Florida's Experiences with Highly Modified Asphalt Mixtures

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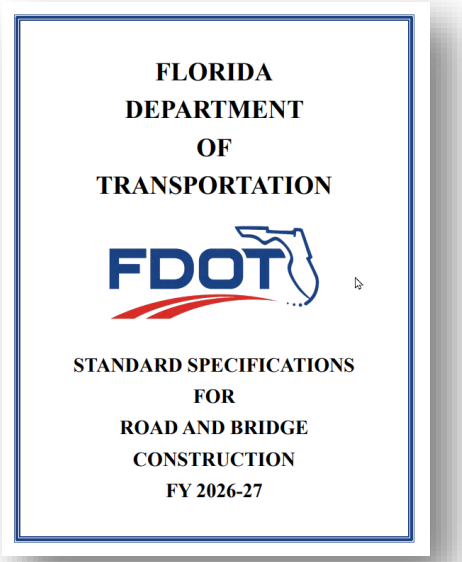
What is a Highly Modified Asphalt Mixture in Florida?

- **Highly modified mixtures use a “high polymer” (HP) binder**
  - Avoids proprietary names
- **High polymer binder is FDOT’s premium binder used to address:**
  - Severe rutting
  - Bottom-up fatigue (alligator) cracking
  - Raveling (in OGFC mixtures)
  - Also used to address reflective cracking in some instances
- **Approximately 3 - 5% of mix placed on FDOT’s system annually**

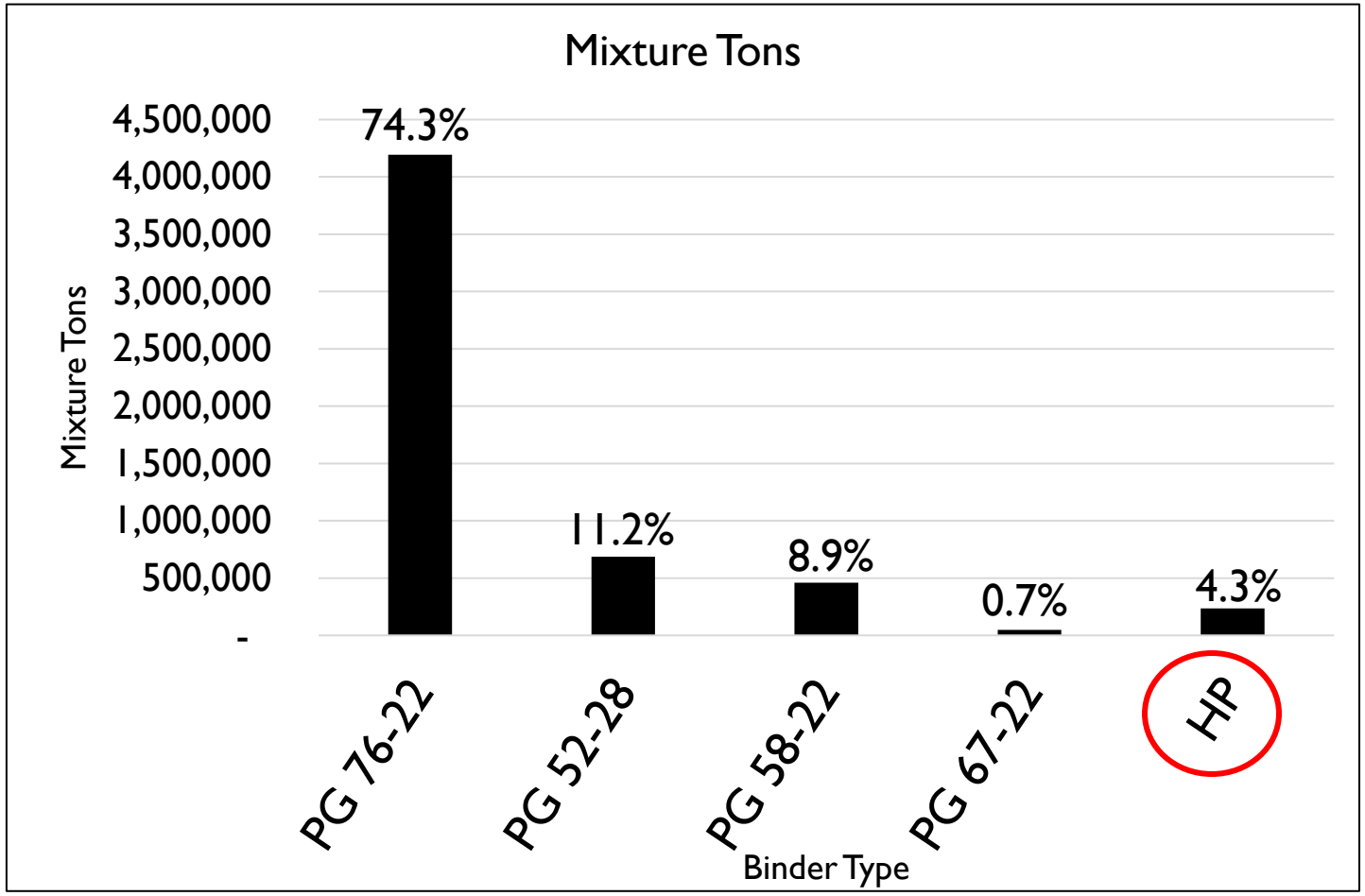
FDOT Highly Modified Binder Requirements

