Florida Department of
TRANSPORTATION

Flexible Pavement Committee Meeting

Accelerated Pavement Testing Research Update

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Topics

- Current APT Research (HVS-9 Studies)
- HVS Mark VI (Aircraft Tire)
- Pavement Permeability Measurements
- Accelerated Pavement Aging System (APAS)
- Pavement Cooling Systems

Current APT Research

- Impact of Asphalt Mix Segregation on Pavement Performance
- Impact of In-place Density on Asphalt Pavement Performance
- Impact of FC-5 Thickness on Pavement Performance
- Impact of Tack Coat Residal Application Rate on cracking resistance

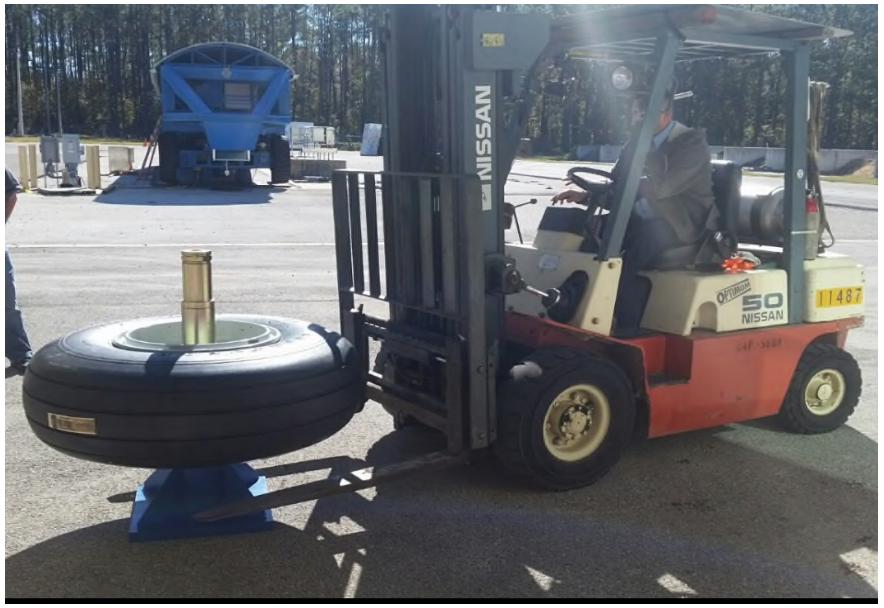
FDOT's APT Program

- Loading performed using the Heavy Vehicle Simulator (HVS) Mark IV & Mark VI Models

