


Engineering City Paving Mixtures

SEAUPG ANNUAL MEETING

November 20, 2019


Presented by David Morton






Outline

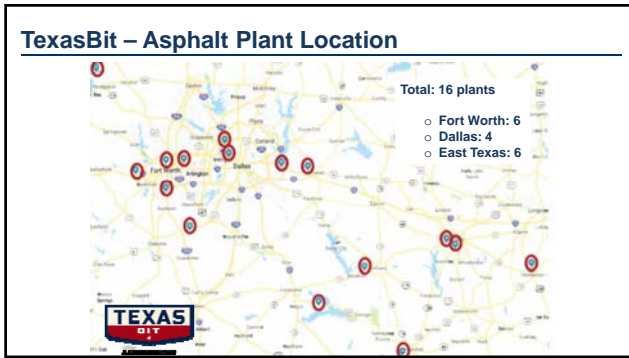
- TexasBit History
- Challenges on Mixture Performance for Municipalities
- Tools to Engineer City Paving Mixtures
- DFW Projects with Innovative MAC Mix

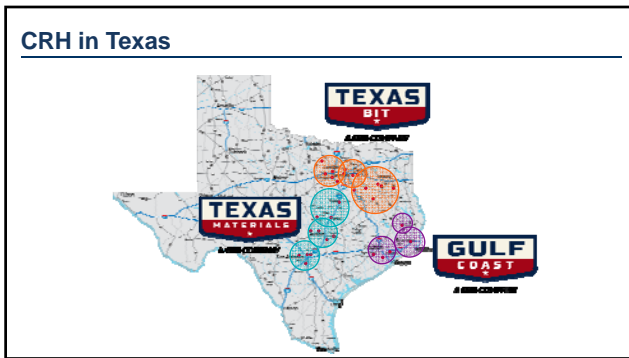
Who We Are: TexasBit History

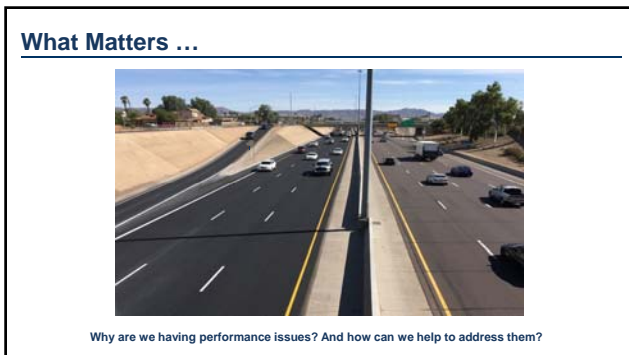


- 1906 Texas Bitulithic was founded by Warren Brothers
- 1966 Merged with Ashland Oil and Refining Company
- 1980 APAC
- 2006 We were acquired by: CRH









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

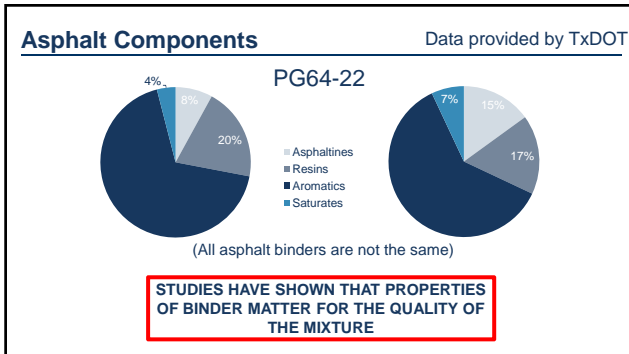
- **Asphalt mixtures** selected for use by municipalities **may not be appropriate for the intended application.**
- **Many mixtures** are traditionally agency mixes (e.g., DOT) and **may be too harsh** (i.e., dry and coarse).
- Many concrete streets are in bad shape and **require cost effective rehabilitation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





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:

- DCAM } Best Mixes
- TOM } Best Mixes
- SMA C } Good Mixes
- +SMA D } Good Mixes
- +SP C } Good Mixes
- +SP D } Good Mixes
- +DG C } Poor Mixes
- +DG D } Poor Mixes

Empirical Data:

- IDT and IDEAL CT
- Overlay Test
- Hamburg

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!

PARAMETER	TOM 347 Specification	MAC TOM Addendum
Aggregate (SAC)	SAC A	SAC A or SAC B
PG of Binder	PG 70 or PG 76	PG 70 or PG 76
Ground Tire Rubber	N/A	• Min 15%
Solubility Rate (STR)	N/A	• Min 99%
Delta Tc	N/A	• Max 6.0 C
Certificate of Analysis (COA)	N/A	• Required
Ratio of Recycled Binder	N/A	Max 25%
Total Asphalt Content	C = 6.0 Min / F = 6.5% Min	C = 5.7% Min / F = 6.2% Min
Cycles to Failure (CT)	Min 300 cycles	Min 300 cycles
Critical Fracture Energy (CT)	N/A	• Min 1.0
Crack Progression Rate (CT)	N/A	• Max 0.45

Texas Overlay Test Requirements

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!

PARAMETER	Type D 340 Specification	SP-D 344 Specification	MAC SP-D Addendum
Aggregate (SAC)	SAC A or SAC B	SAC A or SAC B	SAC A or SAC B
PG of Binder	PG 64, PG 70 or PG 76	PG 64, PG 70 or PG 76	PG 64, PG 70 or PG 76
Ground Tire Rubber	N/A	N/A	• Min 15%
Solubility Rate (STR)	N/A	N/A	• Min 99%
Delta Tc	N/A	N/A	• Max 6.0 C
Certificate of Analysis (COA)	N/A	N/A	• Required
Ratio of Recycled Binder	Max 20% (Surface)	Max 20% (Surface)	Max 30% (Surface)
Virgin Asphalt Content	N/A	N/A	• Min 4.2%
Cycles to Failure (CT)	N/A	N/A	N/A
Critical Fracture Energy (CT)	N/A	N/A	• Min 1.0
Crack Progression Rate (CT)	N/A	N/A	• Max 0.45

Texas Overlay Test Requirements

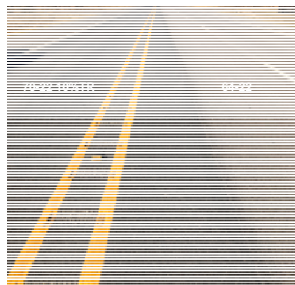
Test Section : SH 174 Rio Vista



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 Trl - 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 applaud TexasBit and their effort to reach out to educate municipalities like ourselves. Too often we rely on the guidance, specifications and research completed by and for DOTs even though our needs and problems are drastically different. Our hope is that we can move past some of the stigma surrounding asphalt pavement in our community by providing an asphalt surface that performs to the expectations of our residents. I think the MAC Mix is moving us in that direction.

Please take a moment to complete the City of Mesquite [customer satisfaction survey](#).

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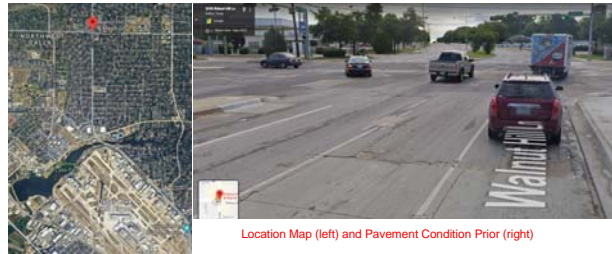
City of Mansfield, Texas Project



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

 Acrobat Document	 MAC Addendum to Item 347
 L&L Presentation for City of Mesquite, TX	 MAC Story



THANK YOU!

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