- **SBS or SB polymer only**
  - Don't specify percentage
- **No polyphosphoric acid**
- **No RAP in HP binder mixtures**
- **Must meet the following MSCR requirements:**



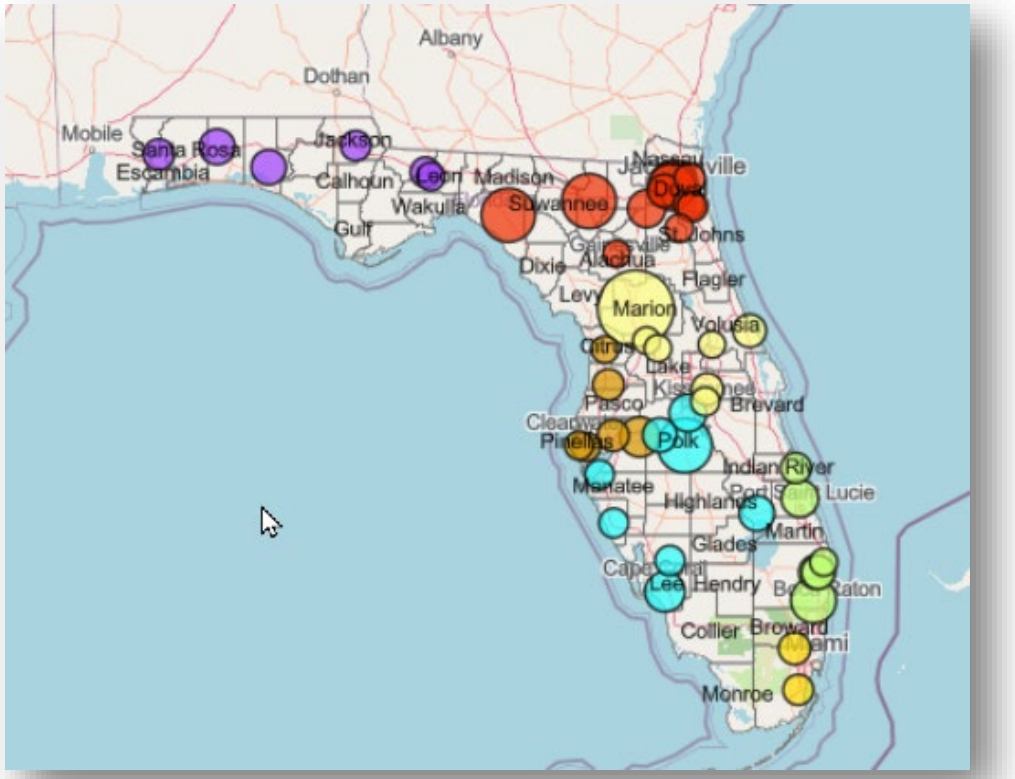
Test and Method	Conditions	Specification Minimum/Maximum Value
Multiple Stress Creep Recovery, $J_{nr,\ 3.2,}$ AASHTO T 350	76°C	0.1 kPa^{-1} max
Multiple Stress Creep Recovery, % Recovery, AASHTO T 350	76°C	$\%R_{3.2} \geq 90.0$

Asphalt Mixture Tonnage by Binder Type (FY 24/25)



Highly Modified Asphalt Mixtures - Usage since 2020

- **83 Projects**
- **1,105,890 tons**
  - 708,094 tons structural course (64%)
  - 297,588 tons dense-graded friction course (27%)
  - 159,642 tons open-graded friction course (14%)
- **16 Contractors/Producers statewide**



