tr>
<td>5</td>
<td>$10.26</td>
<td></td>
</tr>
</tbody>
</table>
Also Works as a Tack Coat
The width and minimum application rate shall be according to the following table:

<table>
<thead>
<tr>
<th>Overlay Thickness in. (mm)</th>
<th>LJS Width “W” in. (mm)</th>
<th>Application Rate (^1) lb/ft (kg/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/4 (19)</td>
<td>18 (450)</td>
<td>0.88 (1.31)</td>
</tr>
<tr>
<td>1 (25)</td>
<td>18 (450)</td>
<td>1.15 (1.71)</td>
</tr>
<tr>
<td>1 1/4 (32)</td>
<td>18 (450)</td>
<td>1.31 (1.95)</td>
</tr>
<tr>
<td>1 1/2 (38)</td>
<td>18 (450)</td>
<td>1.47 (2.19)</td>
</tr>
<tr>
<td>1 3/4 (44)</td>
<td>18 (450)</td>
<td>1.63 (2.43)</td>
</tr>
<tr>
<td>2 (50)</td>
<td>18 (450)</td>
<td>1.80 (2.68)</td>
</tr>
<tr>
<td>2 1/4 (60)</td>
<td>18 (450)</td>
<td>1.96 (2.92)</td>
</tr>
<tr>
<td>2 1/2 (63)</td>
<td>18 (450)</td>
<td>2.12 (3.16)</td>
</tr>
<tr>
<td>2 3/4 (70)</td>
<td>18 (450)</td>
<td>2.29 (3.41)</td>
</tr>
<tr>
<td>3 (75)</td>
<td>18 (450)</td>
<td>2.45 (3.65)</td>
</tr>
<tr>
<td>3 1/4 (83)</td>
<td>18 (450)</td>
<td>2.61 (3.89)</td>
</tr>
<tr>
<td>3 1/2 (90)</td>
<td>18 (450)</td>
<td>2.78 (4.14)</td>
</tr>
<tr>
<td>3 3/4 (95)</td>
<td>18 (450)</td>
<td>2.94 (4.38)</td>
</tr>
<tr>
<td>4 (100)</td>
<td>18 (450)</td>
<td>3.10 (4.62)</td>
</tr>
</tbody>
</table>

HMA Mixtures \(^2\)
Implementation Goals:

- 2016 – 2 Projects per District
- 2017 – 50% of Projects per District
- 2018 – Full Implementation
Thank You