Flexible Pavement Committee

Asphalt and Pavement Research Update

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July 24, 2025

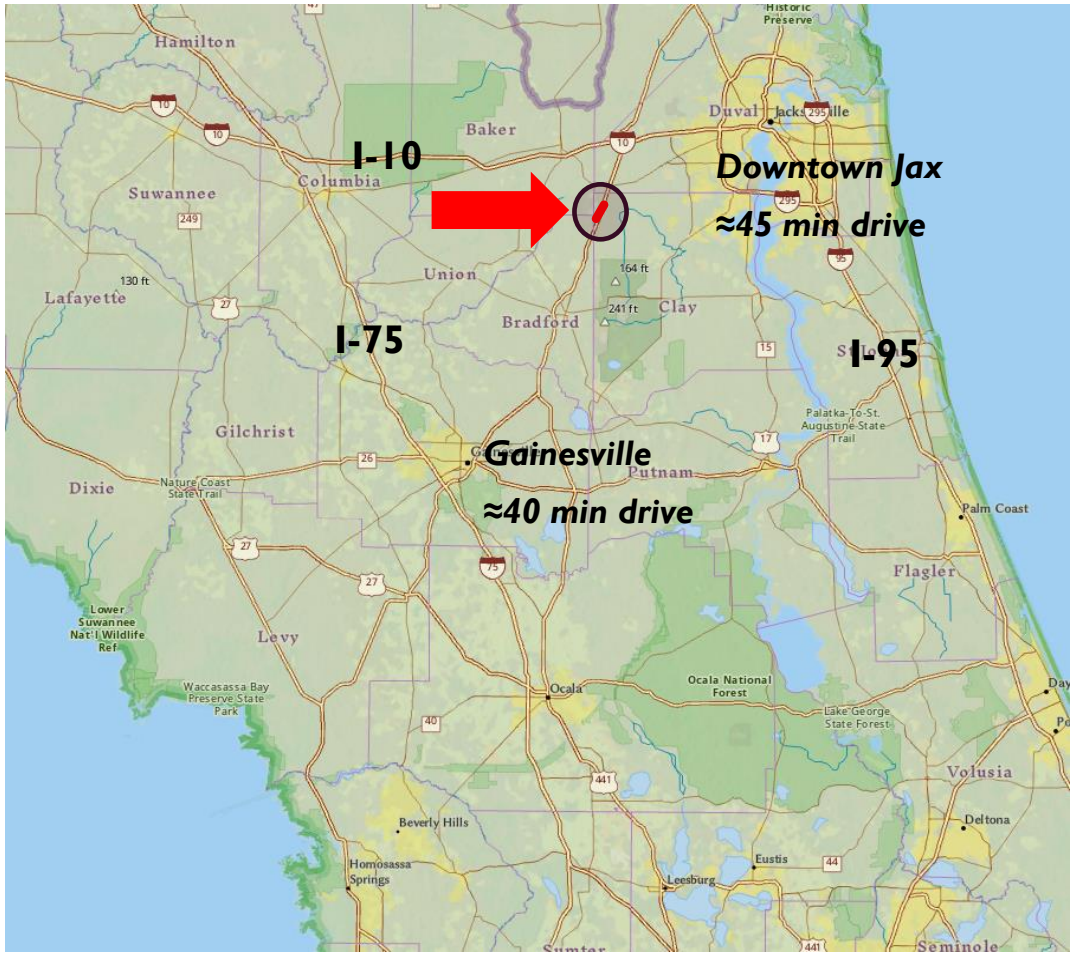
SMO Research Avenues

NCAT Test Track

Heavy Vehicle Simulator (HVS)

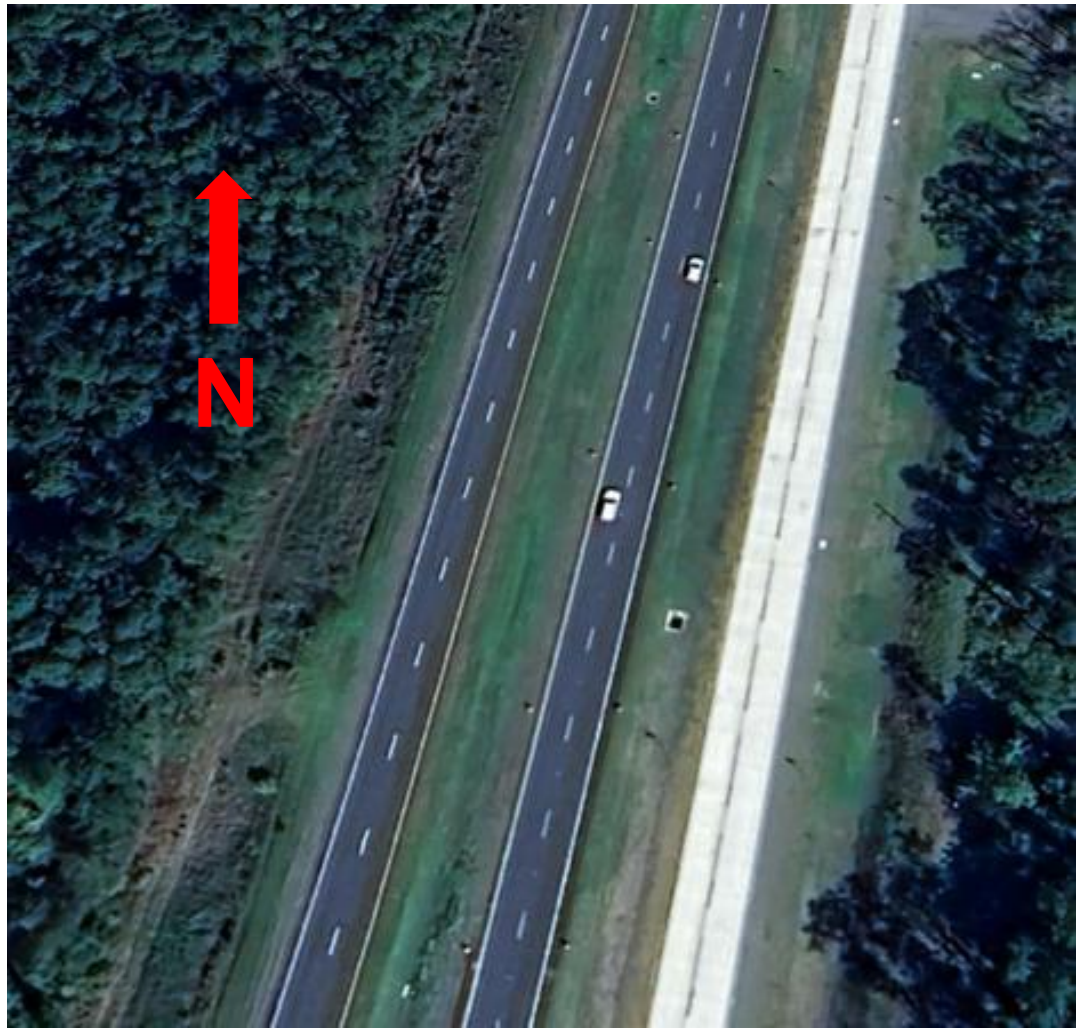
Field Trials (e.g. Test Road on US 301)

Asphalt Test Road



- US 301 (SR 200) in Clay County.
- Approximately 2.3 miles long.
- 12 test sections, 1000 ft. long.

