Asphalt Research Update

Flexible Pavement Committee
July 20, 2023

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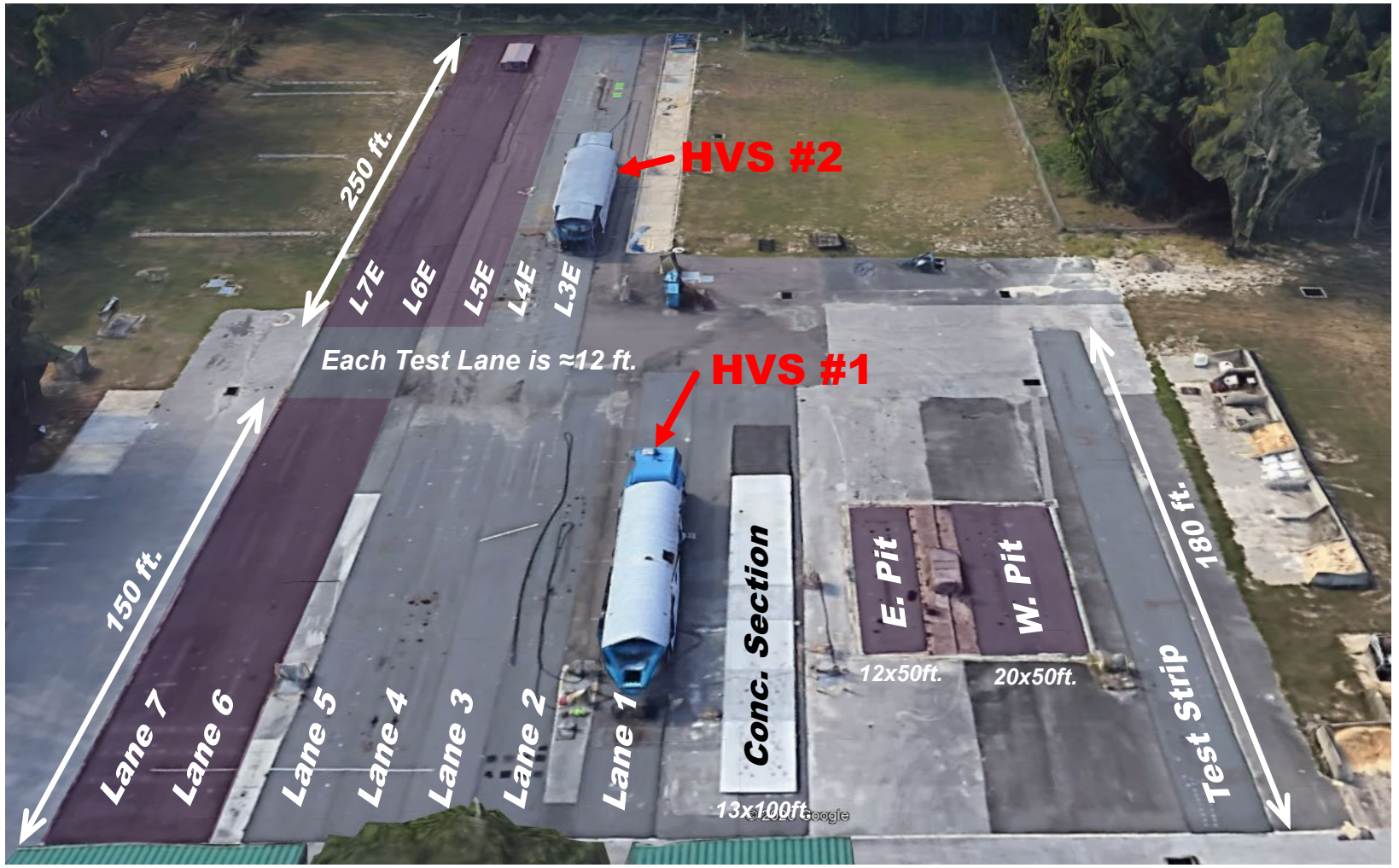
NCAT Test Track

- 5 trucks
- 46 test sections
- 5 million ESALs per year

NCAT Test Track

- **Effect of in-place density on rutting and cracking.**
  - Four levels of density: 88, 90, 92, and 94% Gmm.
- **Participate in group study examining the effect of many types of additives:**
  - Aramid fibers.
  - Wet and dry processes for ground tire rubber.
  - Wet and dry processes for plastics.
  - Two proprietary asphalt binder additives for increased performance: Sigmabond (digested rubber by Polyco) and B2Last (BASF).
  - Control section with no additive.