Tire Service and Installation

Super Single

Aircraft Tire

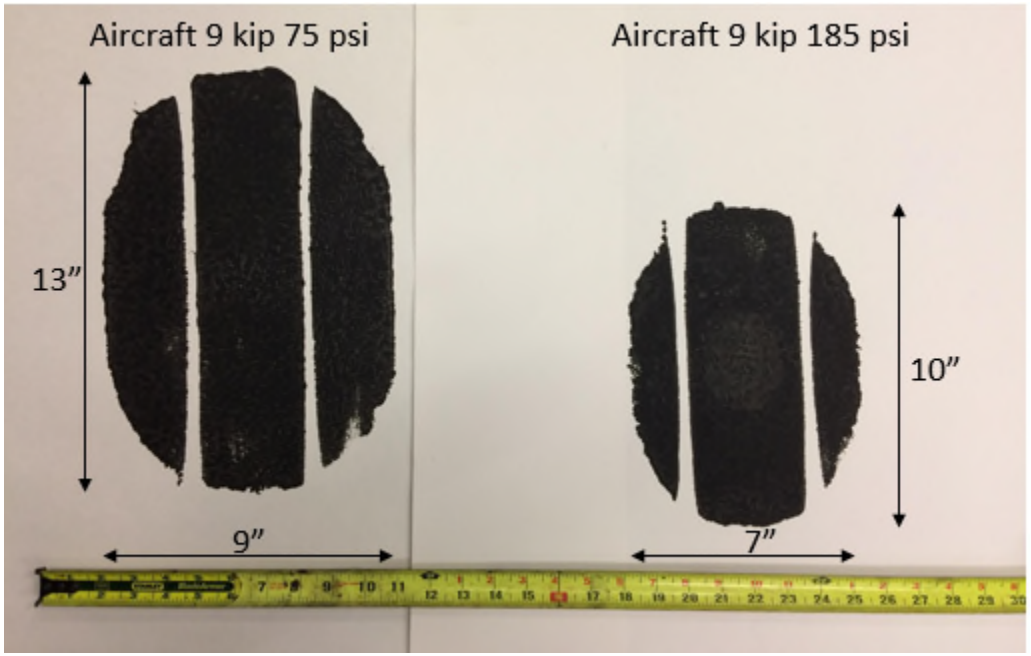


Aircraft Tire Assembly

Comparison of Tire Footprints

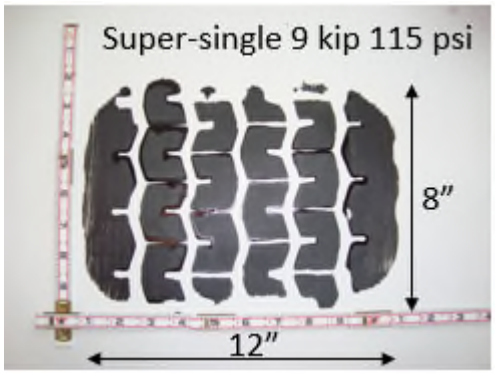
Aircraft Tire (Boeing 727)

- Goodyear: 49x17/32/235 (Size/Ply/Speed)
- a 5% loss of pressure in a 24 hour period is normal
- Maximum Load Rating: 50,000 lbs.



Super Single tire

- Goodyear G286 A SS, 425/65R22.5
- Maximum Load Rating: 11,500 lbs.



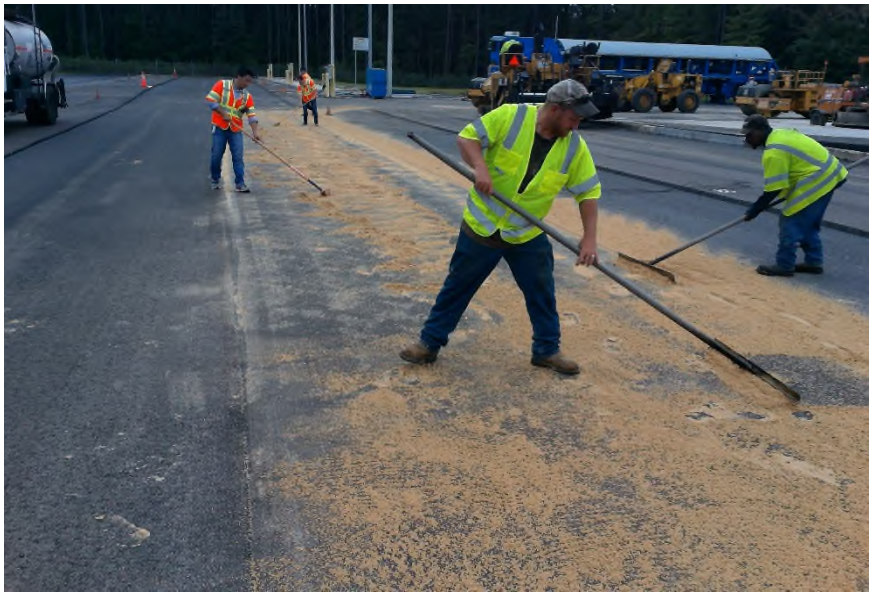
Aircraft Tire Loading Damage (24 kips)

Bonded Test Section (0.06 gal/sy)

Unbonded Test Section (Sand layer)

Tack Coat Rate (Interlayer Bonding)

- Three residual tack coat rates
  - 0.02 gal/sy, 0.04 gal/sy, & 0.06 gal/sy
  - one unbonded section (thin sand layer)



FC- 5 Permeability Testing (Permeameter)