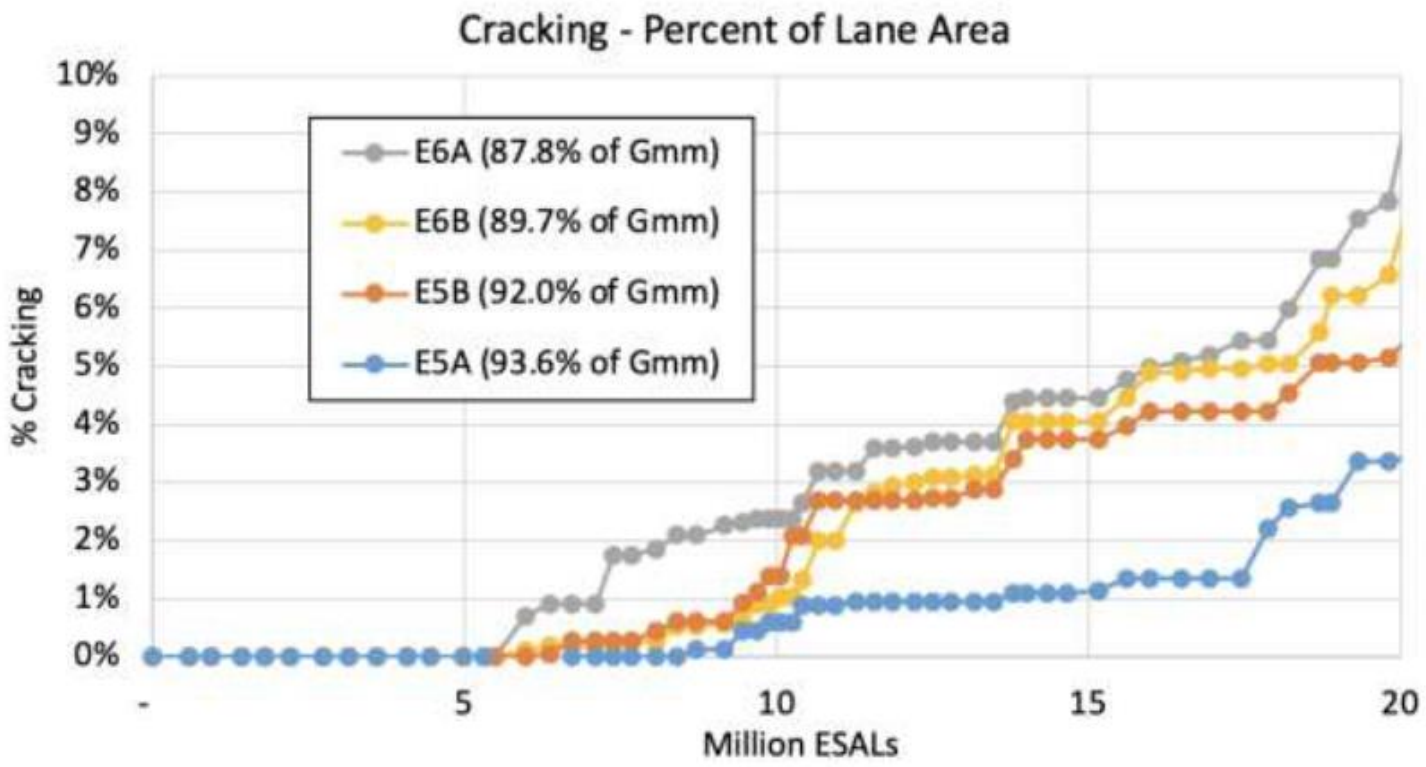
Asphalt Test Road



- **Southbound travel lanes:**
  - Asphalt Test Road
- **Northbound travel lanes:**
  - Concrete Test Road
- **Middle lanes:**
  - Diversion Lanes
- **Traffic started Sept. 26, 2024.**

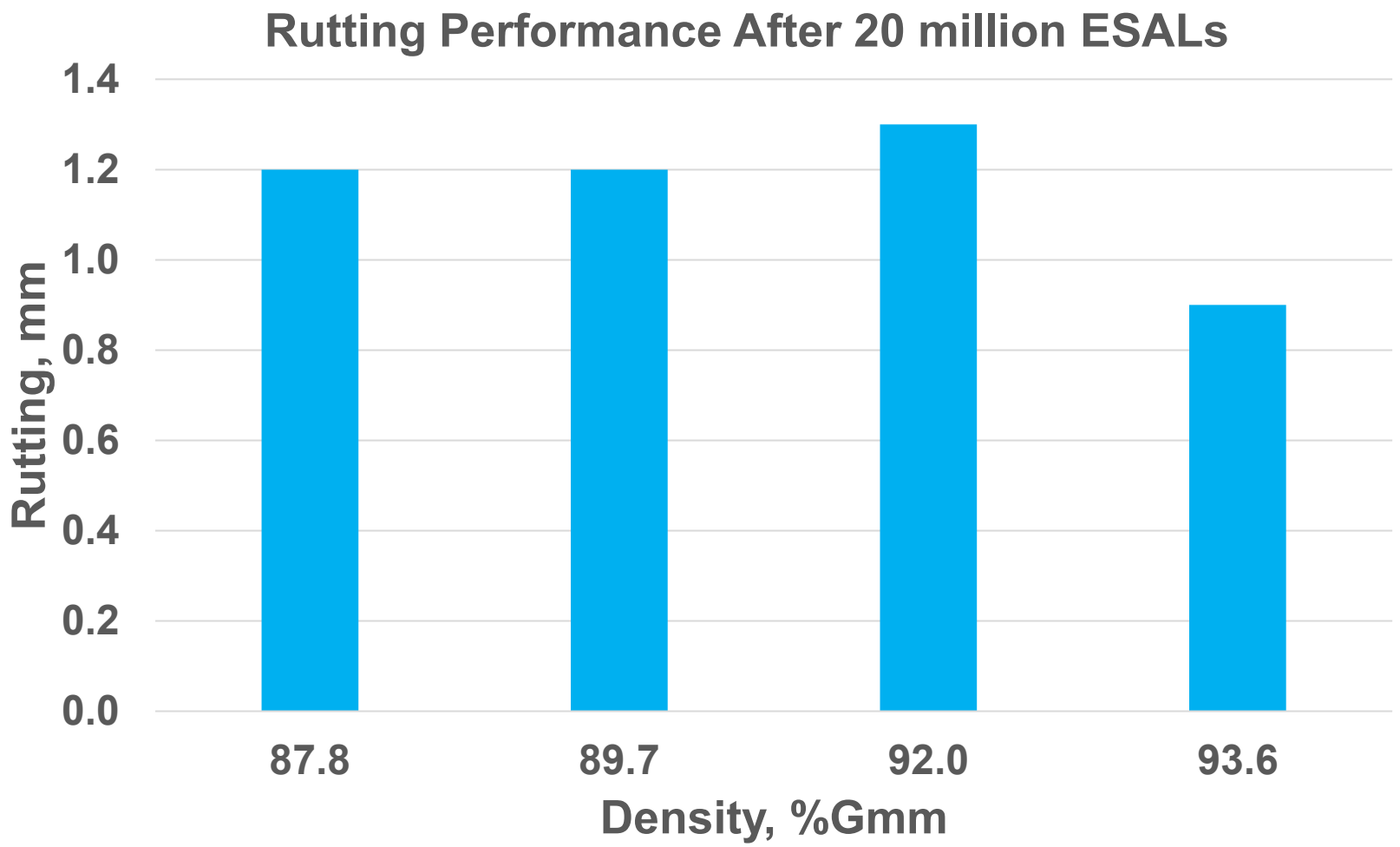
In-place Density study - NCAT

- Effect of in-place density on rutting and cracking after 20 million ESALs.



