Office of Materials Management

Who we are:
- 48 employees
- Technical Staff, Engineers, Lab and Testing Staff

Where we are:
- Washington and I-465 on east side of Indy

What we do:
- Develop materials specifications and test methods
  - Constantly improving specifications
  - Participate in and drive research
- Test materials and coordinate testing of materials in Districts
- Investigate failed materials and unique issues
Office of Materials Management

- Why we do it:
  - Not to ensure contracts are on time
  - Not to ensure contracts are on budget
  - INDOT has many great team members working on that
  - To ensure the materials on those contracts are of the best possible quality:
    - Long-lasting
    - Cost effective
    - Widely available
Office of Materials Management

• How we do it:
  • Identify the issues
  • Propose solution
  • Meet with INDOT/APAI Steering Committee (A LOT)
    • New for 2019: Subcommittees
  • Determine how to roll out changes
HMA Specification Revisions and Testing 2019

• HMA Specification Revisions
  • Recap of 2017 and 2018 changes
  • What we learned and 2019 changes
Recap - HMA Specification Revisions

• 2017 Changes
  • Pay factors
    • Was: 35% Air Voids, 35% Density, 20% Binder, 10% VMA
    • Now: 30% Air Voids, 35% Density, 35% VMA
  • Pay curves
    • Straight line on PWL pay factor calculation
  • Eliminated Category 1 and 5
  • 4 hour mix conditioning
  • RAP/RAS changes
  • No JMF
  • 5th Plate
Recap - HMA Specification Revisions

• 2017 Changes
  • Mix Temperature
    • Max stayed the same – moved from plant measurement to field
  • Appeals changes
  • Aggregate requirement changes
Recap - HMA Specification Revisions

• 2018 Changes
  • Binder Content by Extraction
  • 3 Regional Testing Labs
  • Determine Gsb from extracted sample
  • Gsb will change throughout season
  • Test strips
  • ITM 597
  • Paraffin to Corelok for > 2.0% core absorption
HMA Specification Revisions

• Some changes went well
• Some changes were a “push”
• Some changes.....well you can’t win them all
HMA Specification Revisions

Indiana Binder Content Trends

- 9.5
- 12.5
- 19
- 25

HMA Specification Revisions

• 2018 Changes
  • Test Strips
  • One required per calendar year per DMF
  • Can be located on INDOT project, or off site
  • 10 day *maximum* shut down period after test strip paving
HMA Specification Revisions

• 2018 Changes
  • Test Strips
    • One required per calendar year per DMF
    • Can be located on INDOT project, or off site
    • 10 day *maximum* shut down period after test strip paving

• What happened?
  • If test data agreed with Contractor, no issues (but test strip was therefore unnecessary)
  • If test data disagreed with Contractor, Contractor would not pave, prolonged disputes. Not good for either party.
HMA Specification Revisions

- 2019 Changes
  - Test Strips a one-hit wonder
  - Going away for 2019
  - Still available as an option
    - Without mandatory paving shutdown
HMA Specification Revisions

• HMA Mix Design
  • Air Voids

Shock Absorbers

• Binder content

The Glue

• Voids in the Mineral Aggregate (VMA)
  • Minimum VMA required for sufficient binder content
  • Binder content target set based on this
HMA Specification Revisions

• What is VMA?
  • The space in a compacted HMA mixture not taken up by aggregate
HMA Specification Revisions

- Aggregate
- Asphalt
- Air
HMA Specification Revisions

Aggregate

VMA

Air + Asphalt = VMA
HMA Specification Revisions

• **What is VMA?**
  • A measure to ensure a mixture has enough effective asphalt content

• **Volume of Effective Asphalt (Vbe)**
  • Volume of asphalt available for use as binder

• **VMA = Vbe + Air Voids**
HMA Specification Revisions

• Problem with VMA as field pay factor
  • VMA is:
    • Effective Asphalt + Air Voids
  • Air Voids = DMF → OK
HMA Specification Revisions