1. Clean and saturate the test location
2. Fill the water container with continuous water supply
3. Remove the water source and measure the time of dropping water between the marked water levels
4. Measure the water temperature then use drop time, and layer thickness to calculate field permeability index K (1.0E-5 cm/s)

$$K = \frac{T_{F5}}{S} \times \ln\left(\frac{(87.1 + T_{F5})}{(20.7 + S + T_{F5})}\right) \times (10\text{^}5)\ x\ \frac{1.300667264}{(\frac{42.2 + T_w}{52.2})^{1.5}}$$

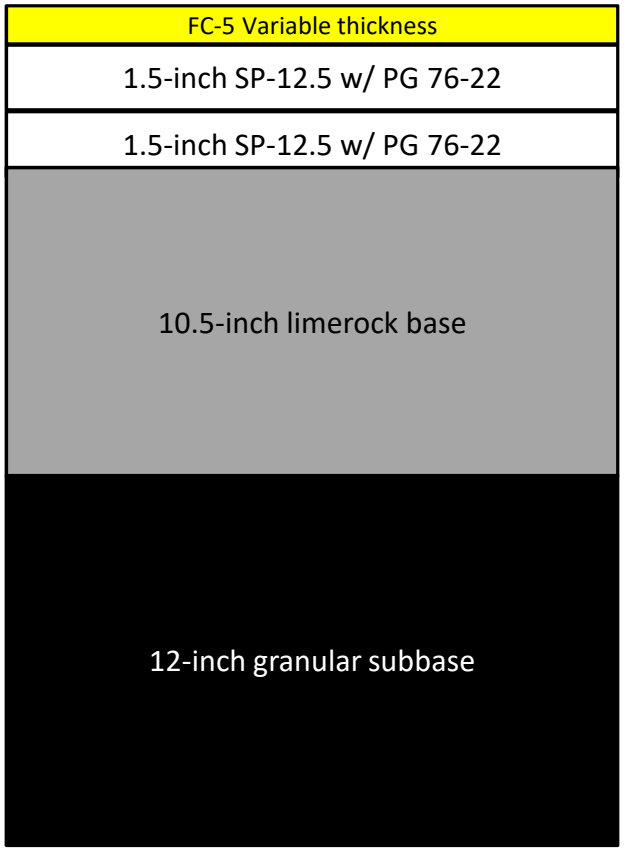
Hydrotimer Device

ASTM E2380

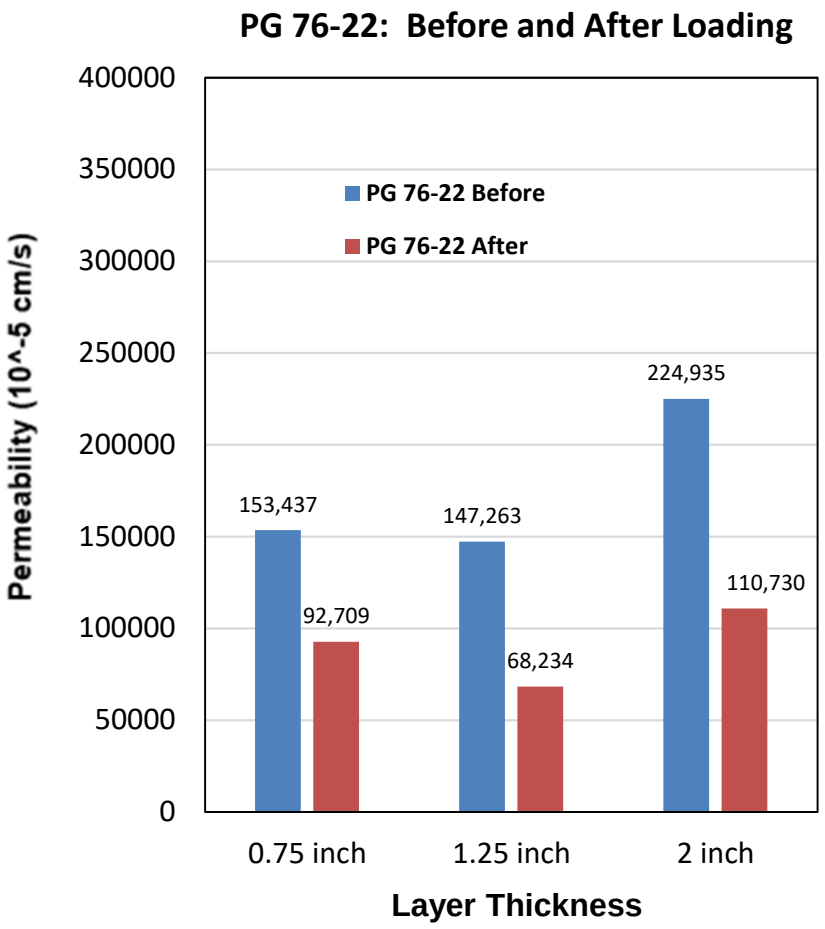
- Field test to evaluate the surface drainage, and the internal drainage of the surface course
- Placed on the pavement with the plunger sealing the water discharge opening
- The timer is automatically activated by float switches as the water level falls in the cylinder.
- Elapsed time measured to the nearest 0.01 second.