- 5 trucks
- 46 test sections
- 5 million ESALs per year
- Traffic for 2 years

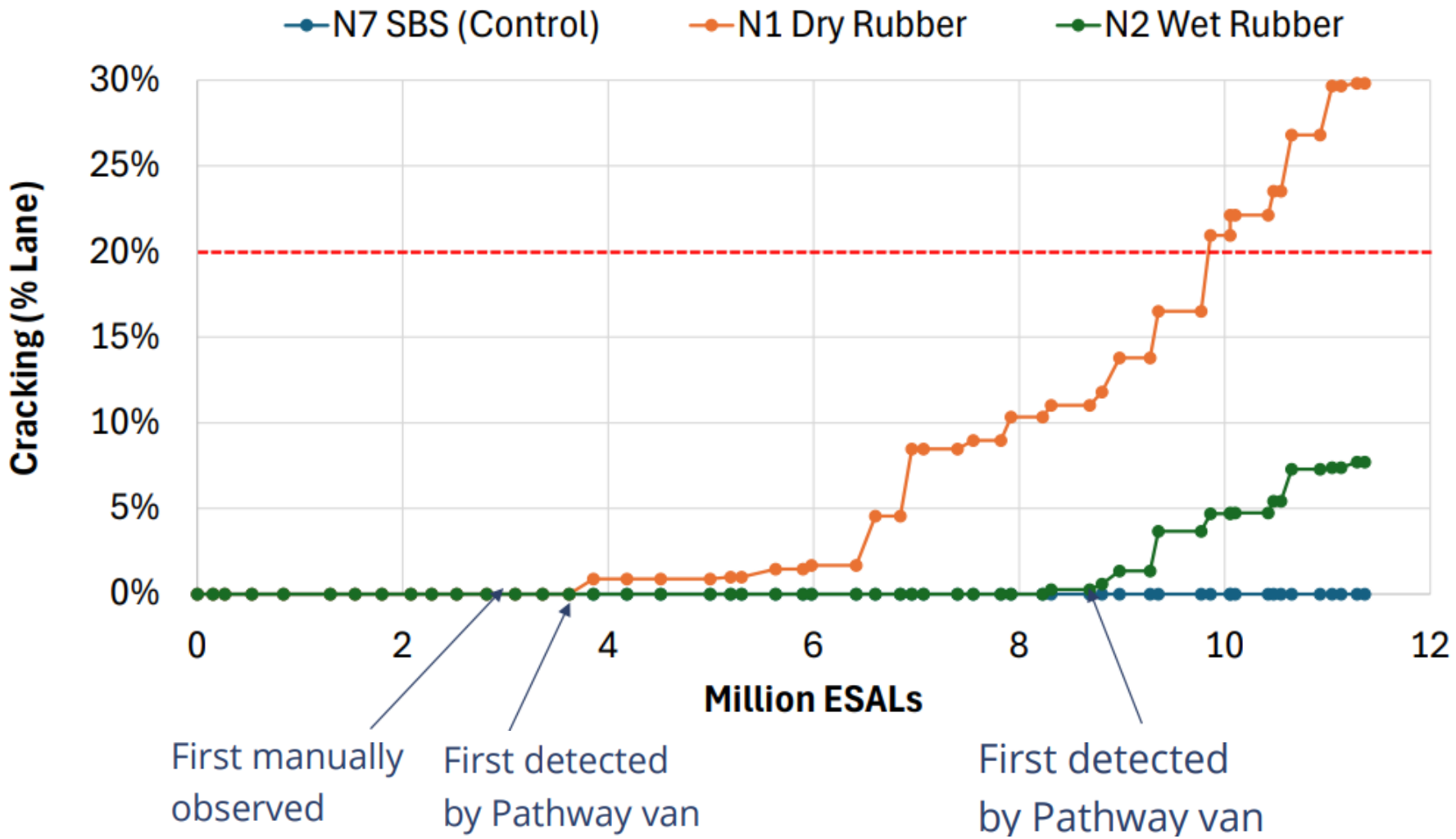
In-place Density study - NCAT



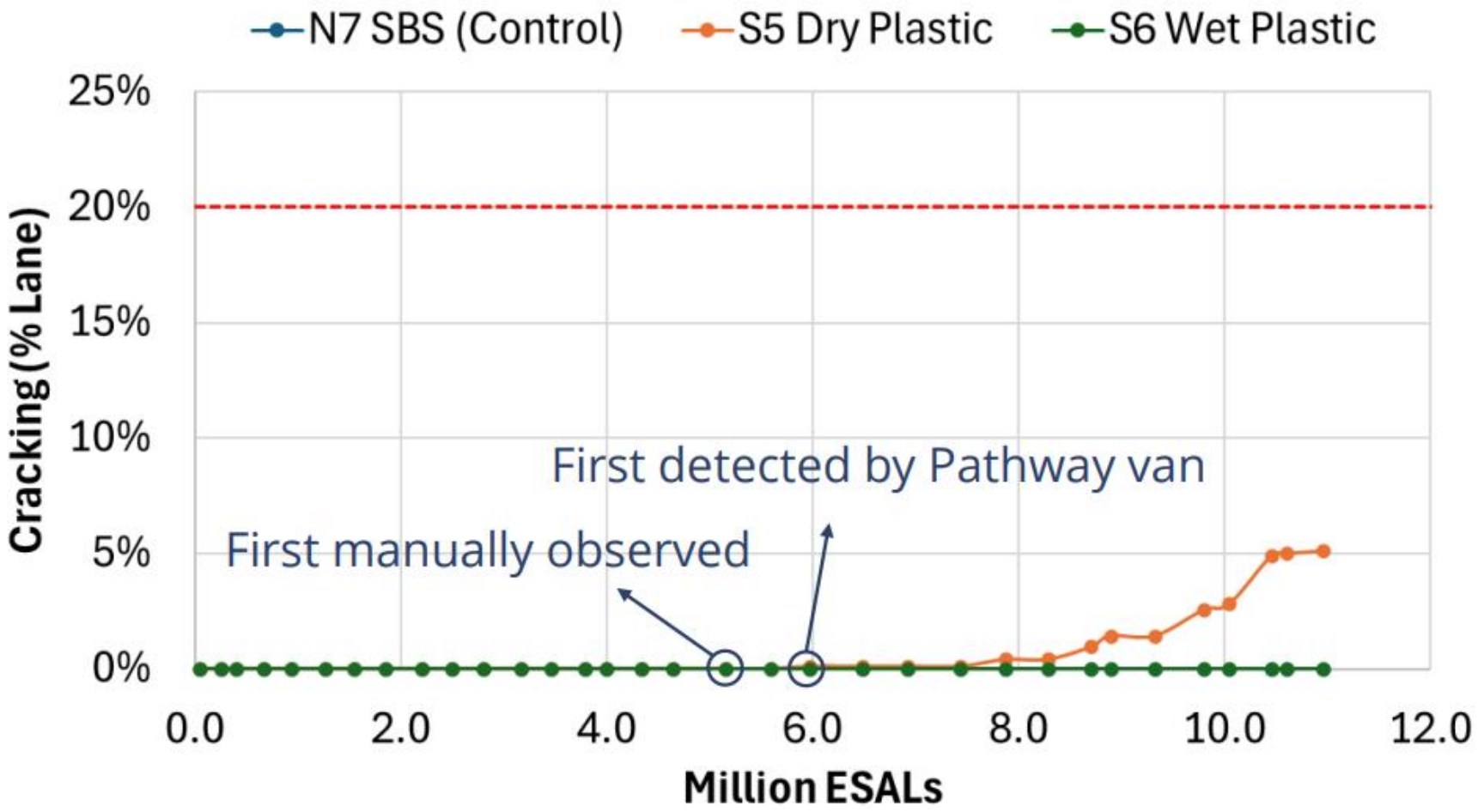
Additives Study - NCAT

- **Participating in group study examining the effects of additives on rutting and cracking:**
  - Ground tire rubber (dry and wet processes).
  - Plastics (wet and dry processes).
  - Aramid (Kevlar) fibers.
  - Control section with no additive.

Additives Study - NCAT



Additives Study - NCAT



Additives Study - NCAT

