Pavement Preservation Utilizing Asphalt-Rubber Chip Seal Applications

RPA Workshop
Thursday – July 24, 2008
El Paso Texas
What Does Long Term Performance Mean to You?
What is Asphalt-Rubber Binder?
Asphalt-Rubber Binder is produced by blending and interacting a minimum of 15 percent granulated reclaimed tire rubber along with other additives as required in a specific binder design, with high quality asphalt cement, at elevated temperatures, for a specific amount of time to produce a material that has improved temperature susceptibility, flexibility and is resistant to aging.
The CRM Interaction
Ambient Ground Crumb Rubber Particle Before Interaction
Ambient Ground Crumb Rubber Particle After Interaction
Asphalt-Rubber Binder Design
-Variables-
Binder Properties are Affected By:

- Asphalt Cement
  PG 70-10, 64-16, 58-22, 52-28?
- Percentage of Tire Rubber
- Percentage of High Natural Rubber
- Other Modifiers (If Utilized)
- Reaction Time
- Reaction Temperature
- Type of Blender
- Agitation
### Asphalt-Rubber Binder

#### Physical Properties

<table>
<thead>
<tr>
<th>Climate Type</th>
<th>----</th>
<th>Hot</th>
<th>Moderate</th>
<th>Cold</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apparent Viscosity, 350° F (177° C), Spindle 3 20 RPM, cP (ASTM D2196)</td>
<td>Min</td>
<td>1,500</td>
<td>1,500</td>
<td>1,500</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>4,000</td>
<td>4,000</td>
<td>4,000</td>
</tr>
<tr>
<td>Penetration, 77° F (25° C), 100 g, 5 seconds: 1/10 mm. (ASTM D5)</td>
<td>Min</td>
<td>25</td>
<td>25</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Max</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
<tr>
<td>Penetration, 39.2° F (4° C), 200 g, 60 seconds: 1/10mm. (ASTM D5)</td>
<td>Min</td>
<td>10</td>
<td>15</td>
<td>25</td>
</tr>
<tr>
<td>Softening Point: ° F (° C): (ASTM D36)</td>
<td>Min</td>
<td>135</td>
<td>130</td>
<td>125</td>
</tr>
<tr>
<td>TFOT Residue, Penetration Retention, 39.2° F (4° C): Percent, (ASTM D1754)</td>
<td>Min</td>
<td>75</td>
<td>75</td>
<td>75</td>
</tr>
</tbody>
</table>
Unique Aspects of Asphalt-Rubber Binder Materials

- Wide Range of Performance
- Improved Physical Properties
- Resistance to Aging
- Increased Viscosity
- Flexible Binder Design
What About Other Binder Materials?

- Polymer Modified Emulsion (PME)
- Rejuvenating Emulsions (PASS or Styroflex)
- Rubberized Scrub Seal Binder
- Terminal Blend (PG 70-22 TR or PG 76-22 TR)
- Polymer Modified Asphalt/Binder (PMA or PMB)
- Rubberized Asphalt Binder – Field Blend (RAB)

What Are The Limitations of These Different Binder Materials?
Aggregate Quality
-Variables-
# SAM & SAMI

## Aggregate Gradation Requirements

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Passing</th>
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<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/8 inch (9 mm)</td>
<td>70 - 100</td>
<td>1/2 inch (12 mm)</td>
<td>95 - 100</td>
</tr>
<tr>
<td>1/4 inch (4.75 mm)</td>
<td>0 - 10</td>
<td>3/8 inch (9 mm)</td>
<td>0 – 20</td>
</tr>
<tr>
<td>No. 8 (2.36 mm)</td>
<td>0 - 5</td>
<td>1/4 inch (4.75 mm)</td>
<td>0 – 5</td>
</tr>
<tr>
<td>No. 200 (75µm)</td>
<td>0 - 1</td>
<td>No. 8 (2.36 mm)</td>
<td>0 – 2</td>
</tr>
<tr>
<td>----</td>
<td>----</td>
<td>No. 200 (75 µm)</td>
<td>0 - 1</td>
</tr>
</tbody>
</table>
Other Aggregate Requirements

- 90% has 2 – Mechanically Fractured Faces
- ASTM C131 – 100 Revolutions, 7% loss max
- ASTM C131 – 500 Revolutions, 30% loss max
- Maximum of 8% Flat or Elongated Particles
Asphalt-Rubber Chip Seal (SAM) for Corrective Maintenance
Application -Variables-

Existing Pavement Condition
How much “Patching” do you need to do?
How much “Crack-Sealing” do you need to do?
Is This Right?
You could just “Smear It On”. Let’s try that!
Can you really effectively patch or crack-seal a street in this condition? What is the PCI?
Asphalt-Rubber Blend Site
Viscosity Testing on the Project Site Quality Control – In The Field! (Confirm the Design)
Application
-Variables-

Binder
Application Rate
Asphalt-Rubber Binder Application

(+ .60 Gallons Per Square Yard)
Aggregate Application Rate
(1 Cubic Yard Per 120 Square Yards)?
Rolling is Very Important!
Asphalt-Rubber Physical Properties - Show up “In the Field”
Other Considerations

* PG Asphalt Characterization
* Chip Retention Testing

Result = Chip Seal Design!
Vialit Plate Cleaned and Weighed
Hot Binder is Applied to Vialit Plate
Keep on Pouring!
Keep Pouring! We Need 79 Grams!
Into the Oven to Evenly Disperse Hot Modified Binder
Binder Disbursement Looks Good!
Out of the Oven!
Binder is Ready for Aggregate Placement
Placement of Graded Aggregate Particles onto Binder Sample
A Total of 100 Pieces
Back into the Oven to Seat the Aggregate
Three Different Plates are Conditioned at 5º C, -5º C and -15º C. Then Put on the Rack!
The Steel Ball is Dropped and Aggregate Loss is Measured and Reported
The Final Goal – A Quality in Place Chip Seal!

Questions?