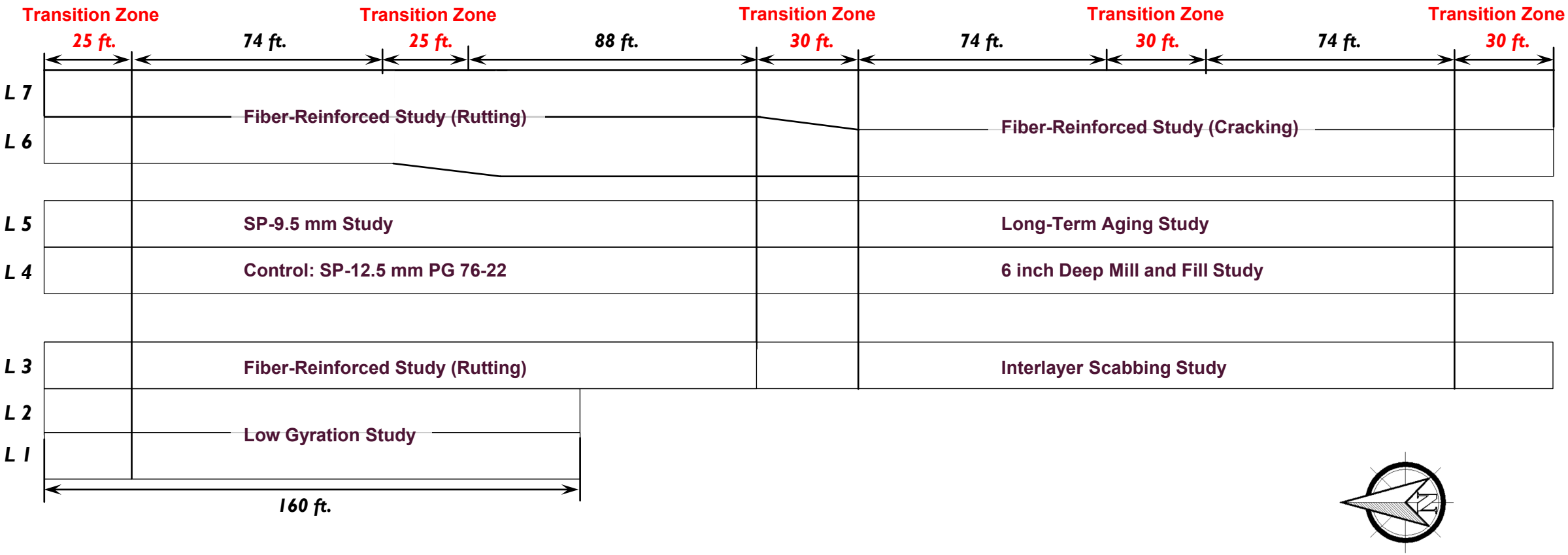
FDOT Heavy Vehicle Simulator



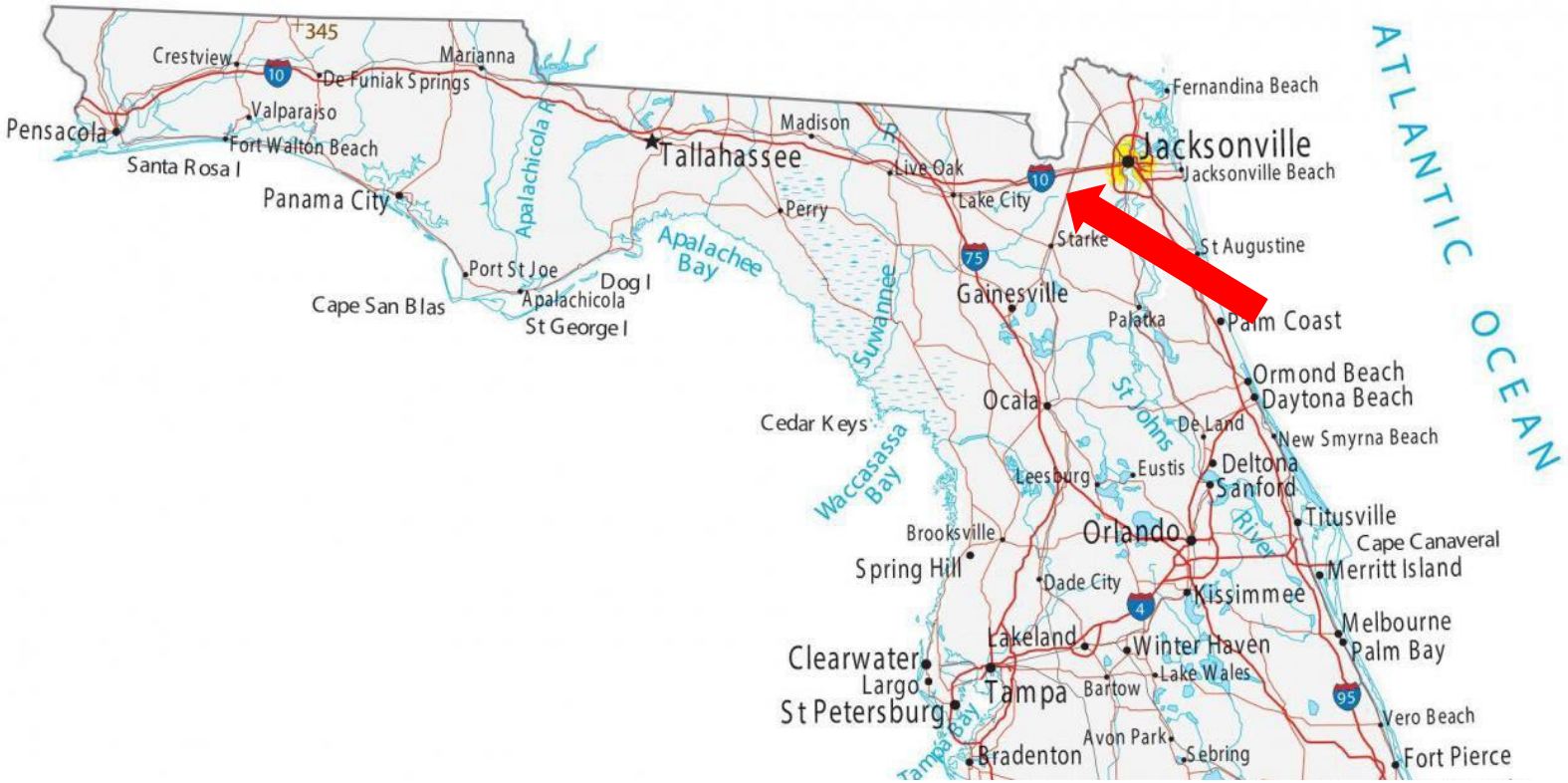
1.5 in. AC Top
1.5 in. AC Middle
1.5 in. AC Bottom
10.5 in. Limerock Base
12 in. Stabilized Subgrade

