In-Place Recycling & Reclaiming Seminar with LIVE Demonstration
June 27-28, 2017

Champion Hosts:

ARRA
Responsible Renewal. Reliable Results.
Pavement Preservation: Make the Most of Your New Road

Thomas J. Wood
Twood@wsbeng.com
612/419/4013
WSB & Associates Inc.
Topics

• Crack Sealing
• Chip Sealing
• Fog Sealing
• Micro Surfacing
• Other stuff
Why you need to crack seal!
Why Crack Treatment?

- Prevents water intrusion into subbase
- Prevents incompressible intrusion
- Improves ride quality smoothness
- Slows down pavement deterioration
- COST-EFFECTIVE
Why You Should Treat Cracks

• Protect your largest investment
• Pavement failure imminent
• Crack treatments are cost-effective, up to 9 years of (75% effectiveness) performance
• Extends pavement life
What cracks to treat?

• All cracks soon after they appear… any crack opening will allow moisture penetration into pavement foundation (subbase)
  • At minimum all cracks ≥1/8”

• Rout and Seal

• Clean and Fill
How to Seal Cracks

• Rout & Seal use on newer pavements with transverse crack spacing greater than 20’
• Clean & Seal older pavements and longitudinal cracks
Don’t forget edge joints
Use the Proper PG Binder
Chip Sealing
Chip Sealing

- It is a heavy asphalt membrane followed with layer of aggregate chips
- **Strengths**
  - Very tough
  - Fast
  - Improves friction characteristics
  - Long lasting
Chip Sealing

• Weakness
  • Vehicle damage
  • Damage from turning traffic
  • Too rough
  • Does not fix structural issues
  • Does not improve ride
Chip Sealing

• How to do it right
  • Design it
  • Use quality Materials
    • Clean Aggregate
    • No extra Aggregate
    • Polymer modified emulsion
Chip Sealing

- Construction Practices
  - Place Aggregate immediately
  - Rolling
    - < 2 minutes
    - Minimum 3 passes
    - Minimum 3 rollers
    - Sweep ASAP
When to Apply Chip Seal

• Built aging study
  • Because 15 years take 15 years

• 3 inch Mill & Fill 1999
  • PG 58-28 binder
  • Chip seal 1 mile section each year starting in 2000
  • Last sections was chip seal 2004
TH56 Cores

- Cores
  - Remove chip seal (if any)
  - Cut into two 25-mm layers
  - Test for fracture energy (cracking potential)
  - Recover component asphalt to check aging
Disk-Shaped Compact Tension Test: DC(T)
DC(T) Results: TH-56

Higher fracture energy is better
Asphalt Institute’s Findings

• Sealing improves resistance to aging (cracking)
• Sooner is better when sealing
  • Waiting for 3 or more years to seal after construction produced similar results as unsealed pavement related to DCT
  • Sealing after 1 or 2 years showed improvement in resistance to aging (cracking)
Surface Rating

CRACK REPAIR DONE

TRIGGER VALUE FOR OVERLAY
Control Section Never Chip Sealed
Last Section Chip Sealed 2004
Fog Sealing
Fog Sealing

- Light uniform application asphalt emulsion
- Materials
  - Css-1h diluted
    - Diluted one part water to one part emulsion
    - 29% residual asphalt
    - Better penetration
Fog Sealing

• Strengths
  • Easy
  • Minimum equipment
  • Great job water proofing surface
  • Fill pop outs and micro cracks
  • Protects HMA from
    • UV, oxidation, & de-ice chemicals
Why Fog Sealing Shoulders

Fog Seal applied 2001
Fog Sealing still working after 4 years
Micro Surfacing
What is Micro/Slurry

- Homogenous mixture of aggregate and asphalt emulsion
  - Like a Dairy Queen Blizzard
- Slurry cure by air drying
  - Top down
- Micro Surfacing chemical cure
  - Will cure and set at night
What is Micro/Slurry

- Used for Surface treatments
- Rut filling
- Ride improvement
- Improve Friction
- Used both on concrete and HMA
Project Selection

- Structurally sound
- Small potholes ok
- Raveling ok
- Flushing ok
- Aged and oxidized ok
- Slurry should only be used for surface treatment
  - One layer thick
Project Selection

- Micro
- Surface treatment
- Developed by Germans in the late 70’ies
- Rut filling
  - Up to 1 ½ inches in one pass
- Restore Cross Section
- More durable then slurry
Good Candidate
Possible Candidate for Micro
NOT a Good Candidate for Micro
Micro Milling with PM Treatments
Micro Milling with Chip Seal or Micro Surfacing