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  • VMA is:
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  • Air Voids = DMF ➔ OK
  • Air Voids < DMF ➔ Could be too much binder
HMA Specification Revisions

- Problem with VMA as field pay factor
  - VMA is: Effective Asphalt + Air Voids
  - Air Voids = DMF \( \Rightarrow \text{OK} \)
  - Air Voids < DMF \( \Rightarrow \text{Could be too much binder} \)
- To meet VMA spec, more binder required. Unlikely to be on purpose due to cost.
HMA Specification Revisions

• Problem with VMA as field pay factor
  • VMA is:
    • Effective Asphalt + Air Voids
  • Air Voids = DMF → OK
  • Air Voids < DMF → Could be too much binder
  • Air Voids > DMF → Not enough binder, BAD
HMA Specification Revisions

• Problem with VMA as field pay factor
  • VMA is:
    • Effective Asphalt + Air Voids
  • Air Voids = DMF \( \rightarrow \) OK
  • Air Voids < DMF \( \rightarrow \) Could be too much binder
  • Air Voids > DMF \( \rightarrow \) Not enough binder, BAD

• Can lower binder content and still meet VMA spec. Producers could be incentivized to do this.
HMA Specification Revisions

• 2019 Changes
  • Change from VMA pay factor to Vbe

• Should also encourage more compactible mixes
HMA Specification Revisions

• 2018 Changes
  • Gsb testing throughout project
HMA Specification Revisions

• 2018 Changes
  • Gsb testing throughout project
  • Some issues with QC to QA comparisons during season
  • Not entirely unexpected
  • Most of the issues with T 84 – fine aggregate
HMA Specification Revisions

• 2018 Changes
  • Gsb testing throughout project
  • Some issues with QC to QA comparisons during season
  • Not entirely unexpected
  • Most of the issues with T 84 – fine aggregate

• 2019 Changes
  • Developing Directive 306
  • Much more detailed instructions for fine aggregate specific gravity
HMA Specification Revisions

• 2017 Changes
  • 4 hour mix conditioning
  • Both mix design and field samples
HMA Specification Revisions

• 2017 Changes
  • 4 hour mix conditioning
  • Both mix design and field samples

• 2019 Changes
  • Keep 4 hour conditioning for mix design
  • Only 2 hour for field samples
HMA Specification Revisions

- 2017 Changes
  - PWL Pay Curves

**Estimated PWL greater than 90:**

\[ PF = \frac{(105.00 - 0.50 \times (100.00 - \text{PWL}))}{100} \]

**Estimated PWL greater than or equal to 50 and equal to or less than 90:**

\[ PF = \frac{(0.50 \times \text{PWL}) + 55.00}{100} \]
HMA Specification Revisions

• 2017 Changes
  • PWL Pay Curves – Pre-2017
HMA Specification Revisions

• 2017 Changes
  • PWL Pay Curves – 2017/2018

PWL Pay Curves
HMA Specification Revisions

- 2019 Changes
  - PWL Pay Curves - 2019
HMA Specification Revisions

• 2017 Changes
  • Pay Factors

Lot PF = 0.20(PF_{BINDER}) + 0.30(PF_{VOIDS}) + 0.10 PF_{VMA} + 0.35(PF_{DENSITY})

where:

Lot PF = Lot Composite Pay Factor for Mixture and Density
PF_{BINDER} = Lot Pay Factor for Binder Content
PF_{VOIDS} = Lot Pay Factor for Air Voids at N_{des}
PF_{VMA} = Lot Pay Factor for VMA at N_{des}
PF_{DENSITY} = Lot Pay Factor for In-Place Density, %Gmm
HMA Specification Revisions

2019 Changes

Pay Factors

\[ \text{Lot PF} = 0.30(\text{PF}_{\text{VOIDS}}) + 0.35(\text{PF}_{\text{VMAVBE}}) + 0.35(\text{PF}_{\text{DENSIY}}) \]

where:

\( \text{Lot PF} \) = Lot Composite Pay Factor for Mixture and Density
\( \text{PF}_{\text{VOIDS}} \) = Lot Pay Factor for Air Voids at \( N_{\text{des}} \)
\( \text{PF}_{\text{VMAVBE}} \) = Lot Pay Factor for\ VMA\ Vbe\ at \( N_{\text{des}} \)
\( \text{PF}_{\text{DENSIY}} \) = Lot Pay Factor for In-Place Density, %Gmm
HMA Specification Revisions

- 2017 Changes
- Pay Factors

<table>
<thead>
<tr>
<th>Specification Limits</th>
<th>LSL*</th>
<th>USL**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Voids at $N_{des}$, %</td>
<td>2.60</td>
<td>5.40</td>
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<tr>
<td>Voids In Mineral Aggregate at $N_{des}$, %</td>
<td>Spec</td>
<td>Spec + 2.50</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Density</th>
<th>LSL*</th>
<th>USL**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway Core Density (% Gmm), %</td>
<td>91.00</td>
<td>n/a</td>
</tr>
</tbody>
</table>

* LSL, Lower Specification Limit  
** USL, Upper Specification Limit
HMA Specification Revisions

- 2017 Changes
- Pay Factors

<table>
<thead>
<tr>
<th>Deviation from Spec Minimum</th>
<th>VMA</th>
<th>Pay Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dense Graded</td>
<td>Open Graded</td>
</tr>
<tr>
<td>&gt; + 3.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ + 2.5 and ≤ + 3.0</td>
<td>1.05 minus 0.05 for each 0.1% over + 2.5%</td>
<td></td>
</tr>
<tr>
<td>≥ + 2.0 and &lt; + 2.5</td>
<td>1.05 minus 0.01 for each 0.1% over + 2.0%</td>
<td></td>
</tr>
<tr>
<td>&gt; + 0.5 and &lt; + 2.0</td>
<td>1.05</td>
<td></td>
</tr>
<tr>
<td>≥ 0.0 and ≤ + 0.5</td>
<td>All</td>
<td>1.05 minus 0.01 for each 0.1% under + 0.5%</td>
</tr>
<tr>
<td>≥ - 2.0</td>
<td></td>
<td></td>
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<tr>
<td>&lt; - 2.0</td>
<td></td>
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* Test results will be considered and adjudicated as a failed material in accordance with normal Department practice as listed in 105.03.
HMA Specification Revisions

- 2019 Changes
- Pay Factors

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<thead>
<tr>
<th>Deviation from Spec Minimum</th>
<th>Pay Factor</th>
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<tbody>
<tr>
<td>$&gt; + 2.5 \text{ 3.0}$</td>
<td>Submitted to the Office of Materials Management*</td>
</tr>
<tr>
<td>$\geq + 2.0 \text{ 2.5 and } \leq + 2.5 \text{-3.0}$</td>
<td>0.251.00 minus 0.05 for each 0.1% over $+2.5%$</td>
</tr>
<tr>
<td>$\geq + 1.5 - 2.0 \text{ and } \leq &lt; + 2.0 \text{-2.5}$</td>
<td>0.651.05 minus 0.01 for each 0.1% over $+2.0%$</td>
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<tr>
<td>$\geq +0.5 \text{ and } \leq &lt; +1.5 - 2.0$</td>
<td>1.05</td>
</tr>
<tr>
<td>$\geq -0.5 \text{-}2.0 \text{ and } &lt;0.0$</td>
<td>0.851.00 minus 0.025 for each 0.1% under 0.0%</td>
</tr>
<tr>
<td>$\geq -2.0 \text{ and } &lt; -0.5$</td>
<td>0.90 minus 0.06 for each 0.1% under -0.5%</td>
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HMA Specification Revisions

• 2019 Changes
• Pay Factors
HMA Specification Revisions

• 2019 Changes
• Pay Factors
HMA Specification Revisions

• 2017 Changes
  • Appeals Changes
    • QC data required prior to release of QA data
    • Appeals allowed based on deviation of QC results from QA results
    • $500 credit for each appealed sublot that did not improve SCPF/Lot PF