Asphalt Plants Producing HP Mixtures

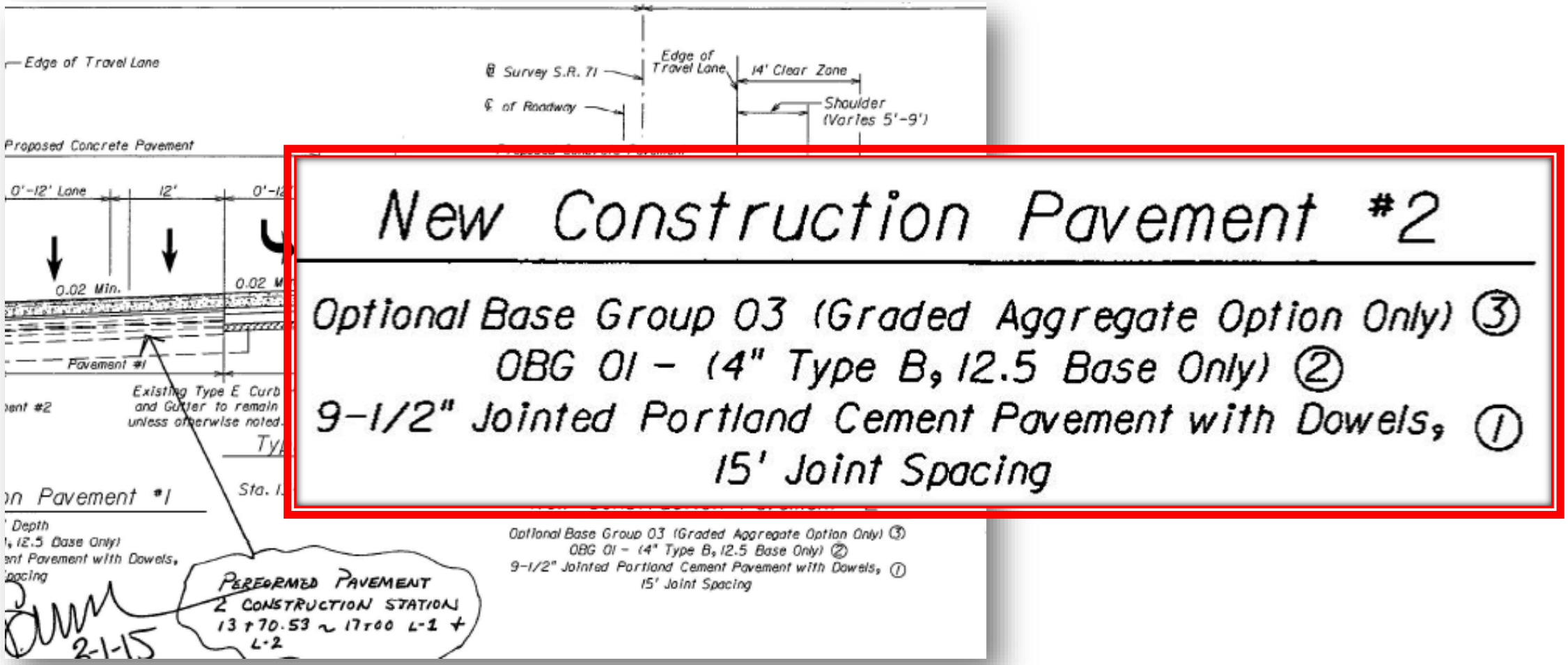
Why did FDOT move to Highly Modified Mixtures?

2010: SR-71 Jackson County (Marianna)

