RAP/RAS Team Update

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ADDITIONAL SUPPORT

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Two Main Issues

• How much of the RAS binder becomes effective asphalt binder?
  – Quantity of binder

• How to address the stiffness/brittleness of the RAS binder?
  – Quality of binder
### Existing Approach (PP 78-14)

- **Binder quantity:**
  - Uses RAS Binder Availability Factor of 0.70 – 0.85

- **Binder quality:**
  - Uses Binder Grade Adjustment Guidelines:
    - Uses Binder Grade Adjustment Guidelines:

<table>
<thead>
<tr>
<th>Recommended Virgin Asphalt Binder Grade</th>
<th>RAS or RAS + RAP Binder Percentage</th>
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</thead>
<tbody>
<tr>
<td>No change</td>
<td>&lt;15</td>
</tr>
<tr>
<td>One grade softer</td>
<td>15 to 25</td>
</tr>
<tr>
<td>Use blending charts</td>
<td>&gt;25</td>
</tr>
</tbody>
</table>
Quantity of Binder

- Raise minimum VMA by 0.1% for every 1% RAS (by weight of total aggregate).
  - Based on assumption of 70% binder availability
  - Will increase effective binder in the mix to offset for the potential for non-effective binder on the RAS
- Simple way of addressing binder availability
  - More binder → Improved durability
  - Angular aggregate and stiffer binder in RAS → Minimal risk of rutting
Quality of Binder

- Focus on critical low temperature difference of the binder - $\Delta T_c$
  - $\Delta T_c = $ Stiffness critical temp ($S$) – the Relaxation critical temp (m-value)
- Measured with the Bending Beam Rheometer (BBR)
- Criteria: $\Delta T_c$ for the blended binder should be greater than or equal to -5.0°C
  - Binder is PAV aged for 40 hours
Two Approaches

1. Binder Blending Procedure

- Agency sets allowable RAS tiers;
- Extract, recover, blend typical materials (RAS, RAP, base binder, etc.) at varying percentages
  - RASBR = 0.00, 0.15, 0.30
- PAV age the blended binder for 40 hours
- Test the blended binders to determine $\Delta T_c$
- Set the allowable tiers based on the criteria that $\Delta T_c$ must be greater than or equal to -5.0°C, and the appropriate PG grade is met.
Two Approaches

2. Mixture Extraction Procedure
   – Individual mixes are fabricated, extracted, the binder recovered and then PAV aged for 40 hours
   – The recovered binder is tested to determine $\Delta T_c$
   – $\Delta T_c$ must be greater than or equal to -5.0°C, and the appropriate PG grade is met
Default Options

- A mixture performance test for cracking implemented by the State is acceptable in lieu of the binder testing for $\Delta T_c$

- Default value option – a maximum RASBR can be used in lieu of testing
  - $\text{RASBR} \leq 0.10$
Mixture Extraction Procedure

- Individual mixes are fabricated
- Loose mix is conditioned at 135°C for 24 hours
  - Uncovered pan at a depth of 25 to 50 mm placed in a forced-draft oven with no stirring
- Mix is then extracted, the binder recovered
- The recovered binder is tested to determine $\Delta T_c$
  - $\Delta T_c$ must be greater than or equal to -5.0°C, and the appropriate PG grade must be met
Summary

• Revised PP 78
• Increased minimum VMA to address issue of binder quantity
• Used $\Delta T_c$ to address binder quality
  – Recovered binder is PAV aged for 40 hours
  – Criteria: $\Delta T_c \geq -5.0^\circ C$
• Added loose mix aging (135°C for 24 hours) as an alternate in the appendix
  – Criteria: $\Delta T_c \geq -5.0^\circ C$
Action Items

• Revised PP 78 sent out to ETG for review
  – A few typos need to be corrected
• Need ETG green light
  – Forward to AASHTO TS 2d
• Declare victory – for now...
• Need to get a new Task Team Chair
Thank You!