Texas Department of Transportation

Wet Surface Crash Reduction Dynamic Friction Test (DFT)

Materials and Tests Division

Soils & Aggregates Section

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- Wet Surface Crash Reduction Program
  - ✓ Pavement Friction
  - ✓ Skid Resistance
  - ✓ Resistance to aggregate polishing

- Does not relate with aggregate physical properties.
  - ✓ Degradation
  - ✓ Durability
  - ✓ Hardness
  - ✓ Soundness

2

➢ DFT measures friction values on wet pavement surface (ASTM E1911).

  ✓ *Roadway field test.*

  ✓ *Nationally recognized and accepted, not a new test.*

➢ Spinning disk with 3 rubber sliders dropped onto wet pavement as disk rotates.

➢ Friction measured from 50 to 5 mph.

  ✓ *Reported DFT values at*

     37, 25, and 12 mph

     (60, 40, and 20 kph).
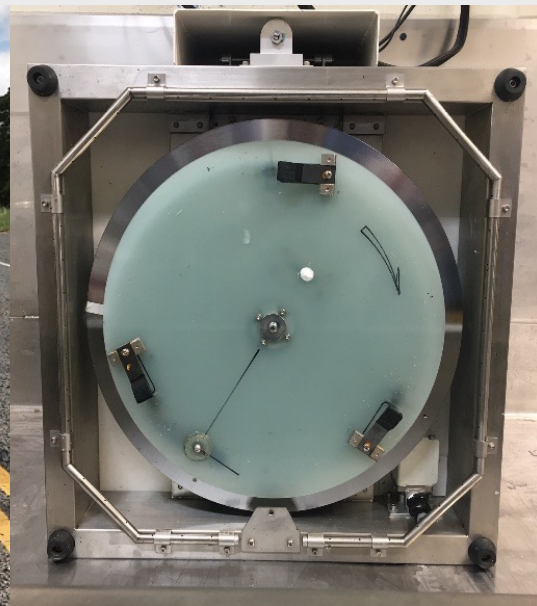
TxDOT laboratory test using DFT.

- ✓ *Only Maryland DOT has a laboratory test procedure and published specification.*

- ✓ *TxDOT test method is easier and faster to run.*

Aggregate polished using Micro-Deval, TxDOT test procedure.

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➢ Bondo is placed into the ring as filler to hold the aggregate in place.

➢ Aggregate is shaken and spread from the trowel into the ring. <u>*Minimal hand placement*</u>.

➢ Tweezers are used to remove excess aggregate and to align particles.

