



September 15, 2025

Materials and Tests Division - Ensuring Quality Initiatives

Ryan Barborak, P.E.

Gisel Carrasco, P.E.



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Journey Towards Implementation of Balanced Mix Design (BMD) in Texas

Ryan Barborak, P.E.

Current State of Affairs (October 15, 2019

– Short Course)

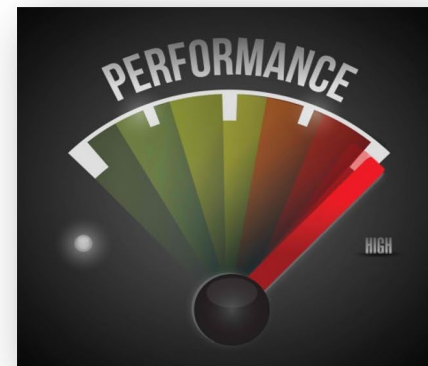
1 What's more important; cracking resistance or rutting resistance?



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?



Timeline of Events

Phase 1 : 2019-2022

9 Test Projects

33 Sections @ ½ -1 day

Phase 2 : 2022-2025

4 Shadow Projects

8 Sections @ 2-4 days

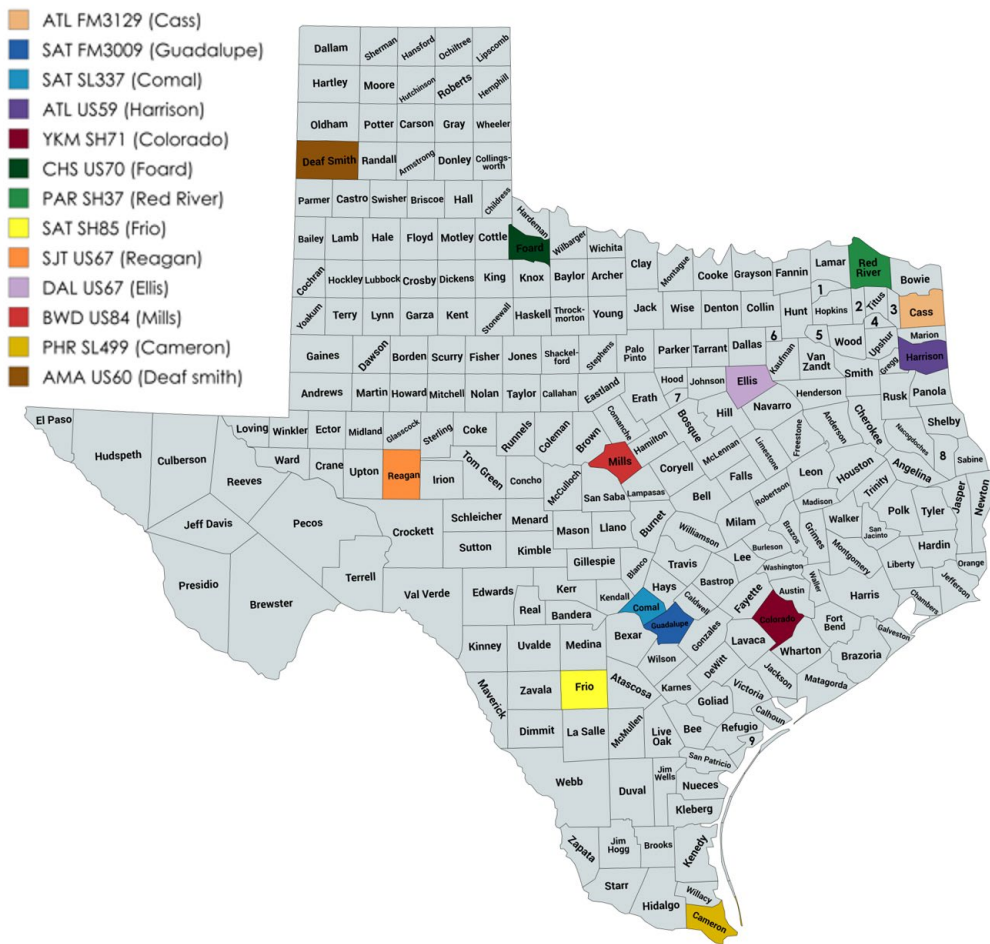
Phase 3 : 2025-2028

3-5 Lead District Pilot
Projects

Statewide
Projects

Phase 1 (2019-2022)