Typical Cross Section

FDOT Heavy Vehicle Simulator



Asphalt Test Road

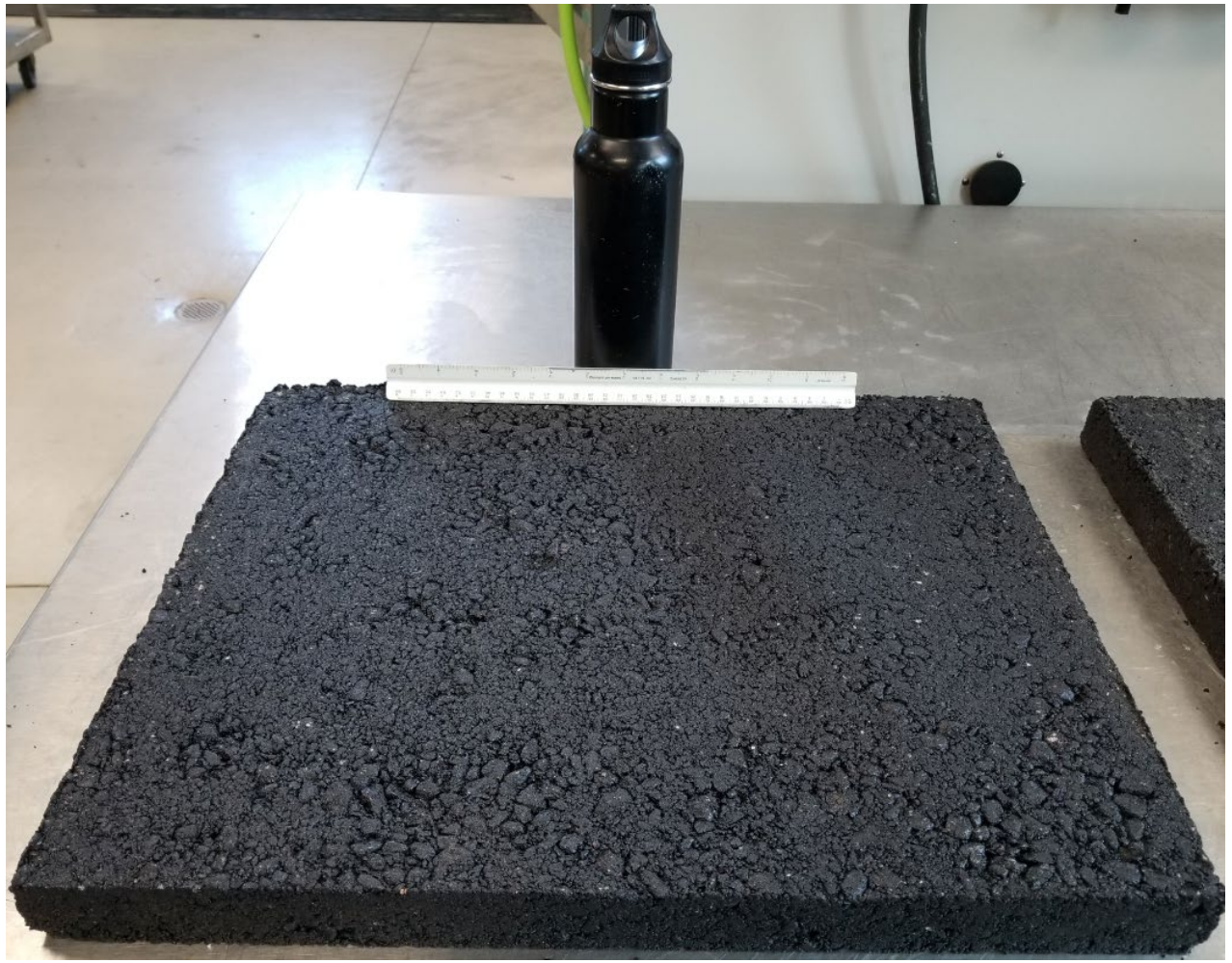


Asphalt Test Road

Asphalt Test Road

- **Sections related to:**
  - RAP base.
  - Cold central plant recycled base.
  - Full depth reclamation.