Comparison vs. SBS Control		Dry Fiber
Mix characterization	Stiffness	=
	Cracking resistance	↓
	Rutting resistance	↑
Field Performance	Rutting	=
	Cracking	=

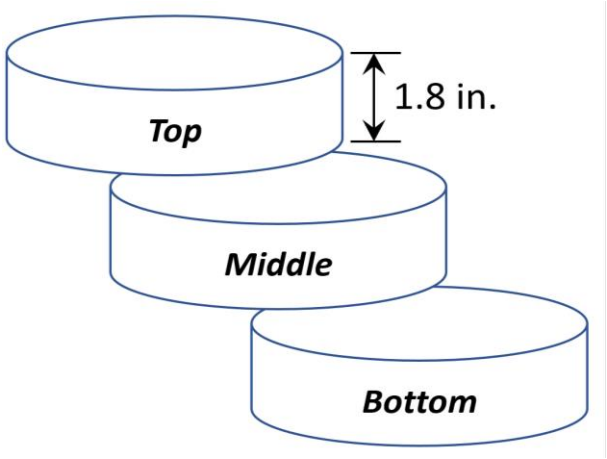
Single Lift Deep Mill/Fill - HVS

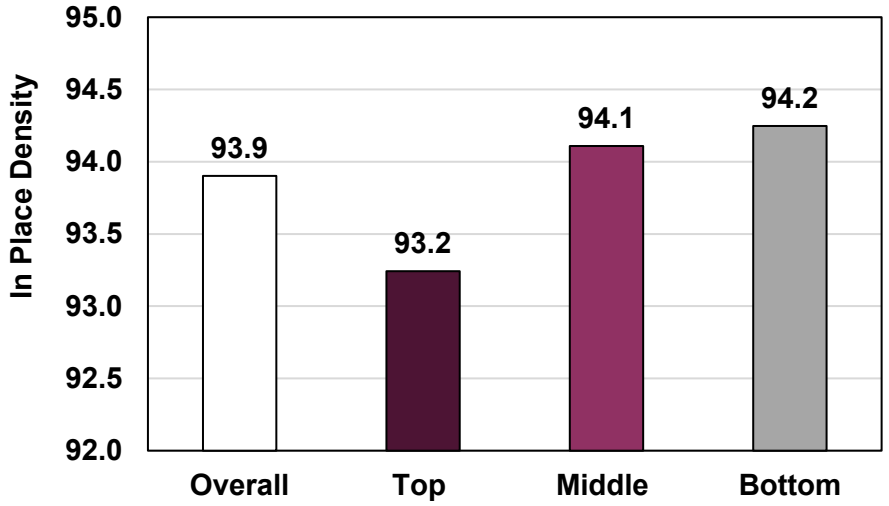
- **Background**
  - Multi-layer paving involves additional paving processes, resulting in longer lane closures and increased traffic disruptions.

- **Objectives**
  - Evaluation of constructability of the thick lift mill/fill
  - Evaluation of rutting performance