➢ Roller is used to create a level, *not flat surface*.
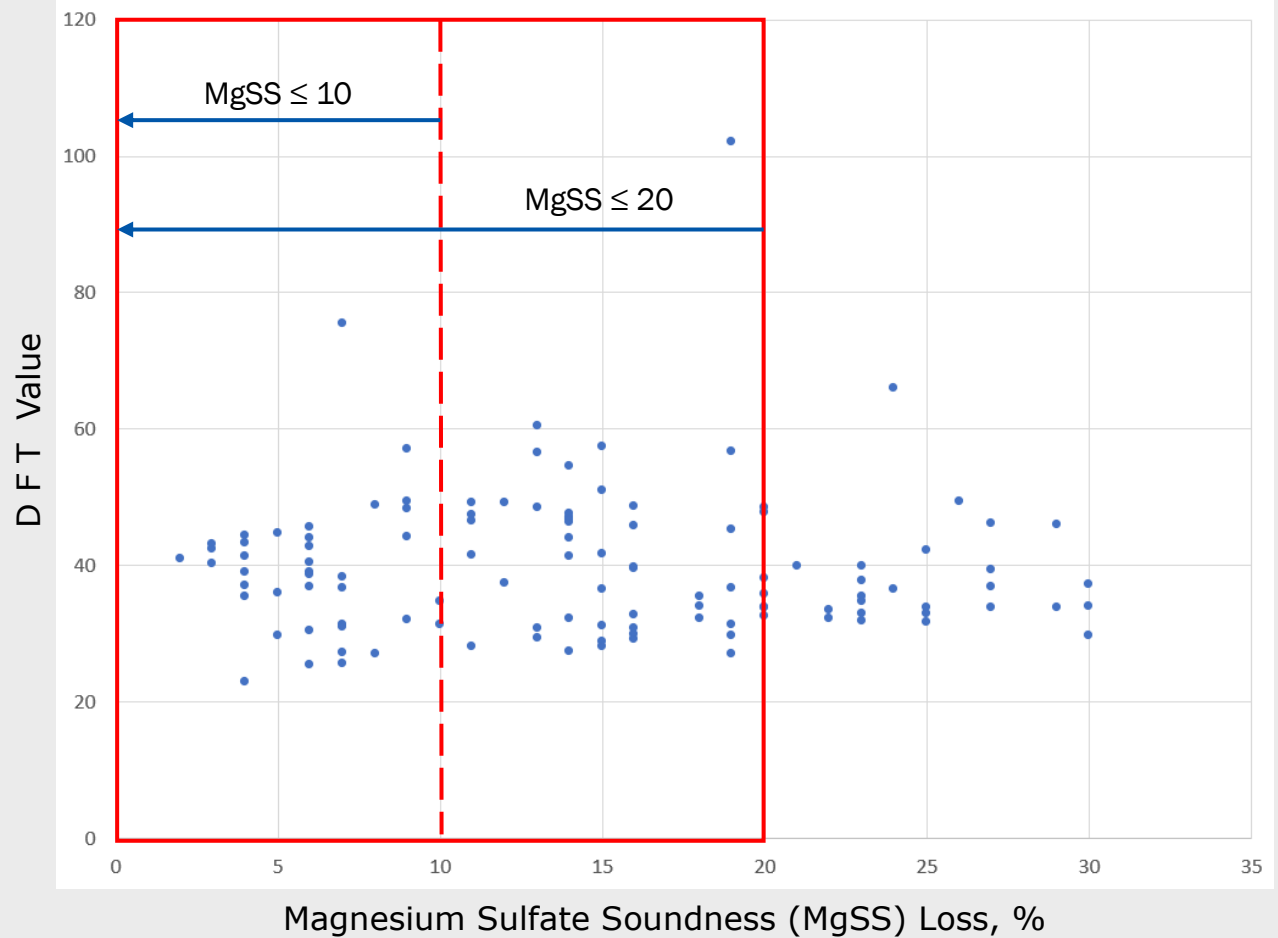

6

Wear and condition of sliders are checked & verified before each test using ceramic tiles.
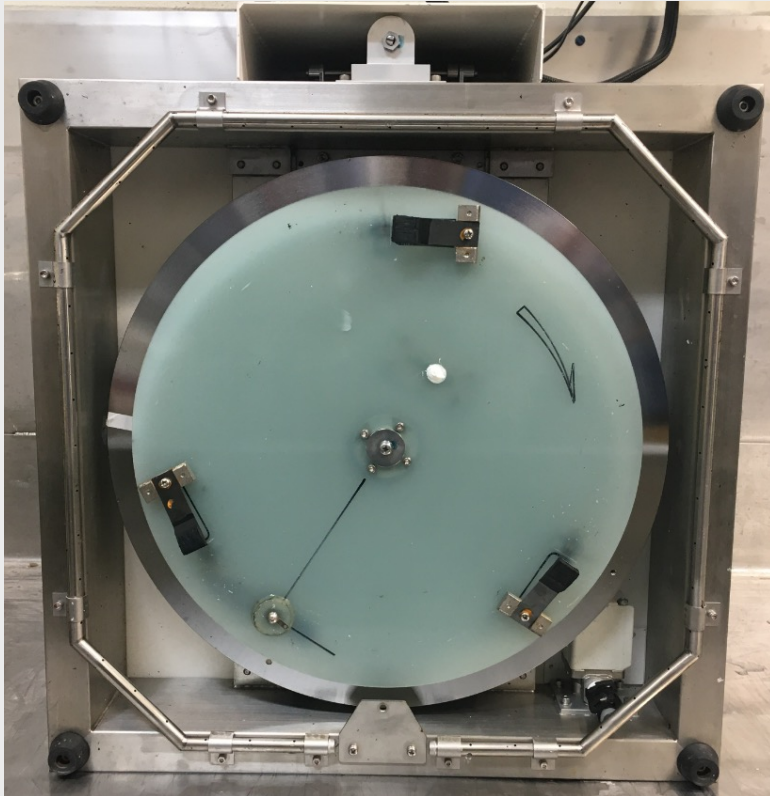
DFT values for all aggregate sources tested.