  - Crack relief layer.
  - Deep lift paving.
  - Superpave 5.
  - Finer, more durable FC-5.

Expedited Pavement Wearing and Friction Determination



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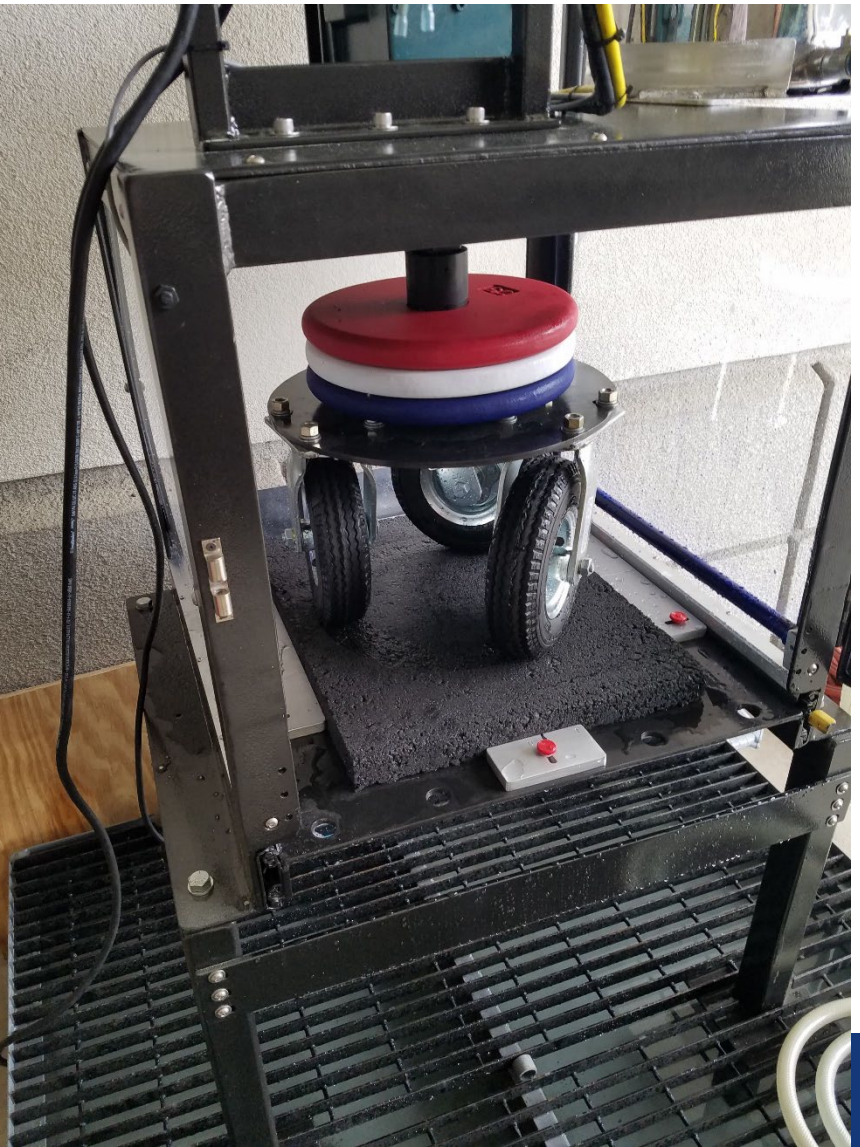

