Producing Uniform and Consistent Mixes

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Presentation Outline

- Recap: OAPC Top 10 List — Ways to Get More Durable HMA Pavements
- Uniformity & Consistency — What Does This Imply?
  JMF Influencing Factors
- Considerations — Material, Production & Placement Control
- Importance of Sampling & Testing
- Role of Specifications
- Acknowledgement
- Q & A
### Recap – OAPC Top 10 Lists

**Ways to Get More Durable HMA Pavements**

<table>
<thead>
<tr>
<th>1</th>
<th><strong>DO YOUR HOMEWORK</strong></th>
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<tbody>
<tr>
<td>Evaluate the existing pavement condition and perform a proper pavement design to determine the appropriate thickness. Select the right mix and PGAC for the project.</td>
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<tr>
<th>2</th>
<th><strong>ENCourage MIXes THAT HAVE higher AC CONTENT</strong></th>
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<tbody>
<tr>
<td>Studies have shown that mixes with higher AC out-perform those with lower AC contents. How to best do this in Ontario needs further evaluation.</td>
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<tr>
<th>3</th>
<th><strong>Specify A Finer Gradation For Your Mix Type</strong></th>
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<td>Finer Superpave mixes will typically have higher AC content and are more durable and less prone to segregation.</td>
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<th>4</th>
<th><strong>Don’t Over heat the Mix</strong></th>
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<td>Overheating the mix will result in premature oxidation and cracking. Specifying WMA asphalt may help alleviate these concerns during late season paving.</td>
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<tr>
<th>5</th>
<th><strong>Include Adequate Surface Preparation in the Plans</strong></th>
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<td>Suitable surface preparation should be allowed for in the contract documents to ensure the construction of smooth roads.</td>
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<th><strong>Ensure Adequate Bond</strong></th>
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<td>Proper tack coat application ensures that the pavement will perform as designed and mitigate premature cracking. Good tack coating will also improve compaction.</td>
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<th><strong>Provide Proper Pavement Density</strong></th>
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<tr>
<td>Compacting the mix to the required specification limits will ensure long term durability, lower oxidation (ageing) and reduced permeability.</td>
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<th>8</th>
<th><strong>Produce Mix That Is Uniform and Consistent</strong></th>
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<td>HMA that is produced to consistently meet the JMF and the specification requirements will perform better.</td>
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<th>9</th>
<th><strong>Use Rap Responsibly</strong></th>
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<td>RAP should be utilized in accordance with the contract requirements. For higher percentages of RAP i.e. greater than 15-20 % a softer PGAC should be incorporated in the mix.</td>
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<th>10</th>
<th><strong>Complete Quality Assurance (QA) Testing and Inspection</strong></th>
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<td>Proper QA and inspection conducted by qualified technicians and inspectors should be part of any HMA paving project to ensure long term performance.</td>
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Uniformity and Consistency

What Does This Imply?

- **Uniformity** – Lack of Variation in Overall Quality
- **Consistency** – Dependent on Material, Process and Operational Uniformity

“If the asphalt mix produced by the plant is consistent and uniform in binder content and aggregate mix throughout, then the resulting roadway made from this material will also be consistent and uniform assuming that the paving material has been properly handled and laid down” – Dr. David Newcomb (TTI)
Uniformity and Consistency

- **JMF Influencing Factors - Aggregates**
  - Excessive or Variable Stockpile Moisture
  - Different/Variable Gravities from Design
  - Difference in Design Blend Water and/or Binder Absorption
  - Inconsistent Gradation
  - Stockpile and Loading Segregation
  - Cold Bin Feed Issues

- **Impact of Aggregate Inconsistency**
  - Gradation Control and Mix Volumetrics
  - In-place Density
  - Payment
  - Performance
Uniformity and Consistency

- JMF Influencing Factors – Asphalt Cement/Binder
  - PG Differences
  - Variable Binder Addition

- Impact of Binder Inconsistency
  - Plant Operational Error
  - Mix Volumetrics
  - In-place Density
  - Payment
  - Performance
Considerations

- Understand the **GOAL** of Mix Design

- Proper Coordination to Ensure Production is within Set Tolerances and Specified Temperatures
  - Material Control
  - Production Control
  - Placement Control
Considerations – Material Control

- Proper Material Control Measures Ensures that Variability is Minimized/Eliminated
  - Source Acceptance and Quality Control Testing

- Selecting/Controlling Aggregates and Gradation Deviations
  - Influencing Factors on $G_s$

- Selecting Correct PGAC

- Optimum Asphalt Cement/Binder requirements

- Mix Compactability Concerns
Considerations – Material Control

- Influencing Factors on $G_{mb}$

- Influencing Factors on $G_{mm}$

- Influencing Factors on the Asphalt Cement/Binder Content
Considerations – Material Control

- Aggregate Handling/Stockpiling Techniques
- Use of More Cold Feed Bins
- Adequate Drying of Aggregates
- Dust Metering and Calibration
- Document Problems and Corrective Actions
Considerations – Production Control

- Proper and Routine Plant Maintenance

- JMF – Remember Areas that Can Go Wrong?
  - Influencing Factors on the VMA

- Why and What Adjustments are Necessary – Base All Adjustments on QC Testing and Inspection Data
Considerations – Placement Control

- Operational Variables that Can Complicate the Compaction Process.
  - Mix Characteristics
  - Pavement Geometry
  - Weather Conditions
  - Rolling Equipment(s)
  - Rolling Patterns
  - Other Paving Logistics

- Proper Planning, Time and Mix Quantity is Key.
Importance of Sampling & Testing

- Sample, Process and Test
  - Quality Evaluation
  - Product Control at Supply Source
  - Operational Control
  - Material Acceptance/Rejection

- Proper Sampling is **CRITICAL** for any Product Testing

- Quality of Sample = Quality of Test Result

- Test in Accordance with Appropriate and Applicable Governing Standards
Role of Specifications

- Ensure and Enforce Good Specifications
  - Encourage Appropriate and Accurate Testing Procedures
  - Establish Reasonable Incentive/Disincentives
Acknowledgements

Shane Buchanan, CRH Americas Materials
His Presentations on Mixture Design Part(s) 1 & 2 At World of Asphalt 2019 were particularly helpful in developing this presentation.
THANK YOU FOR LISTENING