Soundness has no correlation to a physical friction test.

Risk too high for a Statewide SAC B+ based on MgSS.

MgSS ≤ 10

MgSS ≤ 20

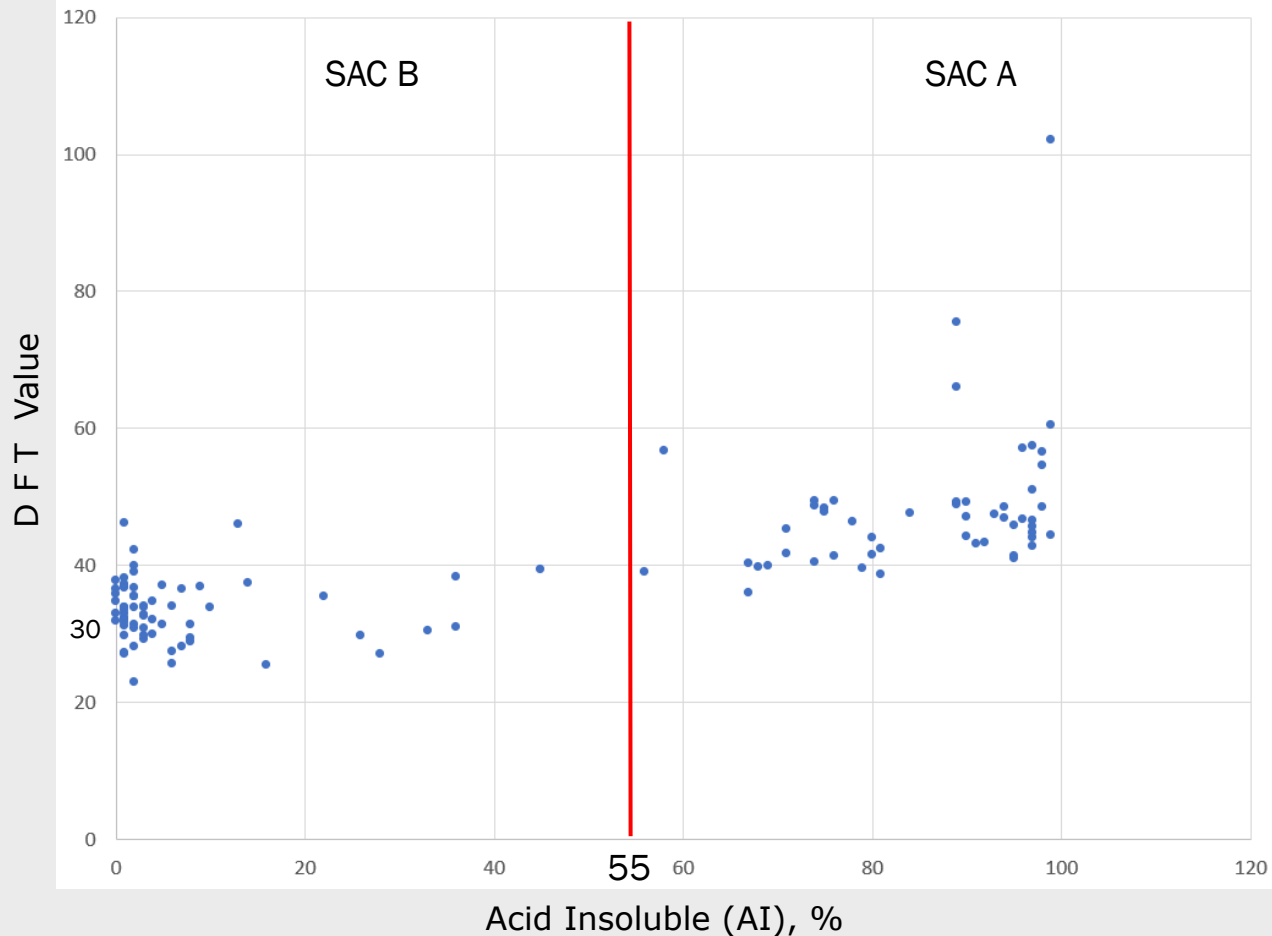D F T Value

Magnesium Sulfate Soundness (MgSS) Loss, %

8

Acid Insoluble only used for SAC A or B classifications.

Trends well with DFT. Generally, as AI increases so does DFT.

R-squared value is 0.51.