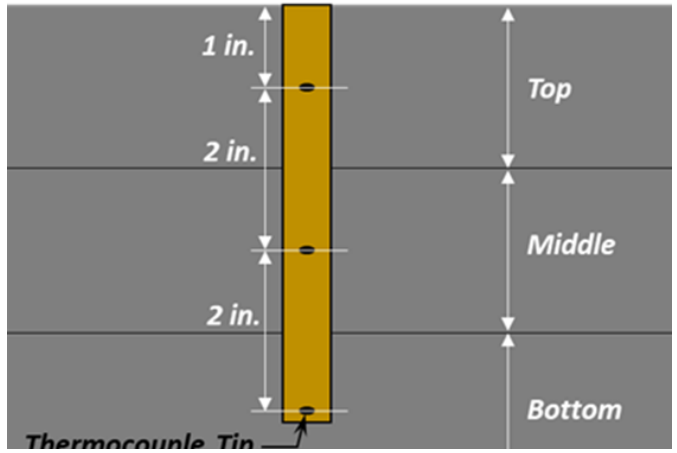
Single Lift Deep Mill/Fill - HVS

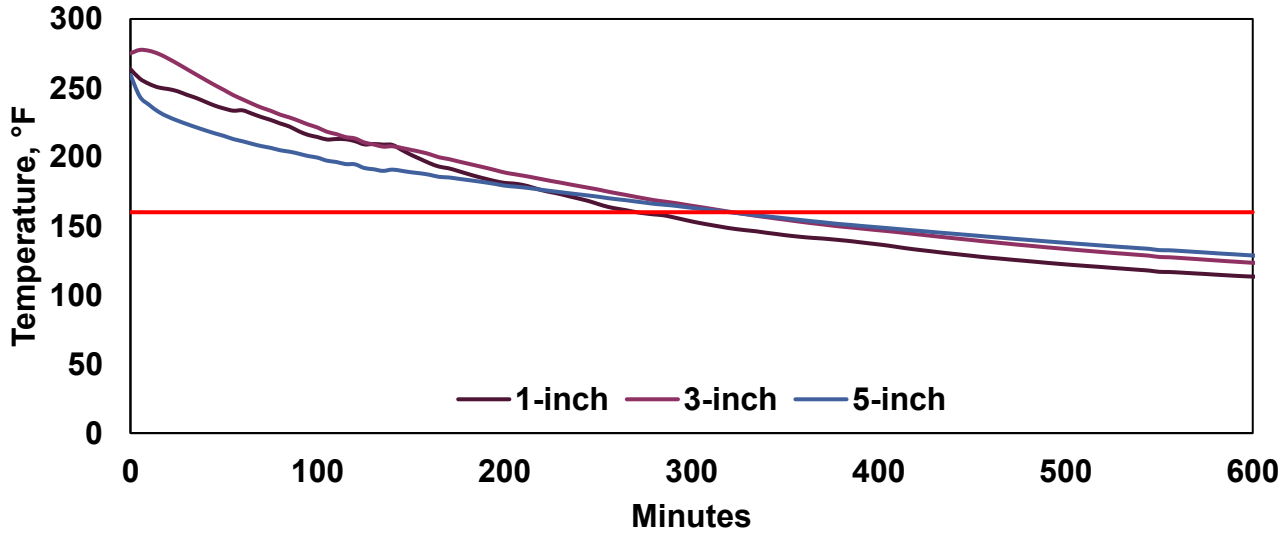
- In-place Density





- Temperature History





Single Lift Deep Mill/Fill – US 301 Test Road

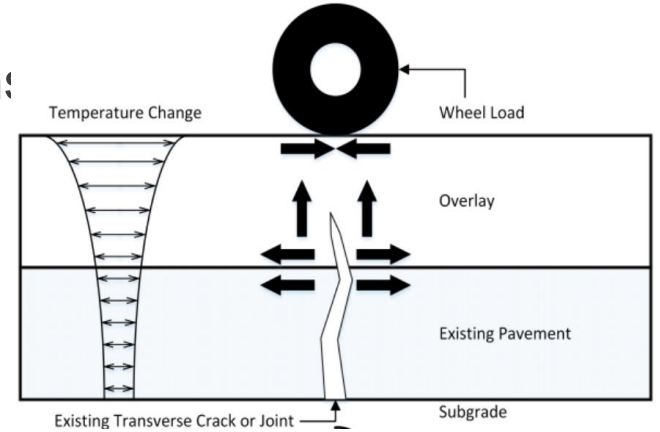
10A Deep Lift (76-22)	10B Deep Lift (HP)
0.75" FC-5	0.75" FC-5
1.5" Type SPM	1.5" Type SPH HP Binder
6.0" Type SPM	6.0" Type SPH HP Binder
Existing Base	Existing Base

In-place density
95.9%

In-place density
94.8%

Crack Relief Mixture – HVS

- **Background**
  - Deeper pavement cracks require milling and filling at greater depths which increases resurfacing costs and time



- **Objectives**
  - Evaluate the effectiveness of the crack relief asphalt mix in preventing bottom-up reflective cracking

Crack Relief Mixture – HVS

Test Section Design

1.50 in. Control
1.50 in. Control
2.5 in. Sawcut Existing Layer

Lane 1 – Section 1

1.50 in. HP Mix
1.00 in. HP CRM
2.5 in. Sawcut Existing Layer

Lane 2 – Section 1

2.00 in. Control
1.00 in. HP CRM
2.5 in. Sawcut Existing Layer

Lane 3 – Section 3

1.50 in. Control
1.00 in. HP CRM
2.5 in. Sawcut Existing Layer

Lane 3 – Section 1

1.50 in. Control
1.25 in. HP CRM
2.5 in. Sawcut Existing Layer

Lane 3 – Section 2

1.50 in. Control
1.00 in. PG 76-22 CRM
3.5 in. Sawcut Existing Layer

Lane 4 – Section 3

1.50 in. HP Mix + 20% RAP
1.00 in. HP CRM
2.5 in. Sawcut Existing Layer

Lane 4 – Section 1

1.50 in. Control
1.25 in. PG 76-22 CRM
3.5 in. Sawcut Existing Layer

Lane 4 – Section 2

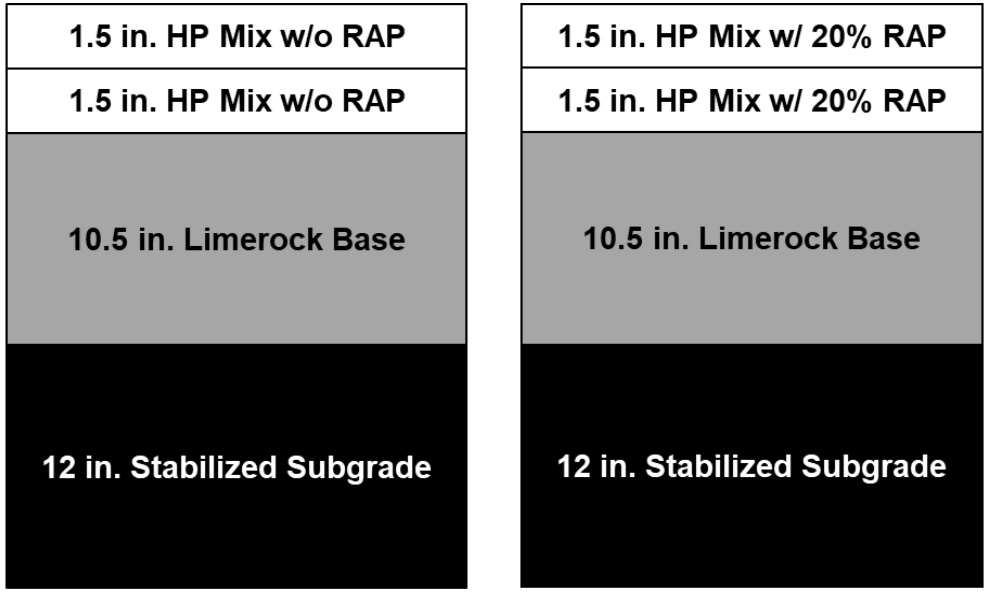
Crack Relief Mixture – US 301 Test Road

8A Reflective Cracking	8B Reflective Cracking (Control)
0.75" FC-5	0.75" FC-5
1.75" Type SPM	3.0" Type SPM
1.25" CRM	
Existing Asphalt	Existing Asphalt
Existing Base	Existing Base