• Why?
  • Need lower cost alternative to 1 ½ inch over lay
  • To improve ride

• What are the performance targets
  • Equal to 1½ inch over lay
Micro Milling with Chip Seal or Micro Surfacing

- Quicker than overlay
- Less costly overlay
  - Chip seal 40% of the cost of 1 ½ inch overlay
  - Micro Surfacing 60% cost of 1 ½ inch overlay
Results for Chip Seal

Southbound RWP TH89 RP 60-74 Micro Mill / Chipseal

<table>
<thead>
<tr>
<th></th>
<th>IRI (in/mile)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before Micro Mill (2013)</td>
<td>90</td>
</tr>
<tr>
<td>After Micro Mill (2013)</td>
<td>65</td>
</tr>
<tr>
<td>After Chip Seal (2013)</td>
<td>55</td>
</tr>
<tr>
<td>After 1 year (2014)</td>
<td>55</td>
</tr>
<tr>
<td>After 2 year (2015)</td>
<td>60</td>
</tr>
</tbody>
</table>
SB TH 64 Average of Both Wheel Paths
Current Condition
Micro Surfacing Research
Micro Surfacing Research

• Issues
  • Reflective cracking
  • Snow plow chatter
  • Wear off in 5 to 7 years on high ADT roadways
Hypothesis

• Softer asphalt should reduce cracking
• CQS-1h 40 to 90 pen or PG 64-22 normally used
• Used softer base Asphalts
  • 90 to 200 pen (PG 58-28) CQS-1
  • 200 to 300 pen (PG 49-34) CQS-1S
Hypothesis
• More asphalt = increased durability
• Increased emulsion from national ave. 12% to as high as 16%
• No bleeding or shoving
Micro Surfacing Research

• Asphalt to Fines ratio
  • .74 A to 1.0 F Normal
  • .87 A to 1.0 F 14% emulsion
  • .99 A to 1.0 F 16% emulsion

• HMA normally has asphalt to fines ratio of 1 to 1
• Looks more like HMA than Micro
### Stabilized Full Depth Reclamation

<table>
<thead>
<tr>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>1&quot; TBWC 2&quot; 64-34</td>
<td>1&quot; TBWC 2&quot; 64-34</td>
<td>1&quot; 64-34 2&quot; 64-34</td>
</tr>
<tr>
<td>6&quot; FDR + EE</td>
<td>6&quot; FDR + EE</td>
<td>8&quot; FDR + EE</td>
</tr>
<tr>
<td>6&quot; FDR</td>
<td>2&quot; FDR</td>
<td>9&quot; FDR + Fly Ash</td>
</tr>
<tr>
<td>26&quot; Class 4</td>
<td>33&quot; Class 3</td>
<td>Clay</td>
</tr>
<tr>
<td>Clay</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*07/14/2008*
IRI M/KM

1 M/KM = 69 in/mi
Transverse Cracking
Rutting

![Graph showing average rutting](image-url)
### MnROAD Mainline WB Lanes

<table>
<thead>
<tr>
<th></th>
<th>Passing</th>
<th>Driving</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Vehicles</td>
<td>29,479,935</td>
<td>28,966,801</td>
<td>58,446,736</td>
</tr>
<tr>
<td>Trucks</td>
<td>1,853,728</td>
<td>6,423,768</td>
<td>8,277,496</td>
</tr>
<tr>
<td>MnROAD AADT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adjusted (1-way)</td>
<td>9,983</td>
<td>9,809</td>
<td>19,792</td>
</tr>
<tr>
<td>HCADT</td>
<td>628</td>
<td>2,775</td>
<td>3,393</td>
</tr>
<tr>
<td>BESALs</td>
<td>1,499,926</td>
<td>5,896,628</td>
<td>7,396,554</td>
</tr>
<tr>
<td>CESALs</td>
<td>2,245,017</td>
<td>6,407,017</td>
<td>11,172,034</td>
</tr>
<tr>
<td>Percent of Total Westbound Traffic</td>
<td></td>
<td></td>
<td>72.2%</td>
</tr>
</tbody>
</table>
Emulsion Stabilized FDR
Modified Double Chip Surface
70 to 90 laps per day at 80K
• Two localized areas of failure easily patched
• 50,000+ ESAL
• Comment from Staff “seem to improve with time and traffic”
My New Role
ISSA Executive Technical Director

- Outreach
- Update Technical Information
- Training
- Support
- Promote Preventive Maintenance
Questions
Thank you

Tom Wood
Pavement Specialist / Executive Technical Director
WSB & Associates' 
Twood@wsbeng.com
612/419/4013