Engineering City Paving Mixtures

SEAUPG ANNUAL MEETING
November 20, 2019
Presented by David Morton

Outline

• TexasBit History
• Challenges on Mixture Performance for Municipalities
• Tools to Engineer City Paving Mixtures
• DFW Projects with Innovative MAC Mix

Who We Are: TexasBit History

1906: Texas Bitulithic was founded by Warren Brothers
1966: Merged with Ashland Oil and Refining Company
1980: APAC
2006: We were acquired by: CRH
TexasBit – Asphalt Plant Location

Total: 16 plants
- Fort Worth: 6
- Dallas: 4
- East Texas: 6

CRH in Texas

What Matters …

Why are we having performance issues? And how can we help to address them?
Current State of Affairs

1. What's more important: cracking resistance or rutting resistance?
2. Economics or performance?
3. Have we placed too many restrictions trying to prescribe what "good hot mix" should look like on paper?
4. Can we simply specify performance?

Discovered Challenges for Municipalities

- Asphalt mixtures selected for use by municipalities may not be appropriate for the intended application.
- Many mixtures are traditionally agency mixes (e.g., DOT) and may be too harsh (i.e., dry and coarse).
- Many concrete streets are in bad shape and require cost effective rehabilitation strategies!
- Traditional mixtures are prematurely fading.

Finding Solutions when Engineering Asphalt Mixtures

- 1st Step: Identifying the needs such as climate, traffic volume, current pavement condition, and budget
- 2nd Step: Engineer the mix for the intended application => BMD
- 3rd Step: Customize to meet different properties depending on customer needs while providing superior performance
Asphalt Components

Data provided by TxDOT

PG64-22

(All asphalt binders are not the same)

STUDIES HAVE SHOWN THAT PROPERTIES OF BINDER MATTER FOR THE QUALITY OF THE MIXTURE

Engineering City Paving Mixtures

MAC Mix was developed to find a balance between historical data from Specialty Mixes and empirical data from Test Analysis

Historical Data

Empirical Data

Note: MAC Mix is a concept based on performance and it is not proprietary to TexasBit.

Flowchart for Designing Process

• Goal:
  Develop an engineered mix solution to solve an identified problem!

• Optimization:
  Performance based is the key aspect of the MAC Mix design process.

• Cost Effective Strategy:
  Utilization of recycled material for sustainability and cost effectiveness.
**MAC Mix : Value Added**

MAC mixes provide value by using Texas DOT specifications + revisions by TexasBit personnel to yield excellent performance, favorable economics (to all parties) and extended pavement life.

**Addendum to DOT Item 347:**

- Objective: Move from traditional recipe specifications towards more performance-based specifications which will open up more innovation potential.

  - Notice that many of the addendum items are MORE stringent than the standard specification!

**Texas Overlay Test Requirements**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Test DOT Specification</th>
<th>MAC Uniform Specification</th>
<th>Addendum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate (CAL)</td>
<td>SF-4 or SF-9</td>
<td>SF-4 or SF-9</td>
<td></td>
</tr>
<tr>
<td>P.C. Binder</td>
<td>SF-8 or SF-10</td>
<td>SF-8 or SF-10</td>
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</tr>
<tr>
<td>Stability Testing</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Free Water</td>
<td>NA</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>Total Ash Content</td>
<td>C = 6.0% Min, 7 = 7.5 Min</td>
<td>C = 6.5% Min, 7 = 7.25 Min</td>
<td></td>
</tr>
<tr>
<td>Cyclic Tensile Test</td>
<td>250 psi</td>
<td>250 psi</td>
<td></td>
</tr>
<tr>
<td>Local Fracture Test</td>
<td>NA</td>
<td>NA</td>
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**Addendum to DOT Item 340 and 344:**

- As with the Item 347, notice that many of the addendum items are MORE stringent than the standard specification!

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Test Section: SH 174 Rio Vista

Mix placed on October 2015 (image obtained on July 2018)

Test Section: SH 19 Emory, TX

Mix Design Information:
- 341 Type D
- SAC A
- 16% RAP
- OAC: 5.2%
- PG 64-22

Mix placed on December 2018
Photo taken on November 2019

DFW MAC Projects

- Oak Timbers – City of Colleyville
- Jubilee St – City of Dallas
- E Broad St – City of Mansfield
- N Bluegrove Rd – City of Lancaster
- St Francis Ave – City of Dallas
City of Dallas – Amberton Pkwy

MAC Superpave 64-22 w/ 30% Binder Replacement (RAP and RAS),
25% Tire Rubber (terminal blended)

City of Mesquite, Texas Project

MAC Superpave 64-22 w/ 30% Binder Replacement (RAP),
25% Tire Rubber (terminal blended)

City of Mesquite, Texas Testimonial!

The draw for the City of Mesquite to move towards a mix design similar to the MAC Mix is the ability to tailor the mix to a streets individual needs and traffic patterns. We appreciated TexasRAN and their effort to reach out to educate municipalities on these mixes. From then on we rely on the guidance, specifications and research completed by and for GOs even though our needs and problems are drastically different. Our hope is that we can move past some of the snags surrounding asphalt pavement in our community by providing an asphalt surface that performs to the expectations of our residents

Please take a moment to complete the City of Mesquite customer satisfaction survey.

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(972) 216-4452 | chickey@ci.mesquite.tx.us | www.cityofmesquite.com
City of Mansfield, Texas Project

Mansfield (May 13, 2019)
MAC TOM 70-22 w/ 25% Binder Replacement (RAP),
20% Tire Rubber (terminal blended)

City of Dallas (Marsh Ln and Walnut Hill)

Location Map (left) and Pavement Condition Prior (right)

City of Dallas (Marsh Ln and Walnut Hill)

Construction 6 months Post Construction
MAC TOM PG 70-22 w/ 25% BR (RAP) and 20% Tire Rubber (terminal blended)
Supporting Information

Double click PDF icons to open

MAC Addendum to Bars 347
L&L Presentation for City of Mesquite, TX

THANK YOU!

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