- Multiple truck stops; severely distressed asphalt pavement

SR-71 Jackson County

- District opted to rehabilitate project with PCC

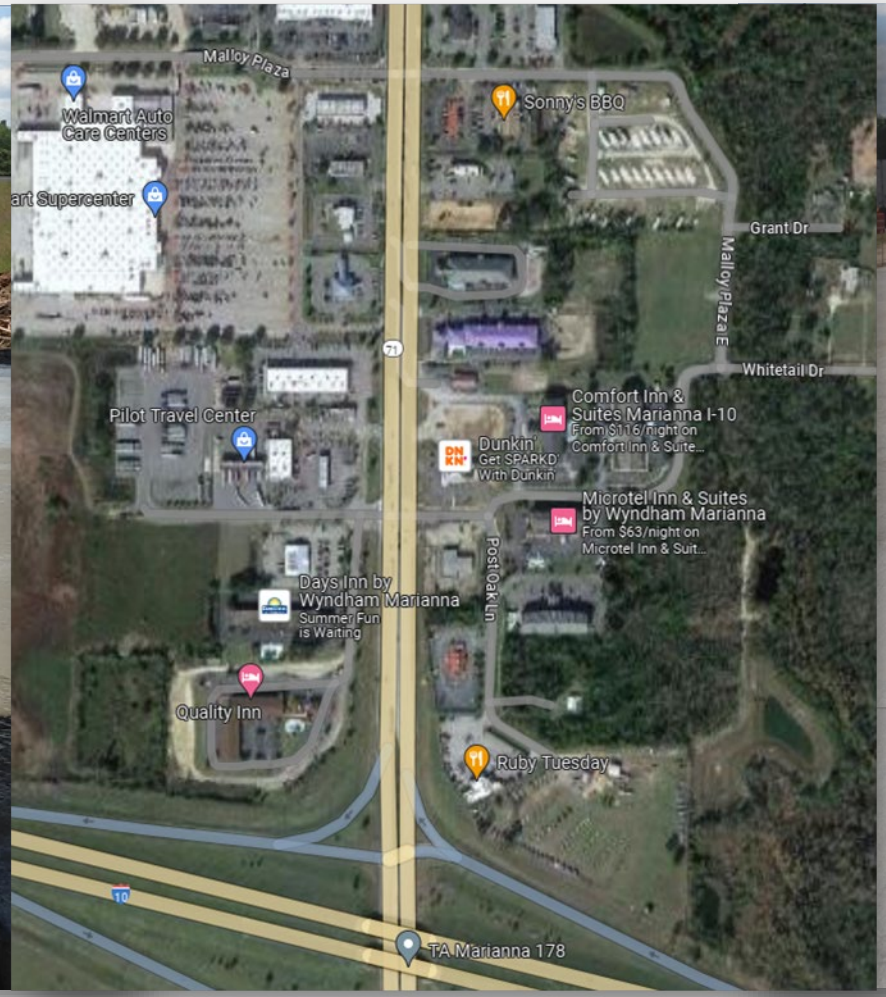


New Construction Pavement #2

Optional Base Group 03 (Graded Aggregate Option Only) ③
OBG 01 - (4" Type B, 12.5 Base Only) ②
9-1/2" Jointed Portland Cement Pavement with Dowels, ①
15' Joint Spacing

