When to Apply a Chip Seal
TH 56  Aging Test Site
What was Done & Why

• Built aging study
  • Because 15 years take 15 years
  • 3” Mill & Overlay 1999
  • Chip seal 1 mile on each section a year starting in 2000
    • Last sections was chip seal 2004

• Wanted to see what effect PM has on aging
• When is best time
Mill & Overlay

• 3” mill and overlay 1999
• PG 58-28 binder
• Cored in 2011 for Asphalt Institute study
## TH56 Test Sections
### Mill & Overlay

### MINNESOTA TH 56 SITE LAYOUT

<table>
<thead>
<tr>
<th></th>
<th>14 TO 15</th>
<th>13 TO 14</th>
<th>12 TO 13</th>
<th>11 TO 12</th>
<th>10 TO 11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age when treated</td>
<td>2000</td>
<td>2001</td>
<td>2002</td>
<td>2003</td>
<td>CONTROL</td>
</tr>
<tr>
<td>original construction</td>
<td>1 YEAR</td>
<td>2 YEAR</td>
<td>3 YEAR</td>
<td>4 YEAR</td>
<td>Age when treated</td>
</tr>
</tbody>
</table>

**Original Construction:** 1999
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)
Higher fracture energy is better.
TH56 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)
Ride Data
Control Section
Chip Sealed at Year 5
Fog Sealing
Topics

• What is a Fog Seal
• What are the Benefits of Fog Sealing of a chip seal
• Construction Issues
What is a Fog Seal

- It is a light uniform application of asphalt emulsion
- Normally CSS-1h or SS-1h
- Cationic or Anionic
- Strongly recommend it be diluted
  - Lower viscosity
  - Better penetration
- Application rate between .06 to .20 gallon per square yard diluted
Why Fog Seal Chip Seal?
How does Fog Sealing help limit snowplow damage

- Increased embedment
  - Additional residual asphalt
  - Accelerates curing of pavement because of dark color
- Combination of binders
  - Combination of soft elastomeric asphalt underneath and harder asphalt over top
Other benefits of Fog Sealing Chip Seals

• Locks down marginally embedded chips
• Makes pavement marking more visibly
  • Reduces amount of paint needed
• Customer perceives surface treatment as a new HMA overlay not a chip seal
Construction Issues

- No rain forecasted for next 3 hours
- Environmental conditions dictates speed of cure
- Proper nozzle size for uniform application
- Properly functioning equipment and qualified operator
- Overlap the centerline at least 1 foot
- Light coat of sand in intersections/high volume areas
NOT THIS!

07/14/2005
What the Traveling Public See!
5 Years Later
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
Why you need to crack seal!
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”
Water intrusion
Incompressible intrusion
Crack sealing treatment

Use:

• In thermal cracks
• Routed reservoirs
• Pavements in good condition - >20’ transverse crack spacing, minor other cracking
• Sealants that are flexible and extensible at lowest temperatures encountered
Type of crack- “thermal [transverse]” (definition)

• Moving cracks formed by temperature related pavement/sub grade movement

• Generally in transverse direction (perpendicular to center line)

• Generally full width of street or road

• Generally >20 foot spacing

• Considered “working” cracks- ≥3mm movement

• Will develop in 2-7 years on most new pavements, 1-3 years on overlaid concrete
Crack type- thermal
Routing

- Rout at least 1/8” from each crack face
- Keep centered over crack
- Reduce spalling by using as many cutters as possible
Rout Size Recommendation

Configuration A: Standard Reservoir-and-Flush
Configuration B: Standard Recessed Band-Aid
Configuration C: Shallow Recessed Band-Aid
Crack filling treatment

Use:

• In longitudinal, block, fatigue and closely spaced transverse cracks (<20’ spacing)
• In wheel paths and high traffic areas
• Stiffer more “traffic resistant” product
• Routed or non-routed reservoirs (use discretion), overband application
• Pavements in fair to poor condition
Crack type- “longitudinal” (definition)

- Can develop in 2-5 years along with thermal cracks
- Occur in longitudinal (parallel to center line) direction
- Caused by thermal movement, construction joints and edge joints
- Considered low movement, “non-working” cracks - < 3mm movement
Crack type- longitudinal
Crack type- fatigue
Not a Candidate for Crack Sealing
Large Cracks???
Polymer modified/aggregate materials
Pick Best Sealant for Climate

Three Step Sealant Selection

1. Determine whether to Crack Seal, Crack Fill or Joint Seal by using the Pavement Evaluation Guide link below.

2. Select your Temperature Model by selecting the "High" and "Low" temperatures in your region using the temperature guide maps below.

3. Cross reference the high and low temperature on the charts below to determine the proper sealant for your application. (Click on your selection)
Cohesive failure:
Adhesive failure:
Installation Choices

- Rout or not
- Size of rout
- Cleaning recess
- Flush
- Overband
Crack Sealants

- Crumb rubber
  - Clean and seal
- Low modulus
  - Clean and seal
  - Rout and seal
- Extra low modulus
  - Rout and seal
  - Transverse cracks only!!!
Basic Needs- all installations

• Clean- most important
• Dry
• Intact pavement
• Proper temperature (pavement 40°F and application of sealant at manufactures recommend temperature)
Cleaning Methods

• Routing - cuts new bonding surface
• Sawing - does same as routing
• Compressed air - sufficient pressure and velocity
• Vacuum - in combination with compressed air
• Heat lance - used to condition pavement
Clean cracks:
Sealant Application - Overband

- Maximum 1/8” thick
- Maximum 3/4” overband on each side of crack
- Overband- best performance (SHRP/FHWA)
Neat application
Recommend Overband Appearance
(Non-Rout/Clean & Fill)
Proper Equipment (basics)

• Oil-jacketed
• Thermostatic heat controls
• Continuous agitation
• Over-heating safety controls
• Right size for operation
• Many commercially versions..........
Asking Water to Jump the Crack
What cracks to treat?
“Don’t forget edge joints”
Summary- Why Crack Treatment?

• Prevents water intrusion into subbase
• Prevents incompressible intrusion
• Improves ride quality smoothness
• Slows down pavement deterioration
• COST-EFFECTIVE
Summary- Crack Treatment Steps

- Pavement evaluation
- Determine if Crack Sealing or Crack Filling treatment is needed
- Determine temperature (high/low extremes)
- Select product
- Proper application
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