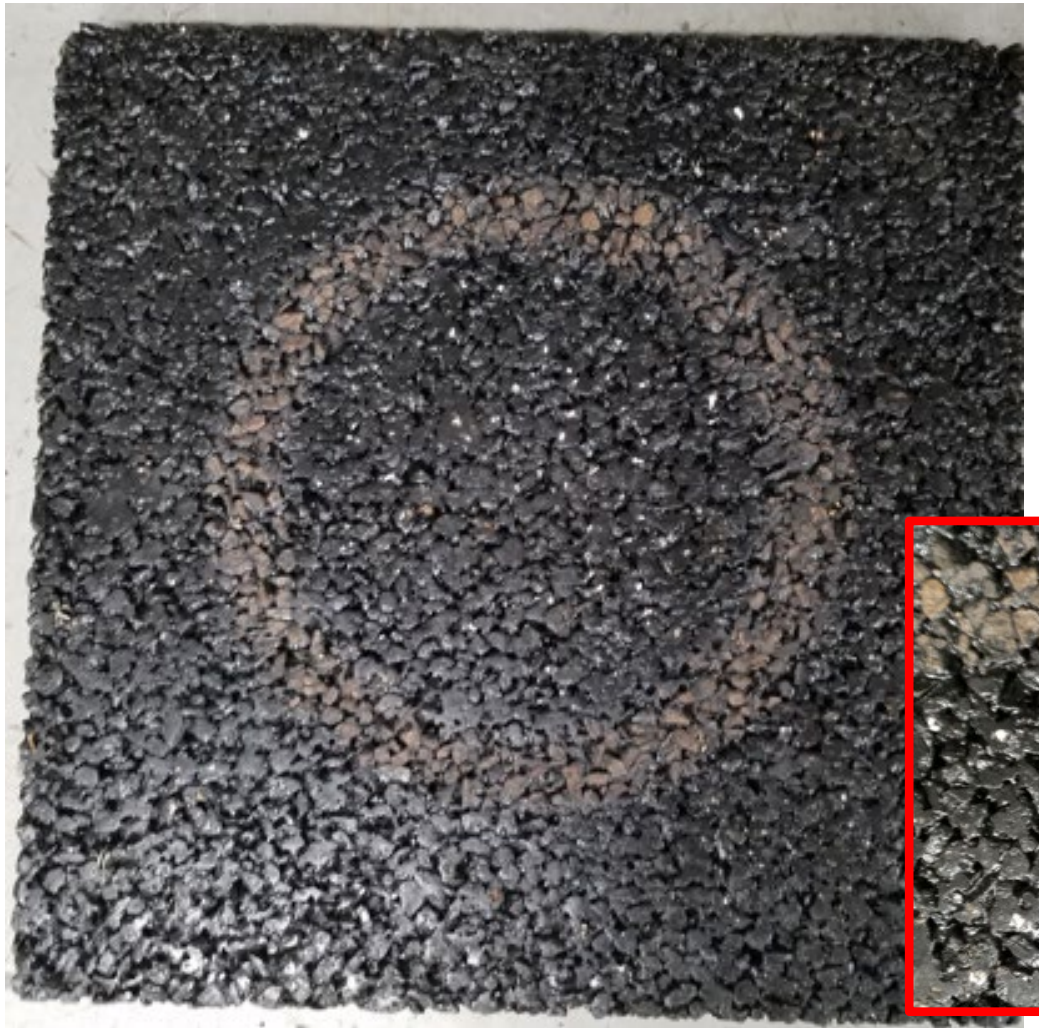

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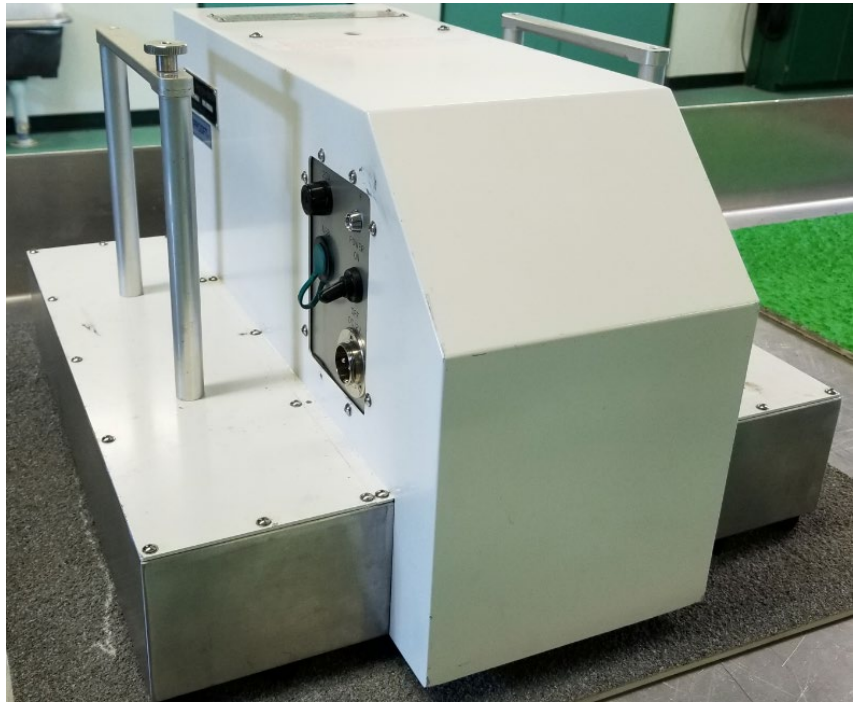
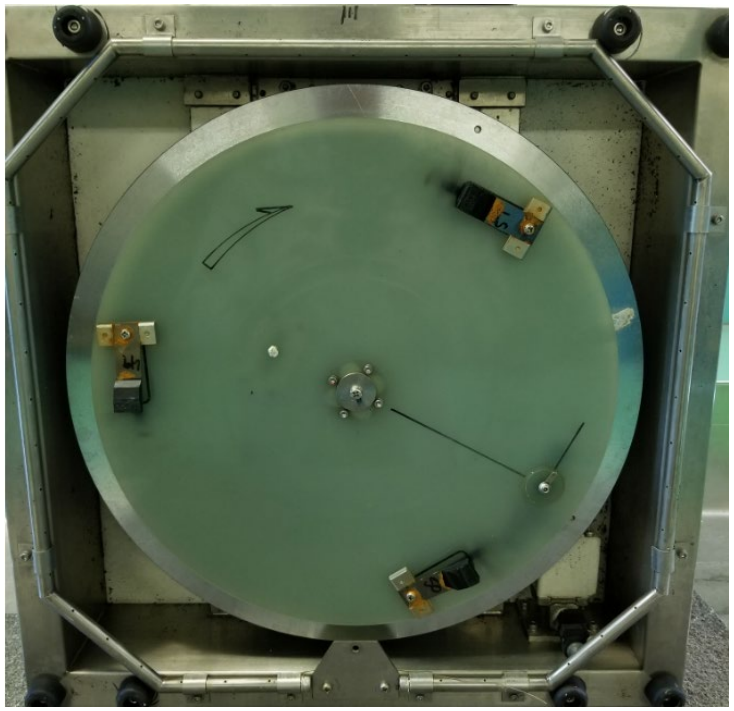
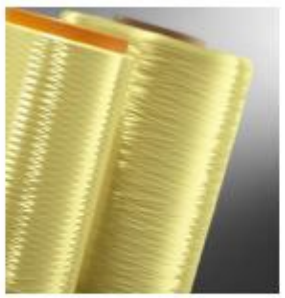




Expedited Pavement Wearing and Friction Determination

- **Will allow expedited evaluation and approval/disapproval of:**
  - New aggregate sources.
  - Evaluation of mixtures containing RAP with virgin FL friction limestone.
  - Any mixture type with questionable friction properties.
- **Current process requires a roadway test section and the application of six million AADT.**

Aramid Fibers (two major brands)



Aramid Fiber
(2.1 ounces/ton)

+

Sasobit® Wax
(2.1 ounces/ton)

=

ACE Fiber™
(4.2 ounces/ton)

ACE Fibers

Forta Fibers

Blend of Aramid and Polyolefin Fibers

Aramid Fibers

- Being studied at the NCAT test track, State Materials Office test track, field test sections (SR-200 in Dist. 2 and SR-15 in Dist. 4), and in SMO lab.
- Will it help rutting and/or cracking resistance?
- Is it worth the cost increase?

OGFC for Suburban Environments (NCAT)

RAP Binder Contribution to the Mixture (NCAT)

- FDOT assumes 100% of the RAP binder is activated, whereas current research says it is not.
- GDOT switched to a 60% factor in 2019.
- GDOT adds extra binder (equal to the 40% of inactive RAP binder) back into the mixture.
- Provides increased crack resistance but may adversely affect rutting.
- NCAT will study effects on performance and how to handle during production.