SR-71 Jackson County

Work Began: August 2013
Work Ended: December 2014



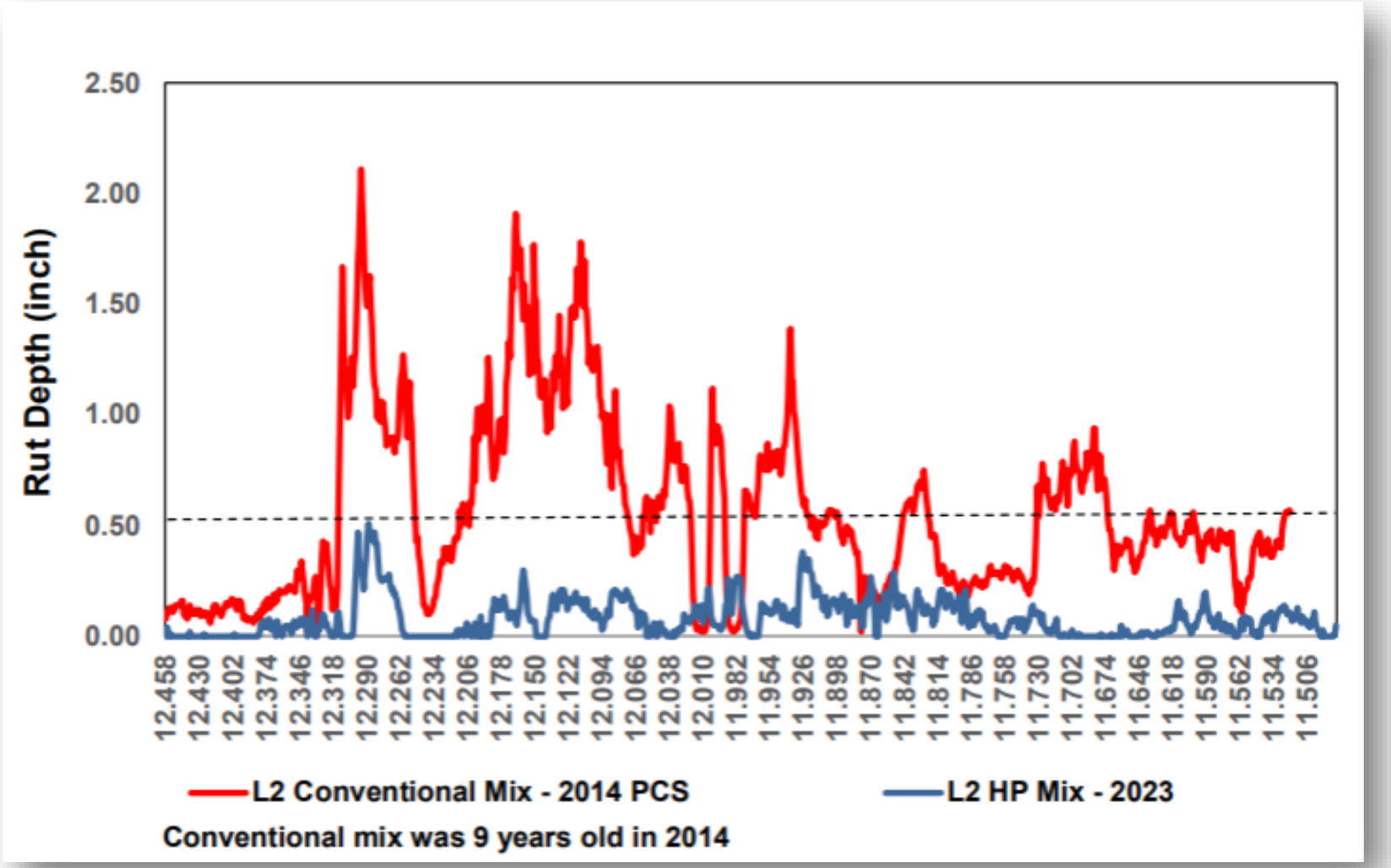
Early Projects

2015: US-90 Gadsden County (Midway)

US-90 Gadsden County

- **Heavily-rutted pavement**
  - Multiple truck stops near I-10
  - Rutting greater than two inches
- **Interim maintenance project - originally programmed to be reconstructed with concrete pavement**
  - Westbound travel lanes at the I-10 interchange
- **Concerned with potential traffic interruptions**
  - District opted to resurface approximately one mile with a high polymer mixture
- **Milled and resurfaced top 2.5” with a single lift of dense-graded friction course containing a high polymer binder**
  - 12.5 mm Superpave mixture; N_{design} @ 100 gyrations; fine graded
  - August 2015
- **Concrete reconstruction cancelled**

US-90 Performance Data (Rutting)