Scatter plot of DFT Value (y-axis, 0 to 120) versus Acid Insoluble (AI), % (x-axis, 0 to 120). A red vertical line at AI = 55 separates "SAC B" (left) from "SAC A" (right).

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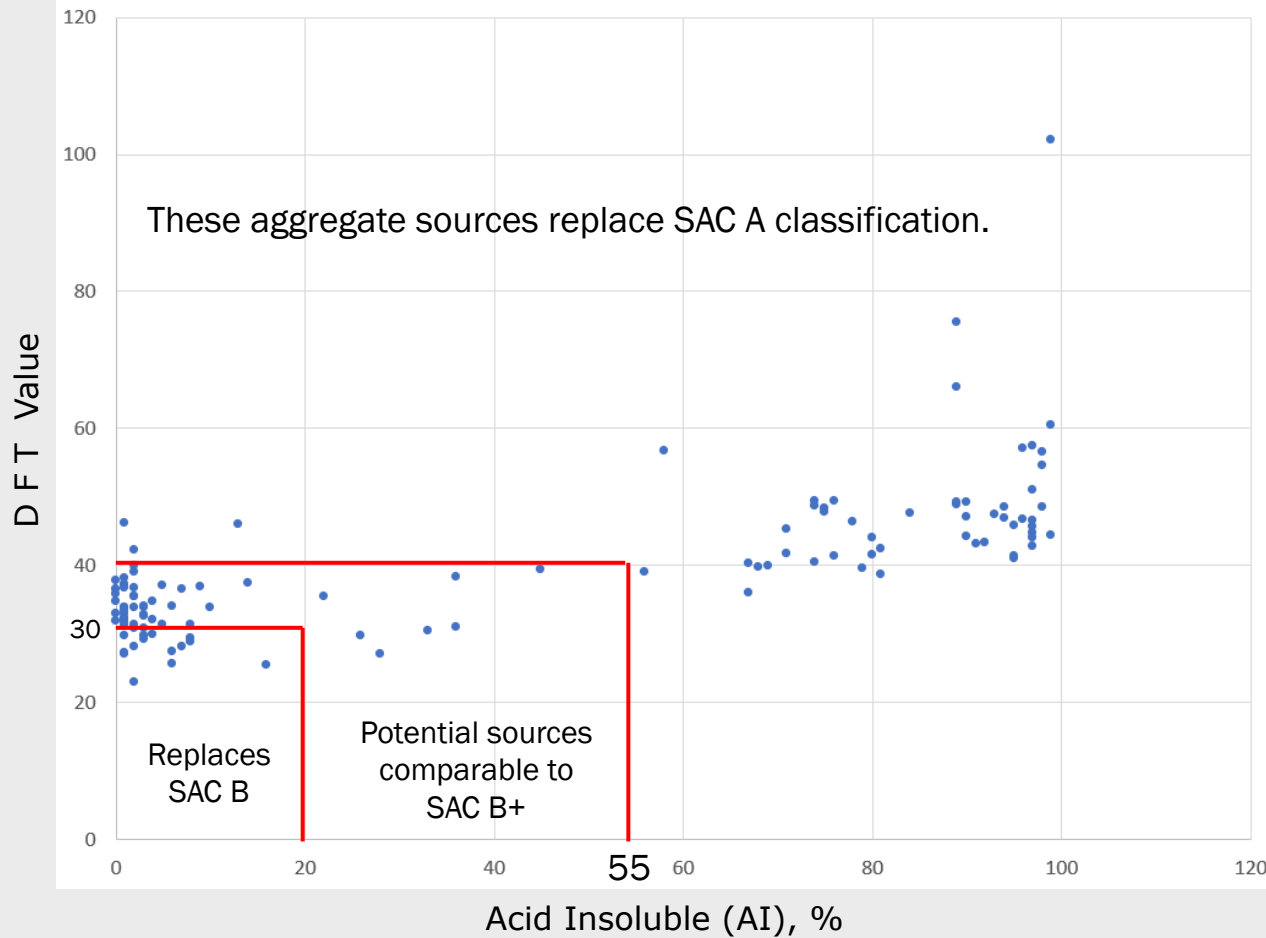
➢ Maryland DOT requires minimum DFT of 40 for high volume roadways using SMA and Superpave.

