Thin, Maintenance Mixes
SM-4.75
VDOT’s Pre-Superpave Subdivision Mix: SM-1

- Fine 9.5 mm mix
- Contains natural sand
- Designed with 50-blow Marshall at 6% air voids
- Typically placed at 1 – 1 ¼ inch
- Restricted from pavements with speed limits in excess of 35 mph
VA Superpave Subdivision Mix

- Called SM-9.0A
- Fine Graded 9.5 mm NMAS
- Designed with 65 gyrations
- Minimum VMA = 16
- Fines to Effective AC\% = 1.3
Thinlay - Three Examples

• Ohio – Item 424, “Smoothseal”
• Missouri – Item 402, Plant Mix Bituminous Surface Level
• Maine – Special Provision Section 401 – Light Capitol Paving
Ohio DOT’s Fine-Graded Polymer Asphalt Concrete (a.k.a. Smoothseal)

- General
  - Developed in the early 1990’s by Ohio’s asphalt paving industry.
  - Non-proprietary Hot Mix Asphalt product capable of being placed in thin lifts
  - Governed by ODOT, Item 424, Fine Graded Polymer Asphalt Concrete
  - For use as a pavement preservation (PM) treatment or long-life pavement applications.
  - Between 2002 and 2007 approx. 228K CY placed
Ohio DOT’s Fine-Graded Polymer Asphalt Concrete (a.k.a. Smoothseal)

- Description of Candidate Projects
  - Pavements suitable for a surface treatment overlay show the following distresses:
    - Dry-looking, “bony” pavements that are porous or permeable
    - Pavements that have begun to ravel
    - Pavements with extensive cracking too fine for crack sealing
    - Pavements with cracking of the surface too extensive for crack sealing alone
    - Pavements where curb reveal does not permit heavy lift thicknesses
What do these mixes look like?

<table>
<thead>
<tr>
<th>Sieve Size, in</th>
<th>Ohio 424</th>
<th>Missouri</th>
<th>Maine</th>
<th>SCDOT</th>
<th>VDOT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
<td>B</td>
<td>402</td>
<td>LCP</td>
<td>“E” Mix</td>
</tr>
<tr>
<td>3/8</td>
<td>100</td>
<td>95-100</td>
<td>100</td>
<td>100</td>
<td>95-100</td>
</tr>
<tr>
<td>4</td>
<td>95-100</td>
<td>85-95</td>
<td>90-100</td>
<td>75-90</td>
<td>90-100</td>
</tr>
<tr>
<td>8</td>
<td>90-100</td>
<td>53-63</td>
<td>70-100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>80-100</td>
<td>37-47</td>
<td>30-60</td>
<td>30-60</td>
<td>30-55</td>
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<tr>
<td>30</td>
<td>60-90</td>
<td>25-35</td>
<td></td>
<td>36-70</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>30-65</td>
<td>9-19</td>
<td>10-30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>10-30</td>
<td></td>
<td>4-28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>200</td>
<td>3-10</td>
<td>3-8</td>
<td>7-12</td>
<td>0-8</td>
<td>2-10</td>
</tr>
<tr>
<td>AC% approx</td>
<td>8.5</td>
<td>6.4</td>
<td>6.4</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Ohio DOT’s Fine-Graded Polymer Asphalt Concrete (a.k.a. Smoothseal)
What are these mixes made of?

- Screenings
- Manufactured sand
- Natural sand
- Fine RAP
- RAS
SC DOT “E” Mix
## Volumetric Properties

### Table 2 - Mix Design and Production Criteria

<table>
<thead>
<tr>
<th>Mix Type</th>
<th>VTM (%) Production (Note 1)</th>
<th>VFA (%) Design</th>
<th>VFA (%) Production (Note 2)</th>
<th>Min. VMA (%)</th>
<th>Fines/Asphalt Ratio (Note 3)</th>
<th>Number of Gyrations</th>
</tr>
</thead>
<tbody>
<tr>
<td>SM-4.75</td>
<td>3.0-6.0</td>
<td>70-75</td>
<td>70-80</td>
<td>16.5</td>
<td>1.0 – 2.0</td>
<td>50</td>
</tr>
</tbody>
</table>

**Note 1:** Asphalt content should be selected at 5.0 percent Air Voids.

**Note 2:** During production of an approved job mix, the VFA shall be controlled within these limits.

**Note 3:** Fines-Asphalt Ratio is based on effective asphalt content.
Recycle

- Ohio – 10% RAP in Type B
- Maine – 20% RAP and RAS, maximum 5% RAS
- Missouri – 20% effective binder replacement
  - Lowered design voids (3.5%); increased VMA (14.5%)
  - 35 blows or 35 gyrations
  - Allow rejuvenators
- VDOT per Table II-14A in Section 211
Before and After
What Can Go Wrong?

Drag

Bridgeing
What Can Go Wrong?
"Turtle Back" Roads

Desired Profile

1" = Low Density

3" = Higher Density

Birdbath (area holds water)

Problem with common practice: Poor compaction/low density where coarse mix is thin.
"Turtle Back" Roads

Desired Profile

Solution: Wedge or scratch with one lift of SM-9.5A, overlay with a second lift.

That’ll work.
Rutted Secondary Roads

Existing Profile

That's no good.
Rutted Secondary Roads

Desired Profile

Common practice Single lift of variable thickness.

That's trouble.
Rutted Secondary Roads

Desired Profile

Problems with common practice:
- Roller "bridges" rut
- Low density mix in rut
- Rut will return quickly

That’s even more trouble.
Ohio DOT’s Fine-Graded Polymer Asphalt Concrete (a.k.a. *Smoothseal*) (2007 prices)

<table>
<thead>
<tr>
<th>Smoothseal Type</th>
<th>$ per CY</th>
<th>$ per SY</th>
<th>Lift Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>$ 124</td>
<td>$ 2.58</td>
<td>3/4 inch</td>
</tr>
<tr>
<td>Conventional HMA</td>
<td>$ 92</td>
<td>$ 3.19</td>
<td>1 1/4 inch</td>
</tr>
<tr>
<td>Conventional HMA</td>
<td>$ 92</td>
<td>$ 3.83</td>
<td>1 1/2 inch</td>
</tr>
</tbody>
</table>

- Maine DOT (2014) pave 90 miles for $3.5 million
Thanks!

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