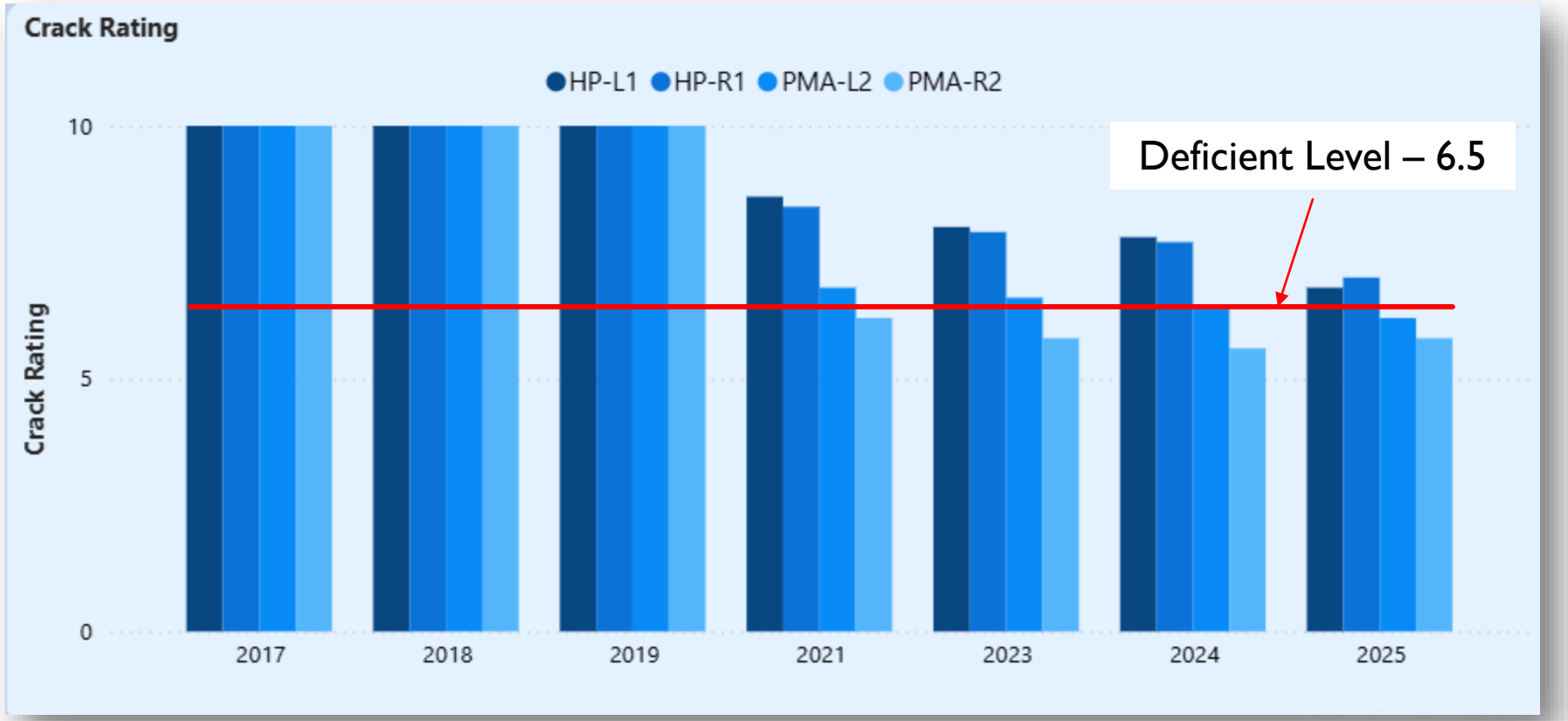


2016: US-41 – Hillsborough County (Tampa – Nebraska Avenue)

- **Project has underlying jointed PCC slabs with 20-ft spacing**
  - Severe reflective cracking from joints
- **Milled off existing asphalt (1.75”); ground concrete pavement surface**
- **Joints and cracks were cleaned and sealed prior to placing mix**
- **Placed 2.0 inches of asphalt over concrete pavement**
  - 12.5 mm Superpave mixture; N_{design} @ 75 gyrations; fine graded
  - Inside travel lanes contain 2.0” of high polymer mix
  - Outside travel lanes contain 2.0” of polymer-modified PG 76-22 mix
- **Project was paved in May 2016**

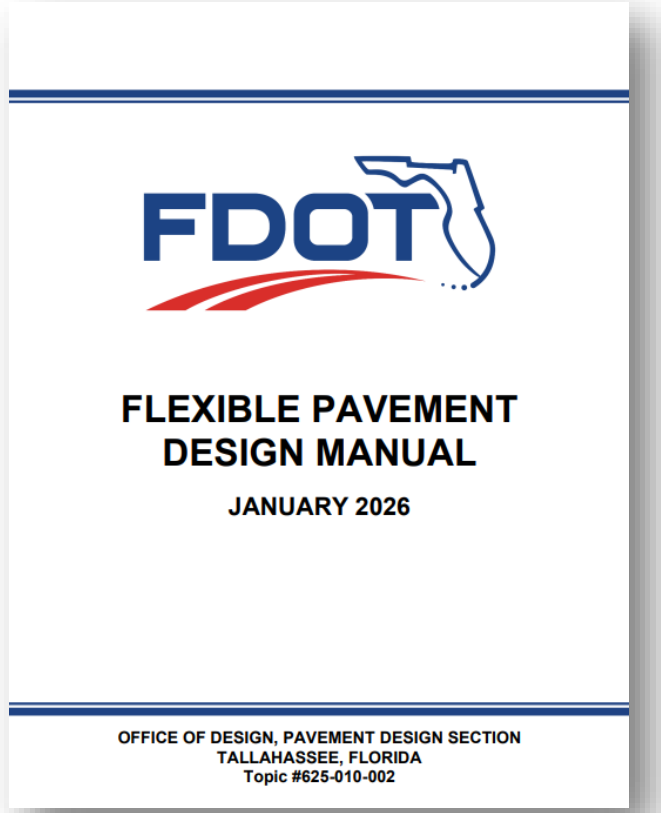
US-41 (Nebraska Avenue) – Tampa (November 2025)