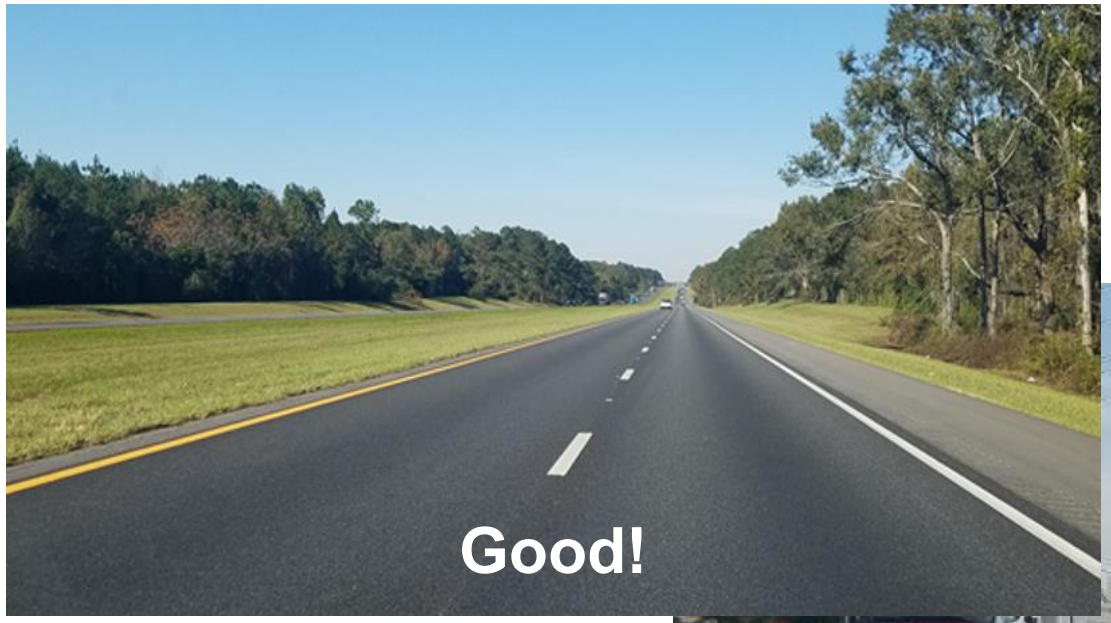
Saw cut cracks

RAP in HP Mixtures – HVS

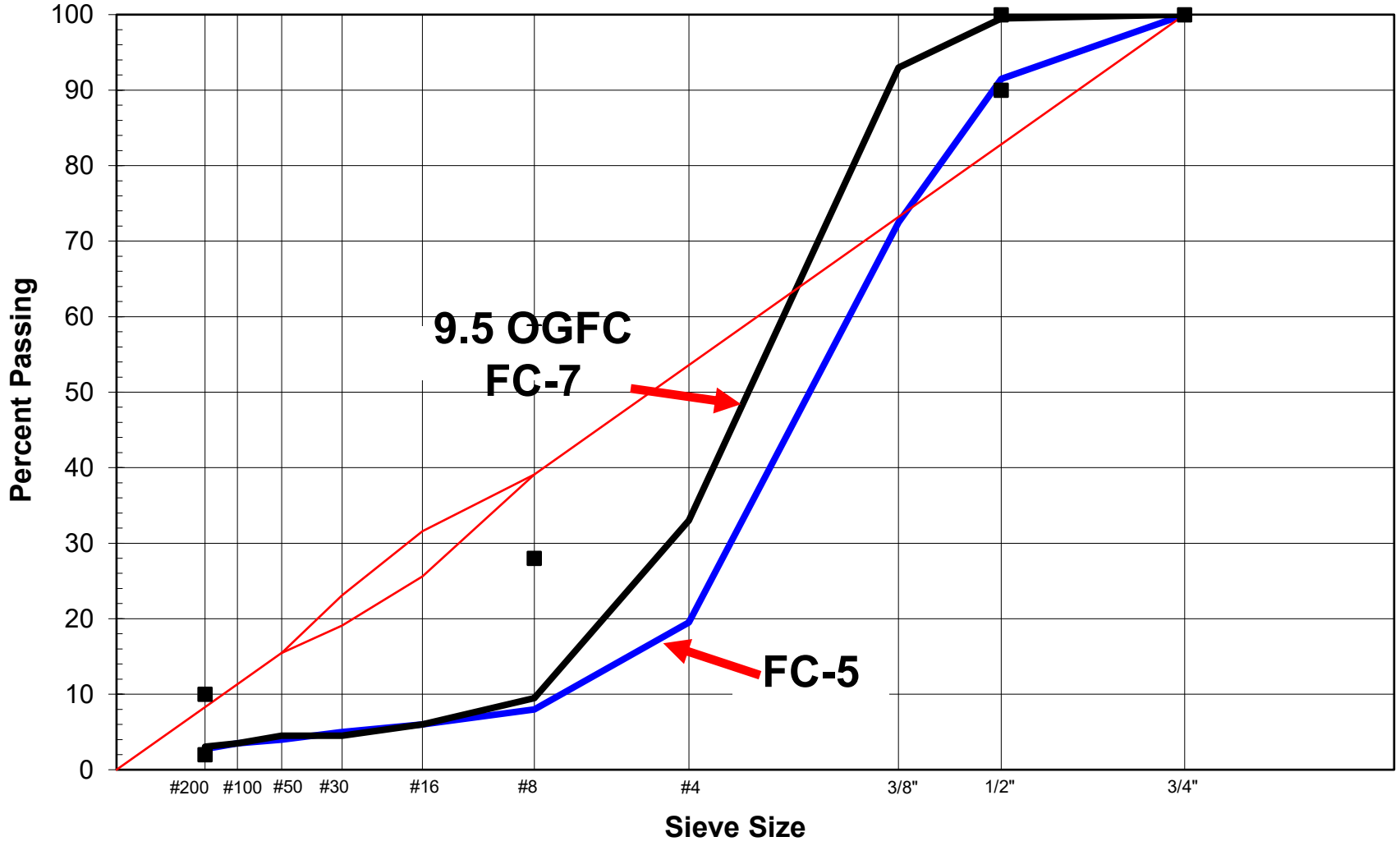
- **Background**
  - Contributes to the department's efforts to improve sustainability of the State highway system
  - Reduce the cost of High-Polymer (HP) asphalt mixes
- **Objectives**
  - Evaluate the impact of incorporating 20% RAP on the cracking and rutting performance of hp asphalt mixtures
- **Test Sections**
  - 3-inch SP 12.5 HP Mix – No RAP (Control Section)
  - 3-inch SP 12.5 HP Mix with 20% RAP (Experimental Section)



FC-5 and FC-7 Study - NCAT



FC-5 and FC-7 Study - NCAT



FC-5 and FC-7 Study – US 301 Test Road

11 FC-5 Only (Control)	12 FC-Q (FC-7) Only
1.0" FC-5	1.0" FC-Q(7)
Existing Asphalt	Existing Asphalt
Existing Base	Existing Base

Longitudinal Grooving of HMA Surface – HVS

- **Background**
  - Concerns of raveling and clogging of air voids in OGFC
  - Feasibility of longitudinal grooving as an alternative to OGFC layers on high-speed arterial roadways

- **Objective**
  - Assess the impact of grooving on rutting and cracking resistance
  - Assess the grooving impact on structural capacity
  - Assess the long-term durability of the grooved asphalt layer

- **Two Grooving Patterns**
  - Grooving pattern #1: ¾” spacing, 1/8” width, 1/8” depth
  - Grooving pattern #2: ¾” spacing, 1/8” width, 1/4” depth