- Developed SS3074 Superpave Mixtures – Balanced Mix Design (BMD)
- Established field test projects by partnering with districts & contractors (9 test projects, 33 test sections, 6 TxDOT Districts)
- Production ranged from a few hundred tons to 1 ½ days of production
- Used HWT and Overlay Test for performance thresholds but began looking into IDEAL CT, IDEAL RT, and Poker Chip (binder) test
- Began monitoring field performance for rutting and cracking



Phase 2 (2022-2025)

- Evolved into multi-day test sections by partnering with districts & contractors (4 test projects, 8 test sections, 4 TxDOT Districts)
- Production ranged from 2 to 4 days
 - Evaluate IDEAL-CT and IDEAL-RT during production
 - Understand construction variability
- Opportunity to tie laboratory & field performance to validate thresholds/criteria of HWT, OT, CT, and RT



**Hamburg
Wheel
Tracking
Test (HWT)**

**Overlay
Test (OT)**



Key Findings Phase 1 and 2 (To Date)

- BMD possible with TX materials
 - Majority of control sections were already balanced with HWT, OT, CT, and RT
 - 17 of 41 (41%) test sections had at least 20% RAP (upwards of 40%)
 - 8 of 41 (20%) test sections were virgin (0% RAP), but 2 of these test sections were SMA and TOM
 - RAP content ranged from 8% to 19% for all other test sections (39%)
 - Not all test sections were balanced
 - Understand and validate thresholds for performance tests



IDEAL-CT

Key Findings Phase 1 and 2 (To Date)

- Adequate & balanced field performance exhibited to date for 41 Mixtures in 13 Projects (1-6 yrs old)
 - No premature failures
 - 4 test sections have %lane cracking ranging from 4% to 8%; rutting depth remained below 12.5 mm for all test sections
 - Link field performance to laboratory performance
- Consistent production possible over multiple days
 - IDEAL-CT and OT showed moderate variability ($COV < 25\%$)
 - IDEAL-RT showed low variability ($COV < 10\%$)
- Established IDEAL-RT & IDEAL-CT preliminary thresholds for field performance
- IDEAL-CT & IDEAL-RT practical during production



IDEAL-RT 8

Where Are We Headed

- Create a new One-Time Use (OTU) BMD Special Specification
 - Evolution from a day production to several days of production to entire project
 - Add what we've learned from Phase 1 and 2 to SS3074 and create new specification
- Review & feedback through TxDOT/Industry/TXAPA BMD Working Group and draft new specification (Sept. 2025)
- Review and feedback from TxDOT Districts in MTD Forum (begin Sept. 2025)
- Full industry review (begin Oct. 2025)
- Revise as needed and address comments (Nov. 2025)
- Issue One-Time Use (OTU) Special Specification (Nov. 2025)
- **OTU BMD Special Specification available for the December 2025 letting**

Special Specification **BMD3074**

Superpave Mixtures – **Balanced Mix Design**



1. DESCRIPTION

Construct a hot-mix asphalt (HMA) surface pavement layer composed of a compacted, Superpave (SP) mixture of aggregate, asphalt binder, and additives mixed hot in a mixing plant, utilizing a Balanced Mix Design (BMD) approach. Payment adjustments will apply to HMA in accordance with this Specification unless the HMA is deemed exempt in accordance with Section 344BMD3074.4.9.4-... "Exempt Production."



Phase 3 (2025-2028)

- Develop pilot projects utilizing BMD Specification
- Continue Phase 1 & 2 efforts including variability, monitoring of previous test sections for performance, evaluating performance tests thresholds, and specification revision
 - Adjust BMD Specification as needed (iterative process)
 - Work towards a statewide special specification
- Measure performance of sections with higher RAP
 - RAP content in BMD is 35%
 - Current RAP content in Item 344 is 15%
- Collaborate with TxDOT and Industry to develop BMD Guidance Manual
- Conduct regional workshops



Partnership

- TxDOT Districts
- Contractors
- Material suppliers
- TXAPA and AGC
- Balanced Mix Design Working Group
- TTI, CTR, UTEP





September 15, 2025

Improving Friction and Other Key Initiatives

Gisel Carrasco, P.E.

