WisDOT Asphalt Bid/Mix Specification Updates

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Wisconsin DOT
Agenda

- Terminology
- Specification Changes
- Combining HMA Bid Items
- Contacts & Questions
Terminology

- **Binder** = Performance Graded (PG) Binder
  - NOT Pavement Layer

- **Upper Layer**
  - DOT language for “Surface Layer”

- **Lower Layer**
  - DOT language for “Binder Layer”
HMA Tech Team Updates

- Mix Design Review Updates
- Tack Coat
- Percent Within Limits (afternoon breakout)
- High Recycle Implementation (afternoon breakout)
- Annual Round Robin - Ongoing
- WHRP Research (Wednesday morning)
- Combined Bid Specification
Mix Design Process

- Standardized spreadsheet submittal in 2016
- Added emphasis on department review of materials
- Mix design life
2015 Updates - Tack Coat

- Increased application rate from 0.025 to 0.05-0.07 gal/sy
- Unify layers – increased bond strength
- “Tack is cheap insurance – Use it!”
Tack Application Rates
Tack – Next Steps
HMA Round Robin

- Completing the 2015-2016 Version
- Reducing the number of QV Disputes (5-6%)
- Except for 1 project, lowest number in last 3 years
  - Under 30 if one project removed
Wisconsin Highway Research Program

- Current HMA Related Research
  - HMA Joint Density & Construction
  - HMA Durability
  - HMA Performance Testing
  - Asphalt Content Testing
  - QMP impacts
2015 Updates – PG Binder Designation

PG 58-28 P

- Performance Grade
- Average 7-day max pavement design temp (58 °C / 136 °F) To Resist Rutting
- Min pavement design temp (-28 °C / -18 °F) To Resist Cracking
- Polymer
2015 Updates – Binder Grade Change

- PG = Performance Graded
- Eliminated the use of PG 64-22 in 2015
- Why?
  - -22°C = -8°F
  - Not the proper binder for Wisconsin Climate
- Other binder changes coming later in the presentation…
2016 Combining HMA Bid Items

- **When**
  - 2017 Standard Specification
  - Available by STSP in February 2016

- **Why**
  - Streamline the bidding and estimating processes
  - Aid design/development staff in preparing estimates
  - Simplify the choice of PG Binders for the marketplace
Combined Bid will take the asphalt binder (PG) and mix type (ESALs, gradation/NMAS, etc) and combine them into a single bid item.

This allows for WisDOT to provide a shortlist of approved mix types to be bid.
Mix Selection System

- Steps: Sub Sandwich Pavement Selection
  - Step 1: Aggregate Gradation (Nmax) (Bread)
  - Step 2: Traffic Category (Meat)
  - Step 3: PG Binder (Veggies)
  - Step 4: PG Binder Traffic Designation (Cheese)

- Result – Mix from the list – LUNCH!!!
Step 1: Gradation (Nmas) – Bread

- Know what layer you are designing
- Old SS 460
  - 12.5mm Upper Layer
  - 19mm Lower Layer
Step 1: Gradation (Nmas) – Bread

- New System
  - 1 – 37.5 mm
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Upper Layer Options
  - 4 -12.5 mm
  - 5 – 9.5 mm
  - 6 – 4.75 mm

- Lower Layer Options
  - 2 – 25.0 mm
  - 3 – 19.0 mm
  - 4 – 12.5 mm
## Step 2: Traffic Level (Meat)

<table>
<thead>
<tr>
<th>Load Category</th>
<th>Existing ESALs</th>
<th>New Category</th>
<th>ESALs</th>
</tr>
</thead>
<tbody>
<tr>
<td>E0.3</td>
<td>&lt;300,000</td>
<td>LT</td>
<td>&lt;2 million</td>
</tr>
<tr>
<td>E1</td>
<td>300,000 to &lt;1 million</td>
<td>MT</td>
<td>2 million to &lt;8 million</td>
</tr>
<tr>
<td>E3</td>
<td>1 million to &lt;3 million</td>
<td>HT</td>
<td>&gt;8 million</td>
</tr>
<tr>
<td>E10</td>
<td>3 million to &lt;10 million</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E30</td>
<td>10 million to &lt;30 million</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E30X</td>
<td>&gt;30 million</td>
<td>SMA</td>
<td>consider for ≥5 million</td>
</tr>
<tr>
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<td>Not Rated</td>
<td></td>
<td></td>
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Reduces 7 mix categories to 4 – Fewer mix designs!
Step 3: Binder Grades (Veggies)

- Remember – Where am I?
  - Northern or Southern Zone
- Layer
  - Lower or Upper
Step 3: Wisconsin Climate Zones

NORTHERN ASPHALT ZONE

SOUTHERN ASPHALT ZONE
Step 3: Binder Grades (Veggies)

- Northern Zone
  - New construction, reconstruction or pavement replacement
    - Upper Layers: PG 58-34
    - Lower Layers: PG 58-28
  - Other projects (Overlay, etc.)
    - All Layers: PG 58-28
Step 3: Binder Grades (Veggies)

- Southern Zone
  - All Layers, All types of construction (replacement & overlay)
  - PG 58-28
Step 4: Binder Traffic Designation (Cheese)

- Based on Multiple Stress Creep Recovery (MSCR) testing at the climatic high temperature at the design location (AASHTO M332 Testing)
- Grade bumping to be adjusted using MSCR designation, not E mix or PG Grade
  - Ex: Moving from an E1 to an E3
  - Ex: Moving from a PG 58-28 to a PG 64-28
Step 4: Binder Traffic Designation (Cheese)

