

**FDOT** Florida Department of TRANSPORTATION

## ACCELERATED PAVEMENT TESTING RESEARCH

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### Topics of Discussion

- Overview of APT Program
- Performance of Asphalt Pavements Constructed Using Different Compaction Levels
- Impact of Layer Thickness on Rutting Performance of Open Graded Friction Courses (FC-5)
- Impact of Asphalt Mix Segregation on Pavement Performance
- Summary

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### FDOT's APT Program


- Test Track housed at the State Materials Office
  - 5 Lanes approximately 450 ft. long x 12 ft. wide
  - 2 Lanes 150 ft. long x 12 ft. wide
  - 2 Outdoor Test Pits



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### FDOT's APT Program

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



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### Research Project Selection

- APT program is integrated with overall research effort
  - Planning, development, and execution of research projects performed on an annual basis
- Research projects solicited from Central and District offices, FHWA, industry, and Florida Universities

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### Environmental Control

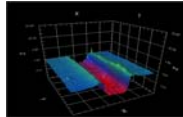
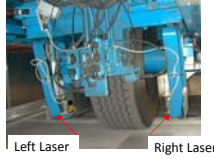
- Heater elements attached to HVS test beam
- Maintain asphalt temperature at 120°F
- Asphalt temperature monitored at 2-inches below surface



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### Heavy Vehicle Simulator

- Uni-Directional Loading: 9 kips
- Super Single tire
  - (Goodyear G286 A SS, 425/65R22.5)
- Wheel wander: 4-inches
- On-board laser profiler system
- Heating system
- 10,000 loaded repetitions per day



### Performance of Asphalt Pavements Constructed Using Different Compaction Levels

### Asphalt In-Place Density

- 12.5-mm NMAS PG 76-22 Asphalt Mixture
- Three densities were targeted
  - 87%, 90%, and 93%
  - ± 0.5% Tolerance

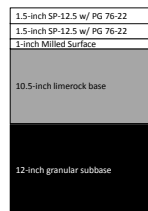


### Density Test Sections

#### Asphalt Density Study

- 12.5-mm NMAS (Granite)
- PG 76-22 polymer-modified binder
- 450 ft. long x 12 ft. wide test lane

12.5-mm w/ PG 76-22

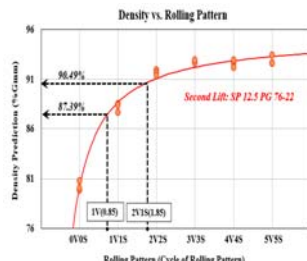


### Establishing Rolling Patterns

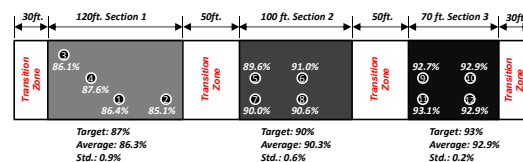
#### Rolling Pattern Results:

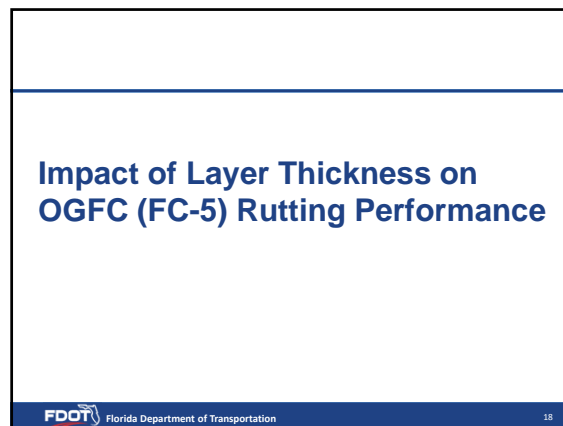
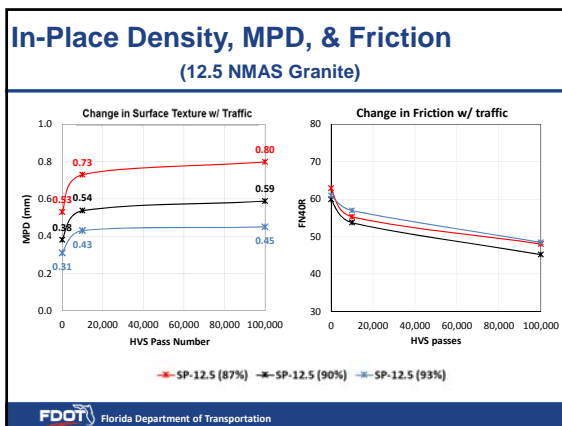
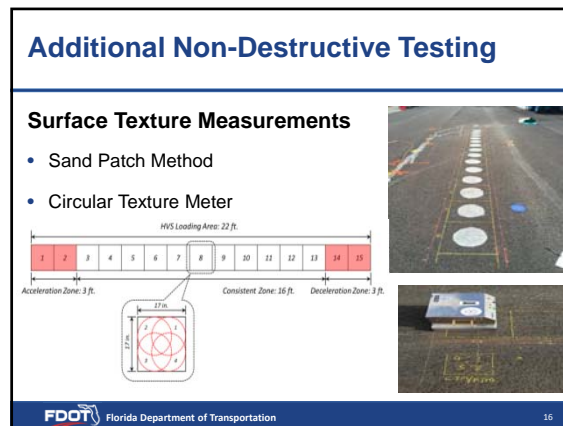
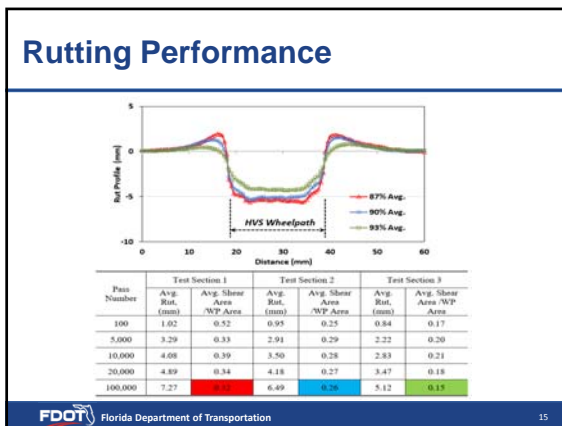
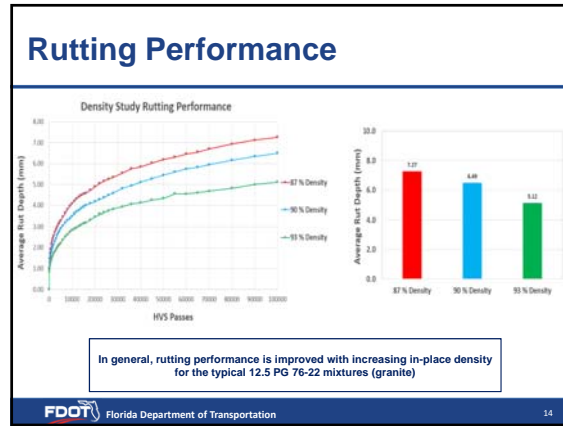
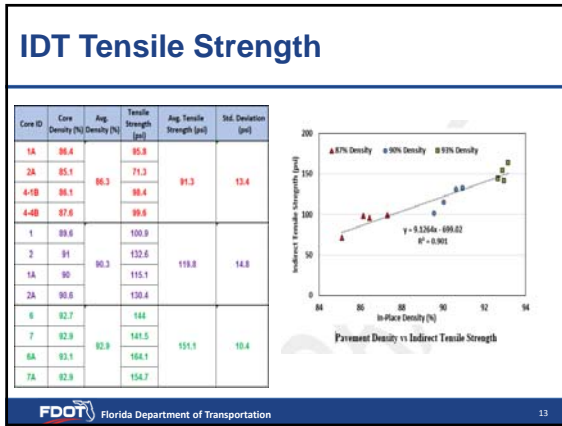
Steel Wheel Vibratory Roller

- Approx. 2200 VPM
- Approx. 4.5 MPH



### Test Track Construction





### OGFC Test Sections

**OGFC Thickness Study**

- FC-5 (Friction Course)
- Two Binders: PG 76-22 & PG 82-22
- Three layer thickness: 0.75, 1.25, and 2.0-inches

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### OGFC Rutting Performance

FC-5 Layer Thickness vs. Rutting

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### Dense vs. OGFC (Texture & Friction)

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### Field Permeability Testing

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

$$K = \frac{T_{FS}}{S} \times \ln \left( \frac{(87.1 + T_{FS})}{(20.7 + S + T_{FS})} \right) \times (10^{-5}) \times \frac{1.300667264}{\left( \frac{42.7 + T_{FS}}{-52.2} \right)^{1.5}}$$

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### OGFC Permeability Results


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### Impact of Segregation on Asphalt Pavement Performance

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### Asphalt Segregation Study

- Quantify the impact of segregation on pavement performance
- Develop/refine methods to quantify segregation using texture measurements (CTM)



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### Segregated Test Sections

#### Asphalt Segregation Study

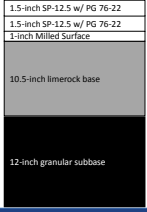
- 12.5-mm NMAS (Granite)
- PG 76-22 polymer-modified binder
- 450 ft. long x 12 ft. wide test lane

12.5-mm w/ PG 76-22

1.5-inch SP-12.5 w/ PG 76-22
1.5-inch SP-12.5 w/ PG 76-22
1-inch Milled Surface

10.5-inch limerock base


12-inch granular subbase



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### Non Destructive Testing


- Use nondestructive testing methods to quantify the presence of segregation in the field
  - Circular Texture Meter
  - TM2: wide spot laser
- Comparison between segregated and non segregated HVS loading areas
  - Surface texture (MPD)
  - Rutting performance