Materials and Test Division Friction Work

- **OBJECTIVES**

- Improve safety and maintain skid resistance of HMA pavements
- Optimize the usage of Surface Aggregate Classification (SAC) A aggregate sources

- **HOW**

- Implementation of the Dynamic Friction Test (DFT)
- Incorporate DFT values for SAC
- Calculate DFT blend values of mixture designs
- Build test sections to correlate DFT blend values

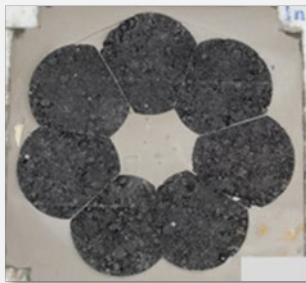


Dynamic Friction Test (DFT)

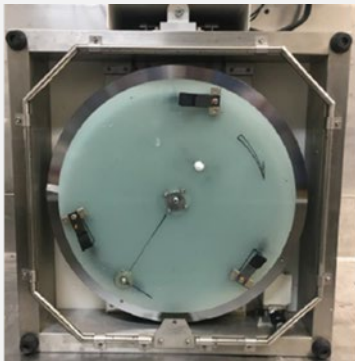
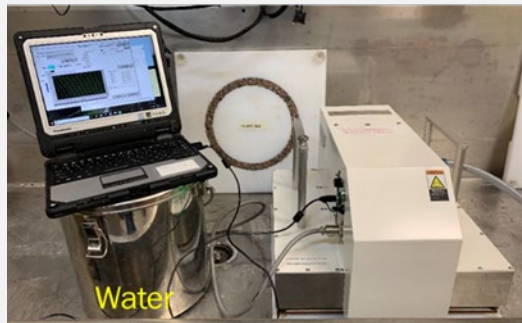
- Test measures a friction value on wet surfaces
- Rings created with aggregate or hot mix asphalt molds
- Spinning disk with 3 rubber sliders is dropped on wet sample
- Disk spins while contacting the wet aggregate surface



Aggregates

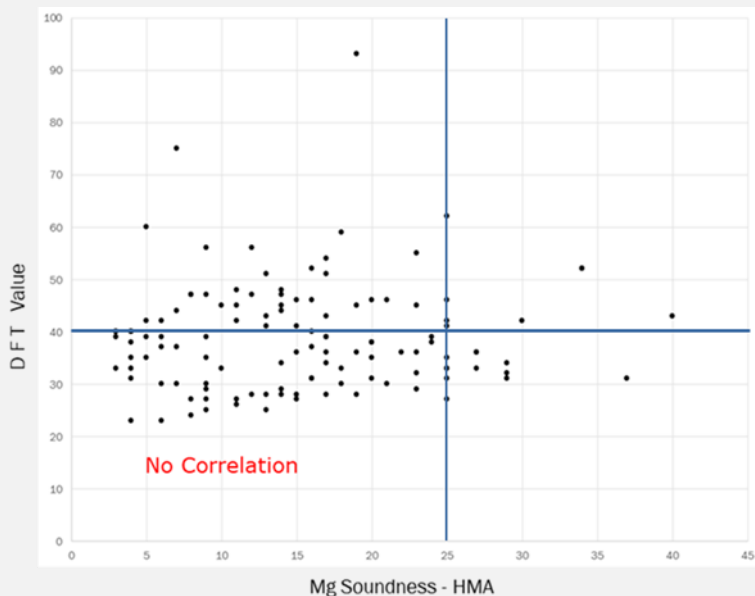


Hot Mix Asphalt



Surface Aggregate Classification

- MTD has been running DFT on aggregate sources since 2017
- Developed a draft test method for DFT