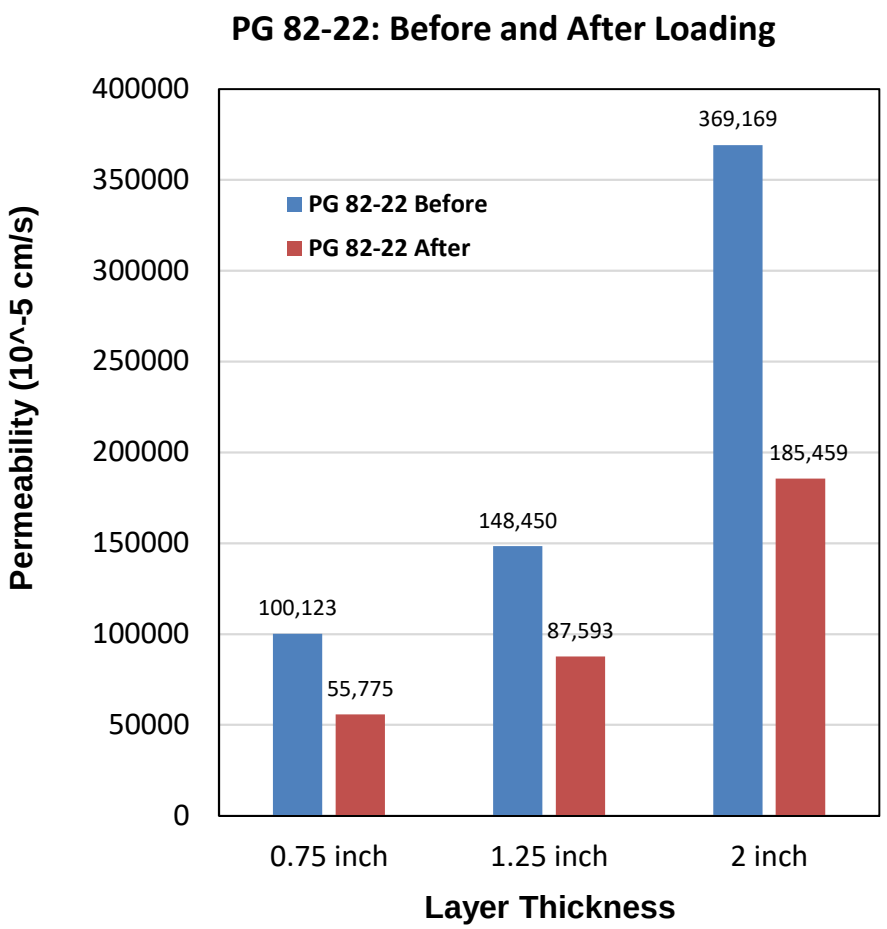
FC-5 Thickness

- FC-5 placed at 0.75, 1.25, and 2 inches thick
- PG 76-22 & PG 82-22 binders



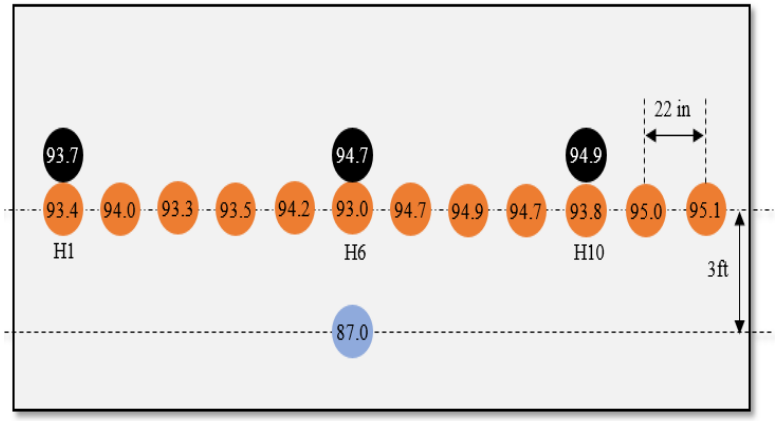
FC-5 Permeability Results (Permeameter)





Accelerated Pavement Aging System (APAS)

- APAS Dimensions: 24 ft. x 10 ft.