US-41 (Nebraska Avenue) - Performance

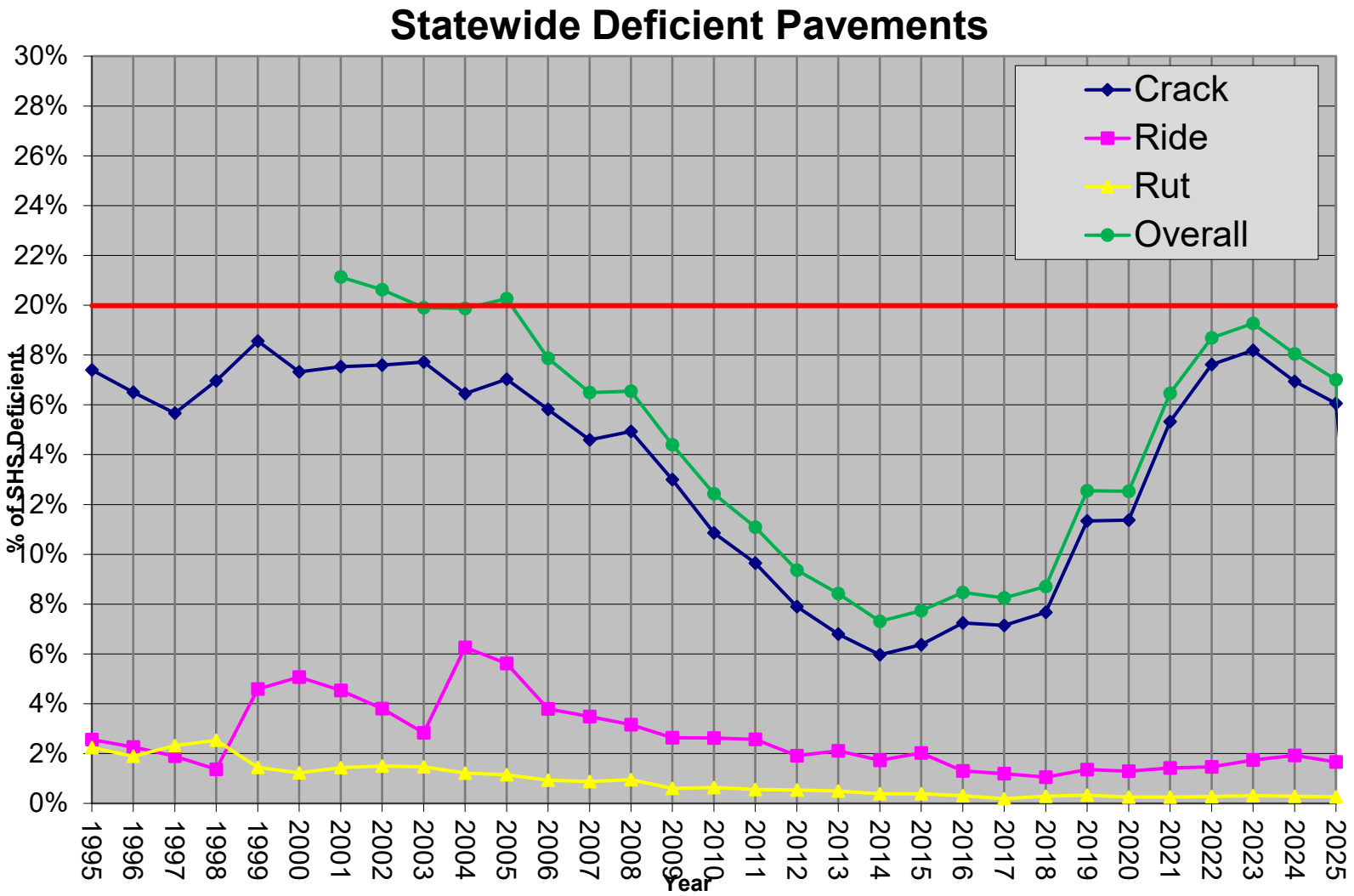


Criteria for Using High Polymer Binders

- **Travel lanes and turn lanes with slow-moving or standing truck traffic**
- **Pavements with a history of:**
  - Raveling
  - Rutting
  - Severe Cracking
- **A minimum of 1,000 tons of modified structural mix is generally recommended per project or group of projects to make the most efficient use of the material**
  - Use PG 76-22 for median openings, side streets, turn-outs, or turn lanes not meeting criteria above
- **Must be coordinated with District Materials and approved by the FDOT Central Office**