- Binder grades to be based on expected traffic level:
  - S – Standard – Normal projects
  - H – Heavy – Higher truck movements, roundabouts, turn lanes
  - V – Very Heavy – Extreme traffic, stopping & starting
  - E – Extremely Heavy – Toll Booths, Port Facilities (Not included)

- Example (old to new): PG 64-28P → PG 58-28 H
  - H, V & E replaces the “P” Grades
## Step 4: Binder Traffic Designation

### Specified Binders for Wisconsin

<table>
<thead>
<tr>
<th>Old System</th>
<th>New System</th>
</tr>
</thead>
<tbody>
<tr>
<td>58-28</td>
<td>58-28 S</td>
</tr>
<tr>
<td>64-28</td>
<td>58-28 H</td>
</tr>
<tr>
<td>70-28</td>
<td>58-28 V</td>
</tr>
<tr>
<td>58-34</td>
<td>58-34 S</td>
</tr>
<tr>
<td>64-34</td>
<td>58-34 H</td>
</tr>
<tr>
<td>70-34</td>
<td>58-34 V</td>
</tr>
</tbody>
</table>
## Let’s put it all together!

<table>
<thead>
<tr>
<th>Step 1</th>
<th>Step 2</th>
<th>Step 3</th>
<th>Step 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gradations (Nmas)</strong></td>
<td><strong>Traffic Level</strong></td>
<td><strong>Asphalt Binder</strong></td>
<td><strong>Designation Level</strong></td>
</tr>
<tr>
<td>1</td>
<td>37.5 mm</td>
<td>LT</td>
<td>Low Traffic Vol. (40 gyrations)</td>
</tr>
<tr>
<td>2</td>
<td>25.0 mm</td>
<td>MT</td>
<td>Medium Traffic Vol. (75 gyrations)</td>
</tr>
<tr>
<td>3</td>
<td>19.0 mm</td>
<td>HT</td>
<td>High Traffic Vol. (100 gyrations)</td>
</tr>
<tr>
<td>4</td>
<td>12.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>9.5 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>4.75 mm</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
So, for this example:

- Gradation = 12.5 mm
- Traffic Level = < 2 mil ESALs
- Binder Grade = 58-34
- Binder Designation = Standard
<table>
<thead>
<tr>
<th></th>
<th>&lt; 2 Mil ESALs</th>
<th>2 to &lt;8 Mil ESALs</th>
<th>&gt;8 Mil ESALs</th>
<th>&gt;5 Mil ESALs</th>
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<tr>
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</tr>
<tr>
<td>3</td>
<td>LT 58-34 S</td>
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<td></td>
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<td>4 HT 58-28 S</td>
<td>4 SMA 58-28 V</td>
</tr>
</tbody>
</table>

Total of 46 bid combinations.

System easily amendable as changes are needed.
### Bid Combinations

<table>
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<tr>
<th>&lt;2 Mil ESALs</th>
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Total of 46 bid combinations.

Key mixes highlighted in yellow.
Guidance Tools

- FDM Chapter 14-10.5
  - Updated to provide guidance
  - Step through the process
- Examples to be inserted in Pavement Design Manual (WisPAVE Manual)
- WAPA
  - Handout Guide
  - Website Selection Tool
    - [www.wispave.org](http://www.wispave.org)
Example – 141 Marinette County

9” New Construction
2” – 4 HT 58-34 S
7” – 3 HT 58-28 S
or
3.5” – 3 HT 58-28 S
3.5” – 3 HT 58-28 S
You pick the new pavement

Design Information:
- County trunk highway in Ashland County
- 1.4 million design ESAL’s
- 2” Mill & Overlay project
- No major traffic generator
- Not a major log hauling route

Choices:
- A: 3 LT 58-28 S
- B: 4 MT 58-34 H
- C: 4 LT 58-28 S
- D: 2 HT 58-34 S
You pick the new pavement

Design Information:
- County trunk highway in Ashland County
- 1.4 million design ESAL’s
- 2” Mill & Overlay project
- No major traffic generator
- Not a major log hauling route

Choices:
- A: 3 LT 58-28 S
- B: 4 MT 58-34 H
- C: 4 LT 58-28 S
  - 12.5mm, Low Traffic, Standard PG Grade & Traffic
- D: 2 HT 58-34 S
You pick the new pavement (2)

Design Information:
- County trunk highway in Dane County
- 2.4 million design ESAL’s
- 5” Roundabout – new construction
- Pavement Designer has chosen a 2” 12.5mm upper and 3” 19mm lower layer

Choices:
- A: Up: 2” 4 MT 58-28 S
  Lower: 3” 3 MT 58-34 S
- B: Up: 2” 4 LT 58-34 S
  Lower: 3” 3 LT 58-28 S
- C: Up: 2” 4 MT 58-28 H
  Lower: 3” 3 MT 58-28 S
You pick the new pavement (2)

Design Information:
- County trunk highway in Dane County
- 2.4 million design ESAL’s
- 5” Roundabout – new construction
- Pavement Designer has chosen a 2” 12.5mm upper and 3” 19mm lower layer

Choices:
- A: Up: 2” 4 MT 58-28 S  
  Lower: 3” 3 MT 58-34 S
- B: Up: 2” 4 LT 58-34 S  
  Lower: 3” 3 LT 58-28 S
- C: Up: 2” 4 MT 58-28 H  
  Lower: 3” 3 MT 58-28 S
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