➢ MDOT has lower DFT requirements for lower volume roadways, 30, 25, and 20.
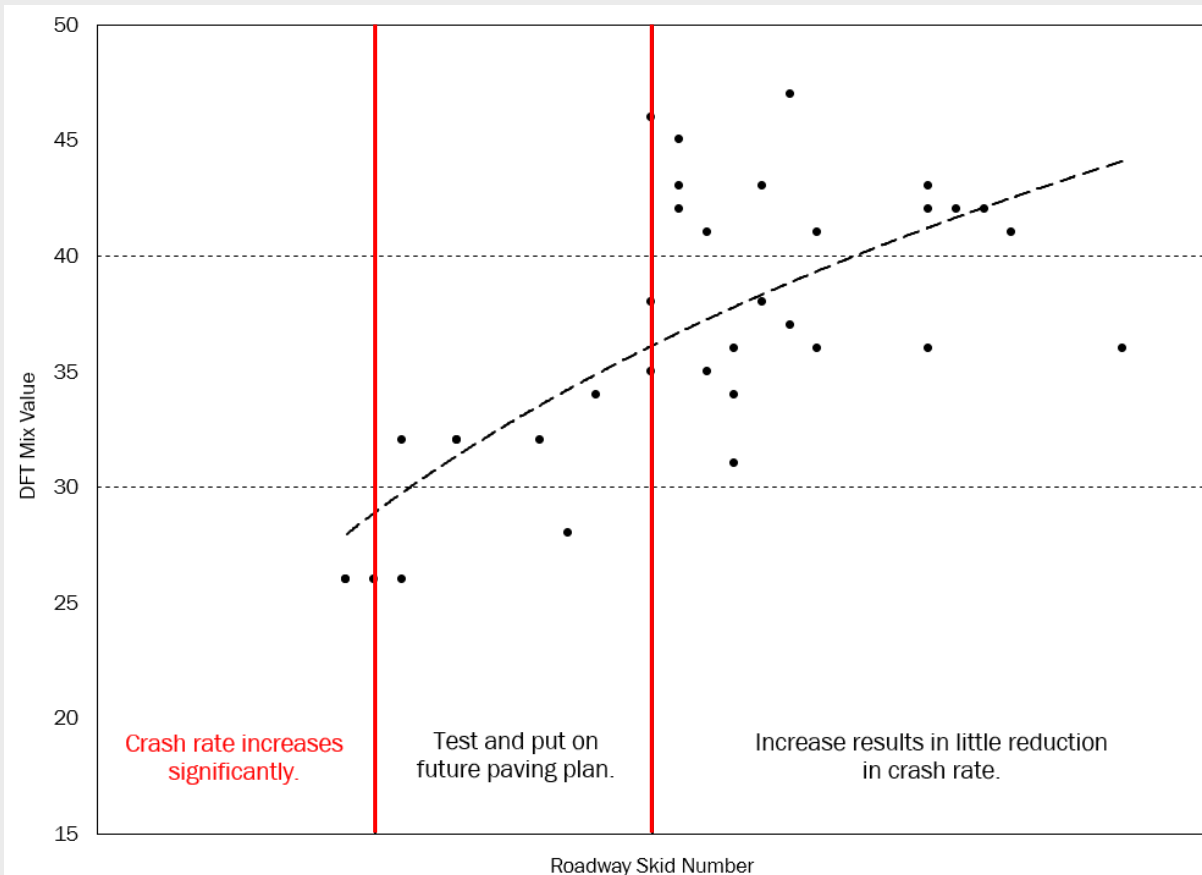
DYNAMIC FRICTION VALUE (DFV)		
Category		DFV, minimum
HDFV I	High DFV	50
HDFV II		45
HDFV III		40
SDFV IV	Standard DFV	30
SDFV V		25
LDFV VI	Low DFV	20