Alternative Friction Overlays (NCAT)

- Will explore asphalt-based alternatives to standard High Friction Surface Treatment (epoxy with bauxite aggregate).

New Crack Relief Mixture (UF)

- Used for prevention of reflective cracking (bottom to top propagation). Not for top-down cracking.

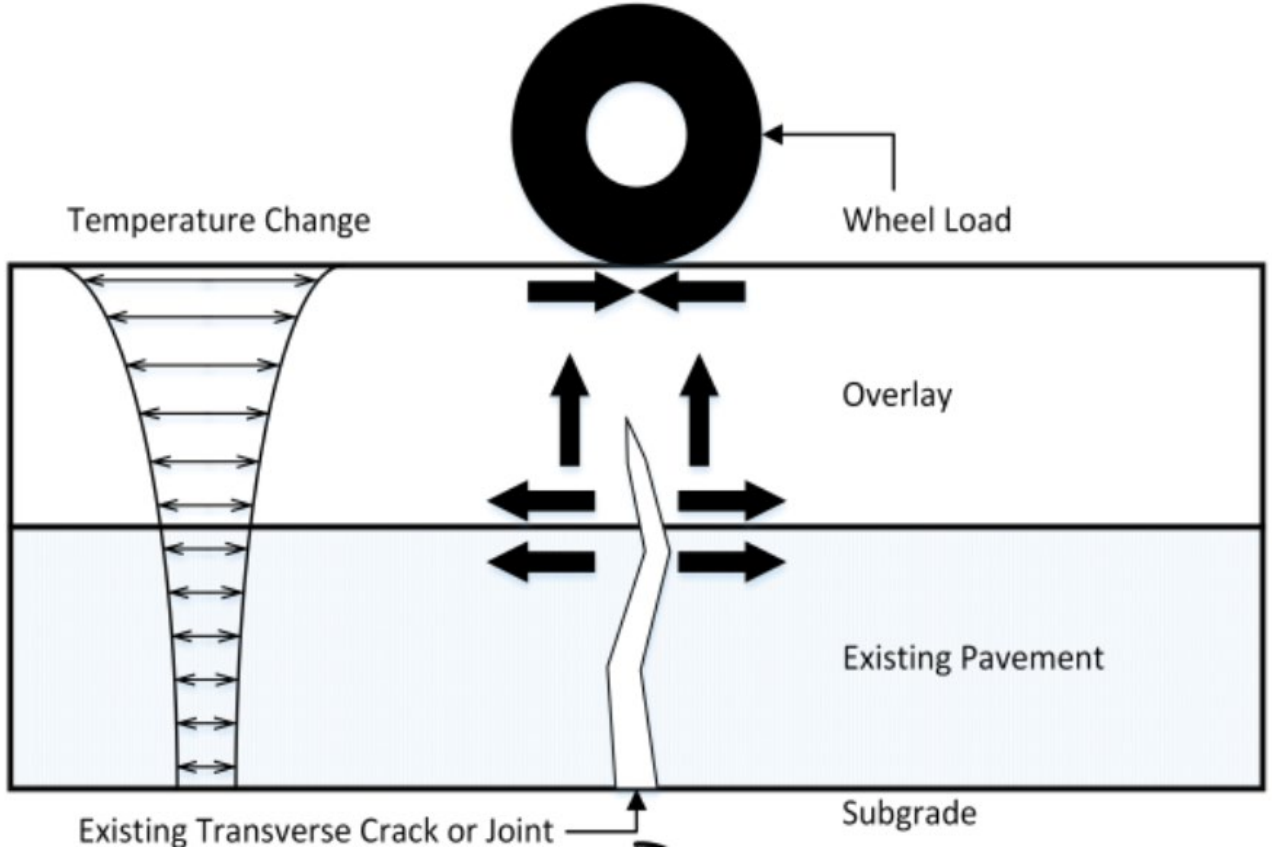


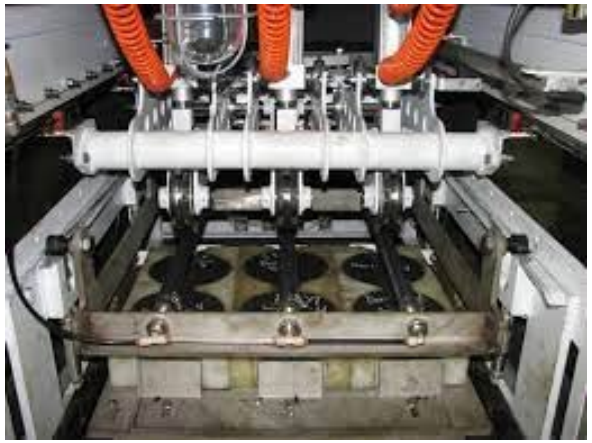
Photo by: Nithin Sudarsanan

Evaluating Asphalt in Flooded Conditions (UF)

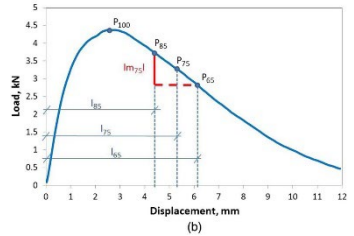
- Goal is to assure asphalt mix durability when submerged in water and at times trafficked.