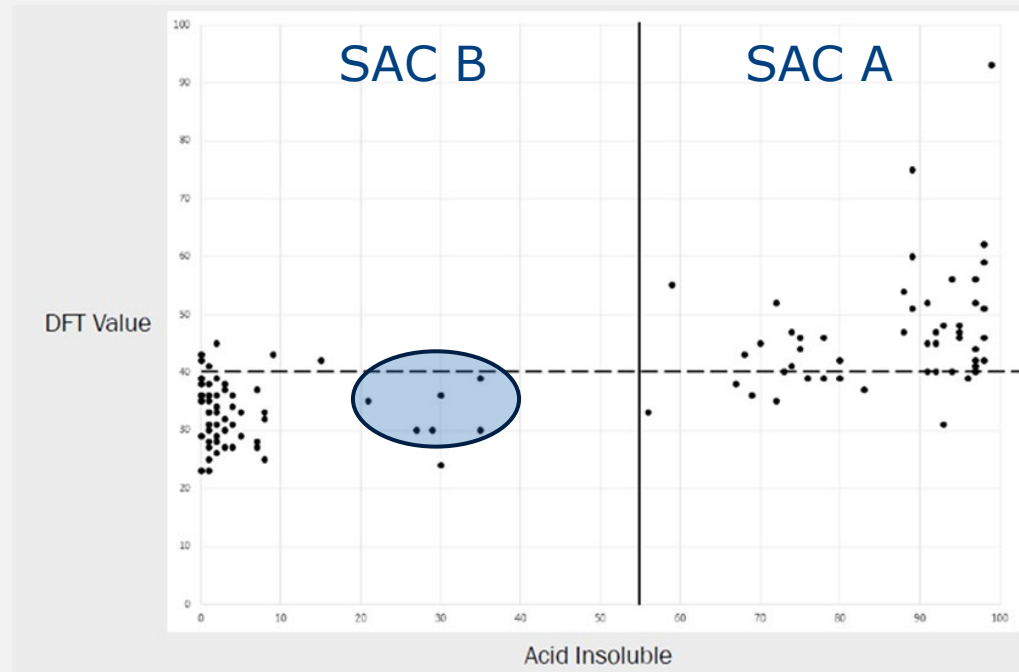


Surface Aggregate Classification Criteria

Property	Test Method	SAC A	SAC B
Acid Insoluble Residue, % min	Tex-612-J	55	-
5 Cycle Mg Sulfate Soundness, % max	Tex-411-A	25	30

DFT Correlation with Acid Insoluble (AI)

- DFT values compared to AI for SAC A & B sources
- In general, AI higher than 55 will produce a high DFT value
- DFT does a good job separating aggregate sources with lower AI values



Implementation of DFT in the AQMP

- Run at least one more DFT on all aggregate sources
- Evaluation of SAC B aggregate sources with high DFT values
- Include DFT value to the aggregate classification criteria

Property	Test Method	SAC A	SAC B
Acid Insoluble Residue, % min	Tex-612-J	55	-
Dynamic Friction Value, min	Tex-XXX-F	?	-

Aggregates rated as SAC A have an acid insoluble of 55 **or greater or Dynamic Friction Value of ? or greater.*

EXAMPLE

ABC Aggregate Source

- AI of 52
- DFT higher than ?

Aggregate source ABC is classified as SAC A

HMA Mix Design Bended DFT Value

- DFT values used to calculate a blended value for the mix
- Blended DFT value will be based on gradation and % retained on the #4 or #8 sieve
- *DFT value of 30 assigned for RAP*

	Stockpile 1	Stockpile 2	Stockpile 3	Stockpile 4	Stockpile 5
Aggregate	Igneous	Limestone	Limestone	Limestone	RAP
SAC	A	B	B	B	B
DFT Value	43	32	32	32	30
Bin %	35.0	15.0	30.0	5.0	14.5
Sieve Size	Sieve Analysis				
1"	100.0	100.0	100.0	100.0	100.0
3/4"	100.0	100.0	100.0	100.0	100.0
1/2"	100.0	99.0	100.0	100.0	100.0
3/8"	99.0	68.0	100.0	100.0	83.0
#4	35.0	6.0	99.9	100.0	51.0
+ #4	65.0	94.0	0.1	0.0	49.0
% Used	22.8	14.1	0.0	0.0	7.1
Normalized	51.7	32.1	0.1	0.0	16.2
Stockpile DFT	22	10	0	0	5
Blend DFT	38				

Current Friction Research Projects

- 0-7212 "Incorporating Lab Skid Measurements into the Balanced Mix Design Process"
- 0-7108 "Evaluate the Importance of Fine Aggregate in Achieving Adequate Skid Resistance in TxDOT Hot Mixes"
- 5-7025 "Pilot Implementation of Surface Aggregate Classification (SAC) of Reclaimed Asphalt Pavement (RAP)"
- Interagency Contracts (IAC)



Research and
Technology
Implementation
Division (RTI)



Next Steps

- Field Sections
 - Continue monitoring existing test sections
 - Planning additional BMD test sections
 - Verification of SAC A RAP
- District Support
 - Evaluation of low skid pavements
- Industry Partnership
 - Mix designs

Additional Materials Quality Initiatives

- Collaboration with industry and districts
- Reviewing HMA sampling procedures (Tex-222-F)
- Preparing RAP management guidance document
- Continuing evaluating High Performance Grade (HPG) Binders
 - Monitoring existing projects
 - Research projects



Questions