Pavement Wearing and Friction – SMO lab

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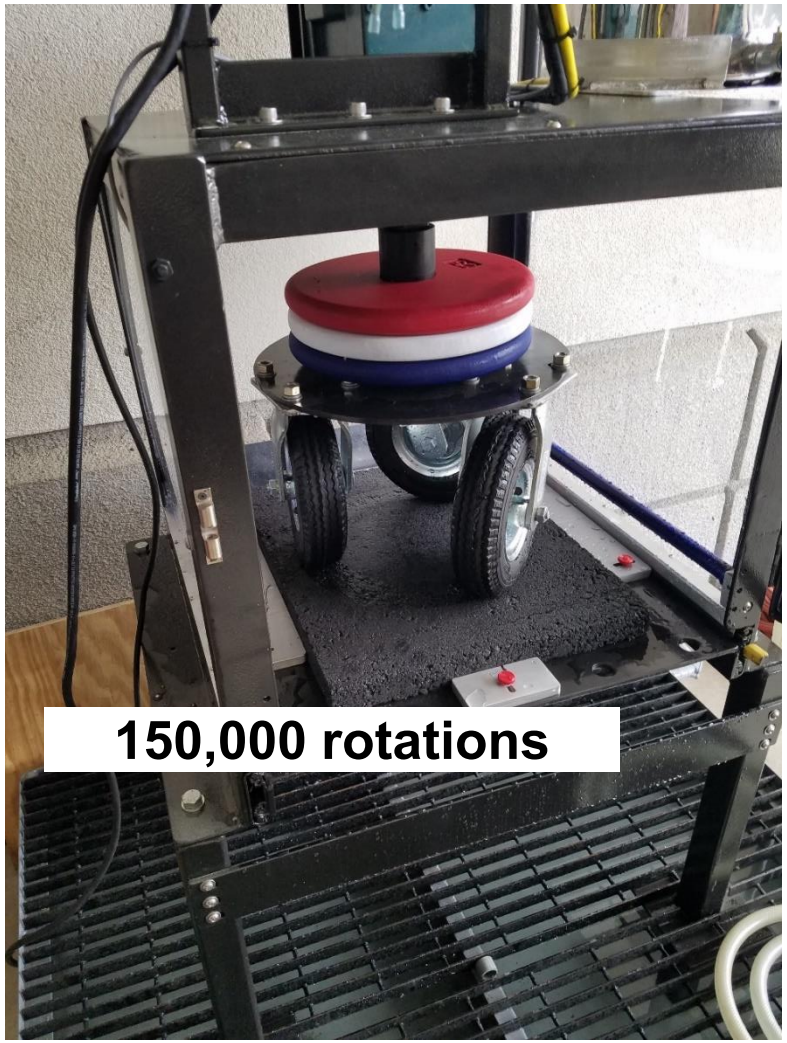
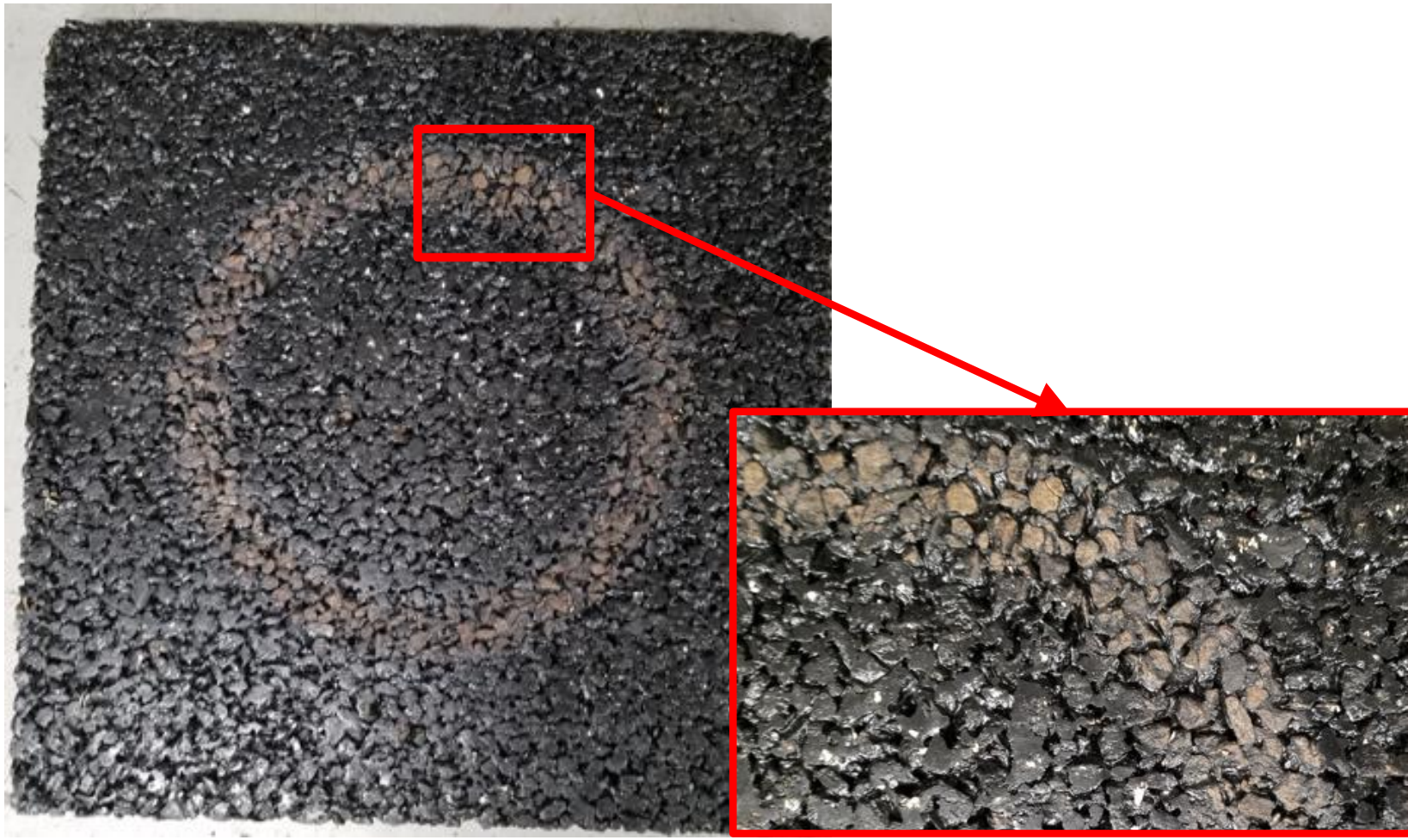
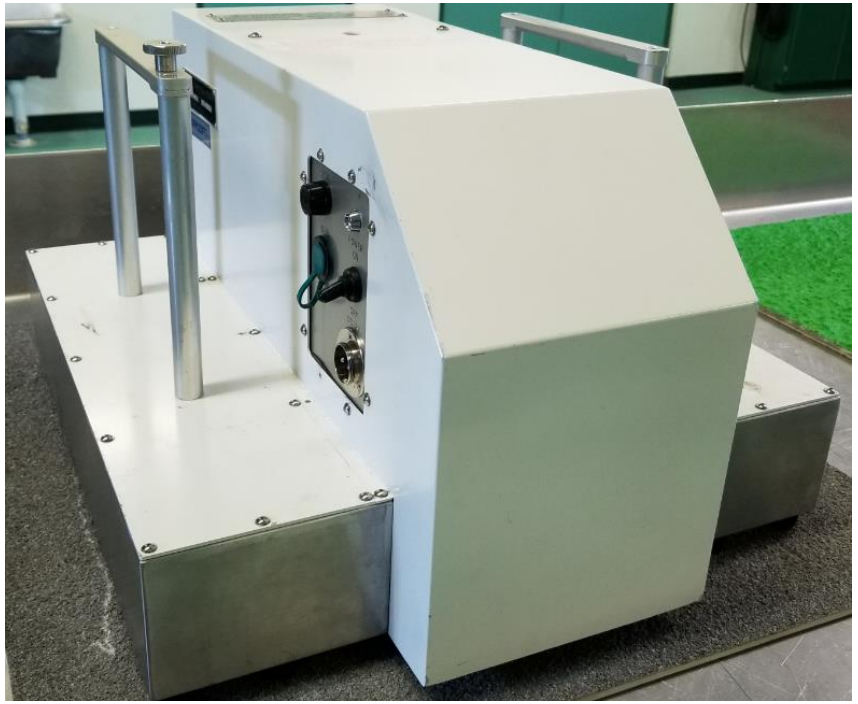
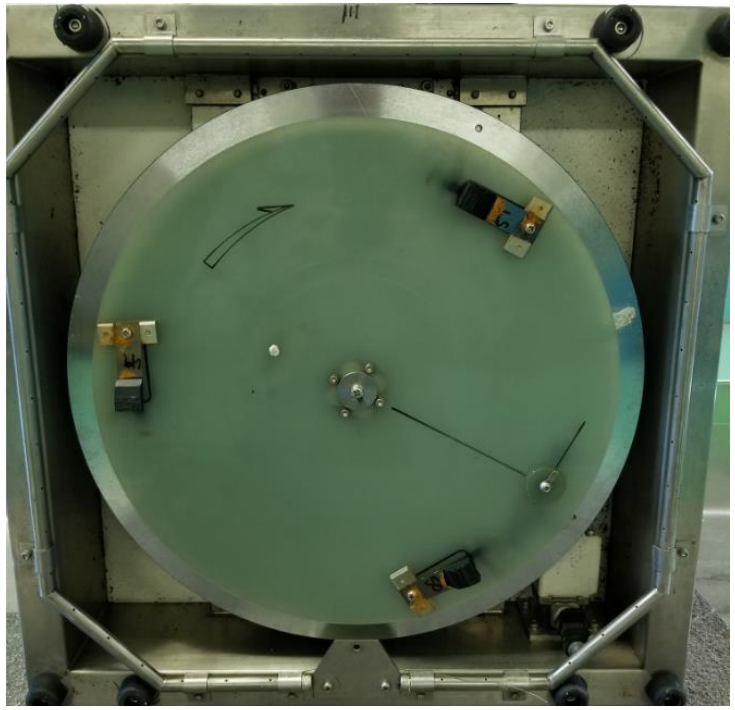