Benchmarking Florida Asphalt Mix Designs (UF/FDOT)

- Evaluating 30 mix designs from across the state.
- Performing rutting and cracking tests.
- In preparation if FDOT ever switches to Performance Mix Design (a.k.a. Balanced Mix Design).



(a)

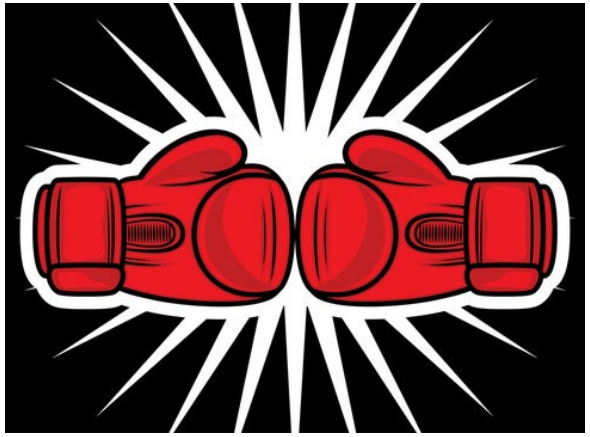


(b)

Evaluation of Superpave vs. Superpave 5 vs. SMA (Texas Transportation Institute)

- Examing two other mix design methods to see if they offer better performance than standard Superpave at an equal or lower life cycle cost.

4 vs. 5 vs. SMA



Evaluation of RAP in FC-5 and High Polymer Mixtures

- Two upcoming projects.
- Will look at how to minimize the impact of RAP on FC-5 and High Polymer mixtures performance (especially cracking).
- Looking to add 10-15% RAP to FC-5 mixtures.
- Looking to add 20% RAP to High Polymer mixtures.

Thank you.
Comments/Questions?

Section #1 - Control

- 12” limerock base
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #2 – Un-stabilized RAP Base

- 12” Un-stabilized RAP base
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #3 – Cold RAP Mix Base (CCPR)

- 12” Cold Central Plant Recycled (CCPR) RAP base (emulsion stabilized)
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #4 – Cold RAP Mix Base (Recharge)

- 12” RAP base stabilized only with Recharge (by Blacklidge Emulsions)
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #5 – Limerock/RAP Mix Base

- 12” Limerock/RAP base (mixing ratio 50% limerock & 50% RAP) (minimum LBR 100)
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #6 – Limerock/RAP Mix Base

- 12” Limerock/RAP base (mixing ratio 75% limerock & 25% RAP) (minimum LBR 100)
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #7 – Full Depth Reclamation (FDR)

- Mill 6-3/4”
- Remix the existing materials per FDOT FDR spec (12” mixing depth)
- 4” Type SP (TL-E)
- 2” Type SP (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #8 – Reflective Cracking Study

- **Test Section (500’)**
  - Mill 3-3/4”
  - Sawcut longitudinal and transverse cracks to the base
  - 1-1/4” Crack Relief Mix (HP binder)
  - 1-3/4” Type SP (PG 76-22) (TL-E)
  - 3/4” FC-5 (PG 76-22)
- **Control (500’)**
  - 3” Type SP (PG 76-22) (TL-E)
  - 3/4” FC-5 (PG 76-22)

Section #9 – Superpave 5

- Mill 3-3/4”
- 3” Type SP5 (PG 76-22) (TL-E)
- 3/4” FC-5 (PG 76-22)

Section #10 – Deep Lift Study

- **Mill 8.25”**
- **Test Section A (500’)**
  - 6” Type SP (HP binder) (TL-E)
  - 1-1/2” Type SP (HP binder) (TL-E)
  - 3/4” FC-5 (PG 76-22)
- **Test Section B (500’)**
  - 6” Type SP (PG 76-22) (TL-E)
  - 1-1/2” Type SP (PG 76-22) (TL-E)
  - 3/4” FC-5 (PG 76-22)

Section #11 – FC-5 Only

- Mill 1”
- 1” FC-5 (PG 76-22)

Section #12 – FC-Q Only

- **Mill 1”**
- **1” FC-Q (PG 76-22)**
  - Similar in gradation to old FC-2 but modernized to FC-5 standards.