- A total of twelve 7500-W heaters installed transversally at 26-inches above the ground
- Automated temperature control system



a. Surface (trigger temperature: 95°C)

APAS: Heating Protocol

Objective

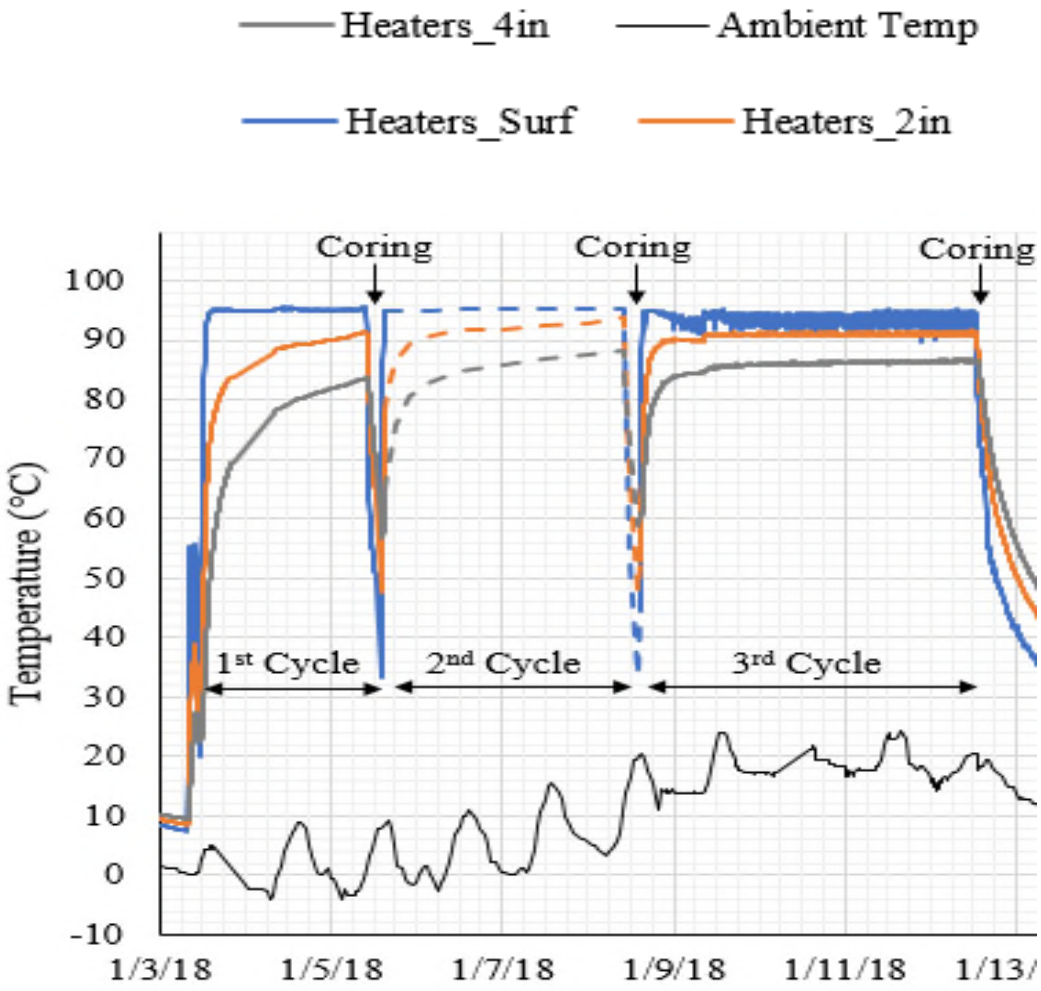
- Determine APAS heating duration (95°C) to correlate with field aged binder G* on PG 76-22 mixture (1.5 inches)