Pavement Wearing and Friction – SMO lab



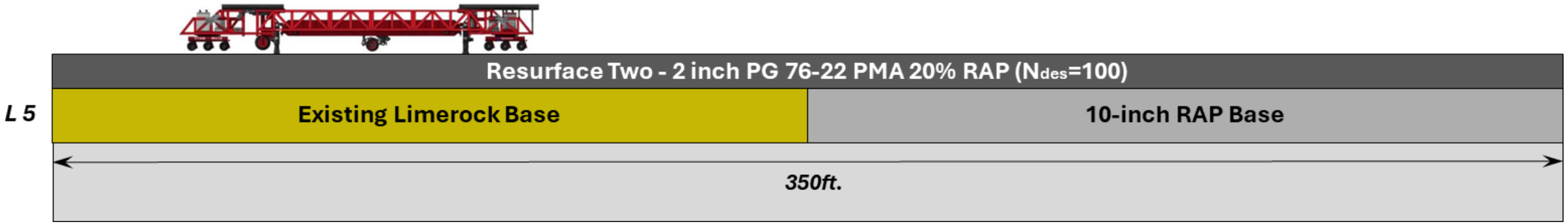


Pavement Wearing and Friction – SMO lab

- Allows expedited evaluation (4-6 weeks once materials received).
- Previous process required a roadway test section and the application of six million vehicle passes (2-3 years).
- Results so far:
  - *Approved 20% RAP in limestone dense graded friction course.*
  - *Efficiently approved 4 new friction aggregate types with up to 20% RAP to reduce the impact of aggregate shortage in Florida.*

RAP Base Study - HVS

- **Objective: Evaluate un-stabilized RAP as a base.**
- **Construction:**
  - Two 5-inch layers of RAP base.
  - Two 2-inch layers of HMA (SP-12.5, PG 76-22 with 20% RAP).
- **Testing:**
  - Testing in-progress for rutting and cracking.



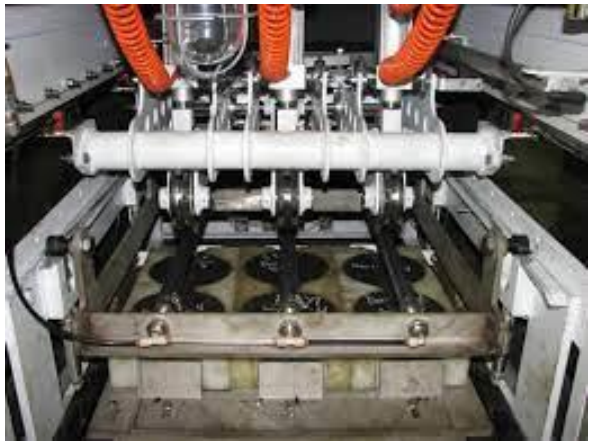
RAP Base Study - HVS

RAP Base Study - US 301 Test Road

1 Control	2 Unstabilized RAP Base	3 CCPR RAP Base	4 Emulsion Stabilized RAP Base Mixed in Place	5 Limerock/ RAP Base (50/50)	6 Limerock/ RAP Base (75/25)	7 Full-Depth Reclamation
0.75" FC-5	0.75" FC-5	0.75" FC-5	0.75" FC-5	0.75" FC-5	0.75" FC-5	0.75" FC-5
2" Type SPM	2" Type SPM	2” Type SPM	2" Type SPM	2" Type SPM	2" Type SPM	2" Type SPM
4" Type SP	4" Type SP	4" Type SP	4" Type SP	4" Type SP	4" Type SP	4" Type SP
12" Limerock	12" Unstabilized 100% RAP Base	12" CCPR RAP Base	12" Emulsion Stabilized RAP Base	12" Limerock/ RAP Base (50/50)	12" Limerock/ RAP Base (75/25)	12" FDR (Mill 6.75")

Key Recent Study:
Balanced Mix Design Benchmarking of FL Mixtures

- Work performed by the University of Florida.
- Benchmarked 15 mixtures at mix design and 15 mixtures at production.



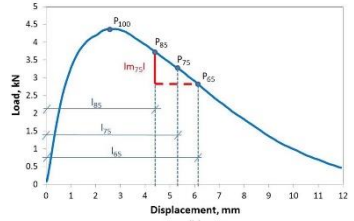
APA

Hot IDT

Ideal RT

Rutting

(a)



Ideal CT

Cracking

Key In-Progress Projects

- **Two separate ongoing projects**
- **15% RAP in FC-5 mixtures (NCAT)**
- **20% RAP in High Polymer mixtures (FSU)**
  - These projects will study the impact on mixture performance (especially cracking and raveling).

Thank you.
Comments/Questions?

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