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

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

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

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

Establishing Rolling Patterns

Rolling Pattern Results:

- Steel Wheel Vibratory Roller
  - Approx. 2200 VPM
  - Approx. 4.5 MPH

Test Track Construction

12.5-mm mix / PG 76-22
3.5-inch SP - 2.2 ft. · PG 76-22
3.5-inch SP - 2.9 ft. · PG 76-22
3.5-inch SP - 3.6 ft. · PG 76-22

30 ft.
30 ft.
50 ft.
50 ft.
120 ft.
120 ft.
In general, rutting performance is improved with increasing in-place density for the typical 12.5 PG 76-22 mixture (granite).
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

Dense vs. OGFC (Texture & Friction)

Field Permeability Testing

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 $K (10^{-5} \text{ cm/s})$

$$K = \frac{V}{A} = \frac{(y_2 - y_1)h}{(x_2 - x_1)A}$$

OGFC Permeability Results

Impact of Segregation on Asphalt Pavement Performance
Asphalt Segregation Study

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

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

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

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

Construction Activity

Test Track Construction

Temperature Distribution before Compaction
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Segregated Pavement Macrotexture

Change in Surface Macrotexture

Rutting Performance

In-Place Density

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 HVS 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