Target Temperature

- Surface temperature: 95°C
- Heating Duration: 14 Days

Temperature Profile

- Temperature 2 in below surface: 91.5°C
- Temperature 4 in below surface: 87°C



APAS: Sampling and Testing Protocol

Core Sampling

- Three sets of cores obtained at each stop-time for laboratory testing

- The 1.5-inch thick cores were trimmed into three 1/2-inch thick layers for laboratory testing to determine the impact pavement depth on aging.

Laboratory Testing

- Binder G*, δ , High temp true grade, Binder MSCR, and Superpave IDT

Start time	Stop time	Accumulated (h)	days
1/3/2018 11:30	1/5/2018 10:00	46.5	2
1/5/2018 14:30	1/8/2018 10:00	114.0	5
1/8/2018 14:30	1/12/2018 12:30	208.0	7
1/16/2018 15:30	1/17/2018 10:00	226.5	10
1/17/2018 15:30	1/22/2018 8:30	339.5	14

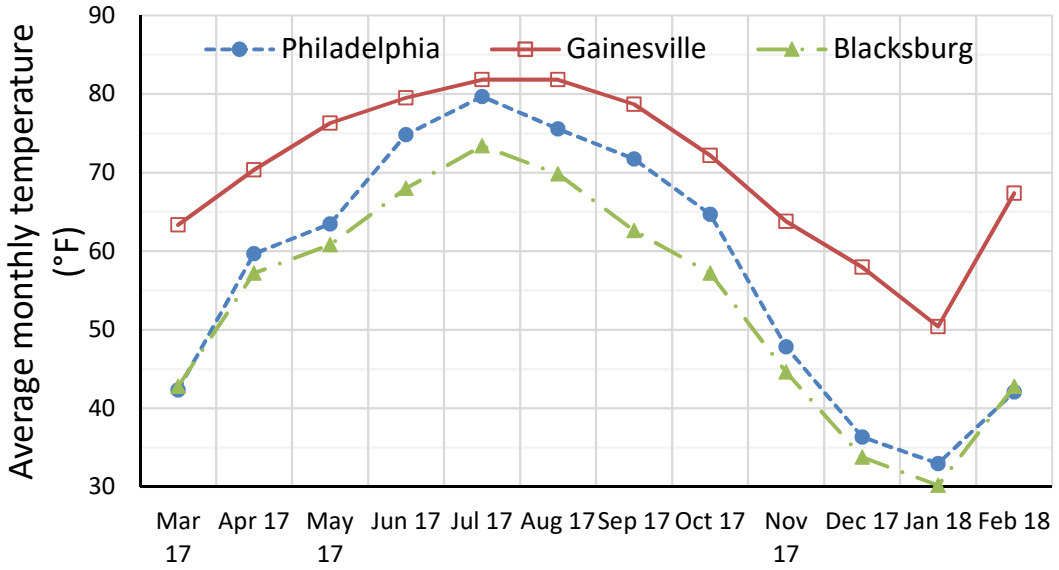
Exploring Pavement Cooling Systems

Objective

Maintain consistent testing temperature during HVS cracking studies

Current Challenge

Fluctuating ambient air temperatures during testing



APT Cooling Systems

Virginia Tech Transportation Institute and Rowan University

System Components:

- 60-ton Air cooled Chiller, 480v
- 50-ton Air Handler
- 19 each 20”x25’ duct
- 2/5 banded cable, 50’
- Pintle hook trailer

HVS-10: Research Planning Meeting

- Discussion of ideas and research focus areas for next round of APT Studies on April 18, 2018


Thank You