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### Test Lane Construction

- Construct the areas with varying severity levels of segregation on test lane
  - Quarter truck loads of asphalt
  - Cycled screed heater on/off
  - Cooler material introduced into paver
  - Material sampling



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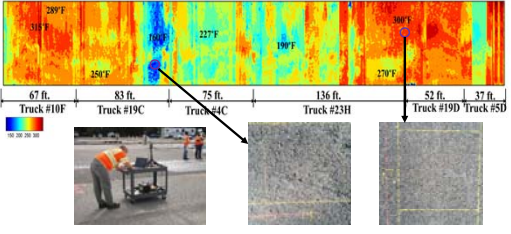
### Construction Activity



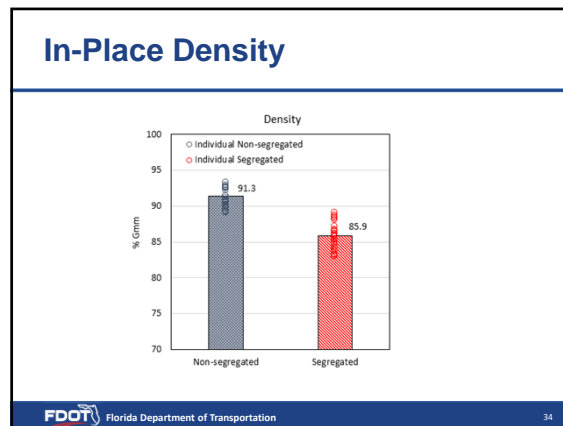
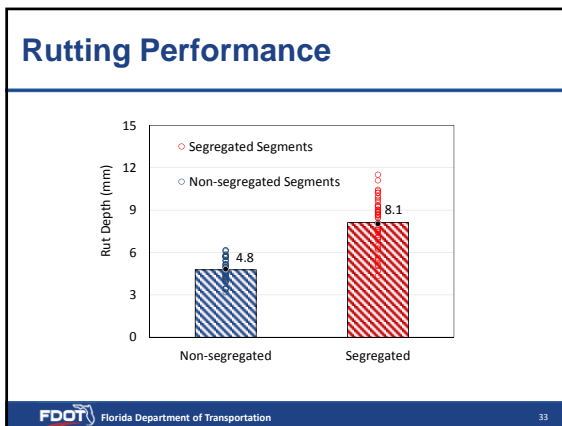
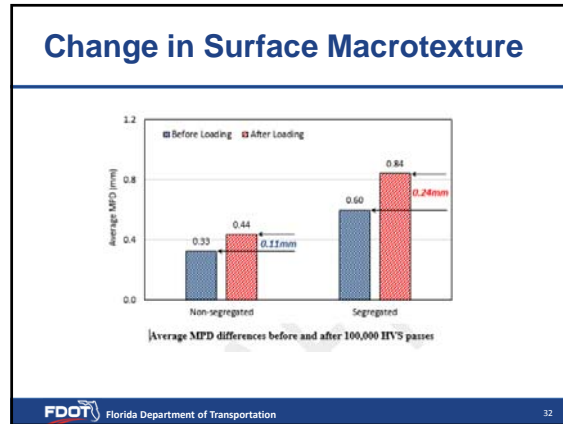
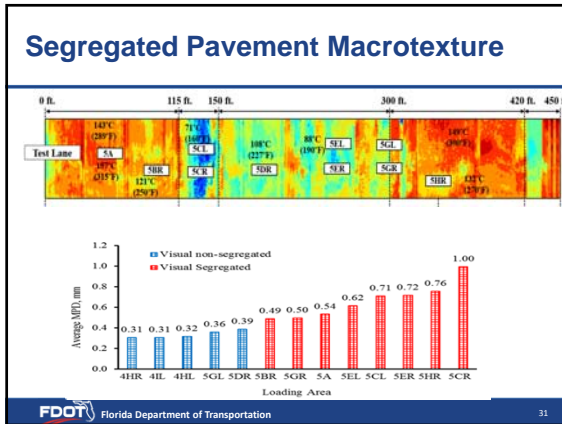
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### Test Track Construction

#### Temperature Distribution before Compaction



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### Summary

- Higher in-place density results in improved rutting & cracking resistance
- The surface macrotexture on dense graded asphalt pavement increases with traffic
- Friction is not well correlated with surface macrotexture on dense graded asphalt pavements

### Summary

- An FC-5 layer thicker than 0.75-inches reduces rutting performance
- FC-5 shows greater reduction in friction than dense graded after 100,000 HV5 passes loaded at 9 kips
- The permeability of FC-5 reduces with increasing traffic
- Rutting on segregated pavements is greater than on non-segregated pavement
- Segregated pavements have higher surface macrotexture than compared to non-segregated pavement

## APT Summary

- APT is a critical component of FDOT's pavement research program
- Key to success is the careful selection of research projects that address critical issues
- Technology transfer is essential