- ➢ Use DFT values for aggregate sources to calculate a HMA mix design DFT combined value.

- ➢ Specification would be based on a blended DFT, mix design can use whichever aggregate sources available to meet a minimum DFT combined value.

- ➢ This will reduce demand on SAC A aggregate sources.

	Stockpile 1	Stockpile 2	Stockpile 3	Stockpile 4
Region	Austin	Austin	San Antonio	San Antonio
Producer	Capitol Aggregates	Capitol Aggregates	Dean Word	Dean Word
Quarry	Delta Materials	Delta Materials	Lone Star	Lone Star
Material	Sandstone	Sandstone	Limestone	Limestone
SAC	A	A	B	B
Soundness	20	20	17	17
DFT Value	52.8	52.8	30.1	30.1
Mix Type	SP-C	SP-C	SP-C	SP-C
Bin %	13	16	11	13
Sieve Size	Sieve Analysis			
1"	100	100	100	100
3/4"	100	100	100	100
1/2"	37	98	99	100
3/8"	5	70.2	70	100
#4	3	5.5	1	48
+#4	97	94.5	99	52
% Used	12.6	15.1	10.9	6.8
Normalized	27.8	33.3	24.0	14.9
Stockpile DFT	14.7	17.6	7	4
Blend DFT	44.0			

Blend DFT value is calculated from % retained using the DFT value measured at MTD lab for each aggregate source.

- ➤ Small pool of skid data.

- ➤ Compares calculated mix design DFT value to skid, DFT not from roadway.

- ➤ DFT mix design value trends well with roadway skid values.

Scatter plot titled with y-axis "DFT Mix Value" ranging from 15 to 50 and x-axis "Roadway Skid Number". Two red vertical lines divide the chart into three zones labeled:
- **Crash rate increases significantly.**
- Test and put on future paving plan.
- Increase results in little reduction in crash rate.

Need to know:

- ✓ *Does a high DFT mix design value give us a high or better initial roadway skid number?*

- ✓ *How long will a high DFT mix design value sustain roadway skid through time?*

Chart axes: Y-axis "D F T Mix Design Value" (0–50), X-axis "Roadway Skid Number" (0–50)