A $500.00 credit adjustment will be included in a quality adjustment pay item in accordance with 109.05.1(e) for each appealed sublot that did not result in an improvement to the SCPF or Lot PF.
HMA Specification Revisions

• 2019 Changes
  • Appeals Changes
  • QC to QA tolerance 0.020 on cores
  • If both QC and QA cores above 93 %MSG, (%Gmm), appeal not required

content, 0.010 for the MSG and 0.010 for both the BSG of the gyratory specimens and
0.020 for the BSG of the density cores. Upon request from the Contractor, the BSG of the
density core will be exempted from the individual subplot appeal if both the QC and QA
results show a %MSG for the density greater than or equal to 93.0%.
HMA Specification Revisions

• 2019 Changes
  • Dense graded draindown
  • Mix design draindown requirement
  • We don’t want unstable mixes
HMA Specification Revisions

• 2019 Changes
  • ITM 597
    • Mandatory test strips gone
    • Production Gsb tolerance increased to 0.020
    • Outlier check reduced to 0.030
HMA Specification Revisions

• 2019 Changes
  • Corelok offset
    • Based on literature review and INDOT data
    • 0.020 “offset” applied to Corelok results
HMA Specification Revisions

- Superpave5
- Design a mix at 5% air voids
- Target 5% AV (95% density) in field

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<th>SPECIFICATION LIMITS</th>
<th>MIXTURE</th>
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<td>Air Voids at $N_{des}$, %</td>
<td>LSL* 2.60</td>
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** USL, Upper Specification Limit
HMA Specification Revisions

• Superpave5
  • Increases density without extra cost or compaction effort
    • (Does require all new mix designs)
  • Increased density leads to increased life
    • Duh, we knew that
    • This makes it easier!
• Additional research describes that improved performance
  • Come see my presentation at 3:00 on Wednesday
HMA Specification Revisions

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• Additional research describes that improved performance
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This is the most important change
HMA Specification Revisions

- Superpave5
  - Fully effective for lettings after 9/1/19
  - Is actually in letting documents starting 3/6/19, but.....
- Construction Memo 19-03
Construction Memo 19-03

• Three different options for contracts let before 9/1/19
  • Option 1: All of HMA changes, without Superpave 5
  • Option 2: All of HMA changes, including Superpave 5
Construction Memo 19-03

- Three different options for contracts let before 9/1/19

  - Option 1:
    - All of HMA changes, without Superpave 5

  - Option 2:
    - All of HMA changes, including Superpave 5

  - Option 3:
    - All of HMA changes, with Contractor option for Superpave 4 or Superpave 5 for any mix
2019 HMA Changes

• Won’t that cause mass confusion?
• Not any more than switching mix designs normally does
• New DMF Entry and HMA Pay Wizard system will help
DMF Entry

• Producers enter mix designs online
• Districts review, accept for appropriate mix category/type
• Producers add contracts
DMF Entry

• For additional questions, contact:
  • Kenneth Gootee, kgootee@indot.in.gov
  • Nathan Awwad, nawwad@indot.in.gov
HMA Pay Wizard

• Turnaround time was a major issue in 2018
• Working on delivery time, testing time
• Most annoying was....data transfer time
HMA Pay Wizard

• Turnaround time was a major issue in 2018
• Working on delivery time, testing time
• Most annoying was....data transfer time
HMA Pay Wizard

• Labs enter test data
• Available to view online by Producers immediately
• Appeals are requested online
• Future enhancements for both DMF entry and Pay Wizard
Other HMA Items

- Still refining:
  - Void Reducing Asphalt Membrane (VRAM)
  - Spray Pavers
  - Tack coat improvements
  - HMA testing data analysis
  - Turnaround Time improvement
  - Performance Testing
  - Friction aggregate acceptance improvements
  - Other new test methods?
Thank you!

Questions?

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