Pavement Performance in Florida



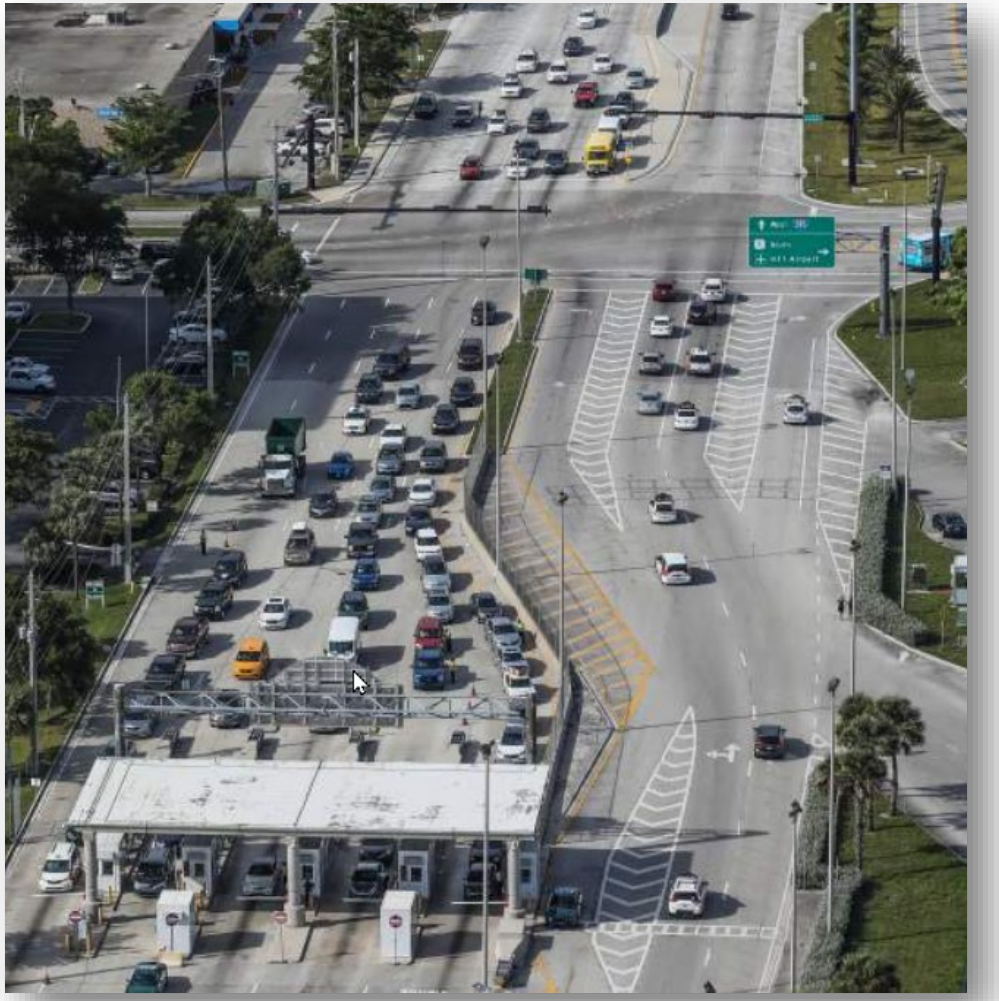
Typical Applications of HP Mixtures

Rutting

- **Only 0.3% of the Department's system is deficient due to rutting.**
- **However, rutting is a significant safety concern**
  - It rains a lot in Florida
- **Traffic volumes are increasing**

Inspection Stations (Rutting)

High Volume Intersections / Interchanges (Rutting)



Bottom-up Fatigue (Alligator) Cracking

- **Like rutting, there is a low percentage of this type of distress in Florida**
  - Becoming more prevalent
- **However, this is an expensive repair, especially when geometrically constrained by curb or guard rail**

Bottom-up Cracking at Bridge Approaches

Open-Graded Friction Courses (OGFC)

- **Half of FDOT's 45,000 lane miles are paved with OGFC**
  - Approximately 500,000 tons of OGFC every year
- **Used on high-speed, multilane limited access and arterial roadways**
  - Includes high speed signalized intersections and other locations with repetitive turning and stopping movements.

Raveling OGFC

Cost Data 1/1/2025 – 12/31/2025

Structural Courses		
Mixture Type	Cost/Ton	% Increase
Unmodified	$144.93	--
Modified	$158.40	9.3
Highly-Modified	$179.15	23.6

Dense-Graded Friction Courses		
Mixture Type	Cost/Ton	% Increase
Modified	$168.47	--
Highly-Modified	$178.99	6.2

Mix Design and Production with Highly Modified Asphalt Mixtures

- **Used with conventional Superpave mix designs**
  - AASHTO R 35 & M 323
  - Design at 4% voids
  - No changes to the mix design process
- **Target 4% voids during production**
- **Acceptance quality characteristics measured during production:**
  - Roadway density, air voids, binder content, and gradation (No. 8 and 200 sieves)
- **Percent within limits specification**

Production Considerations (Contractor input)

- **Binder storage 325 – 350°F, keep it agitated**
- **Storage time: Supplier says 2 – 3 days**
  - Held it longer – material was tested and still met specification requirements
- **Need to provide advance notice to supplier (1 week)**
- **Pumping: Reduce production rate – longer pumping distance (> 80') results in the pump drawing too many amps which may cause problems**
- **Mix storage: Try not to store more than 2 – 3 hours**
  - Definitely not overnight.
- **Mix production temperatures typically 330 – 335°F**
- **Problems: Occasionally get a build-up in the drum discharge if not running other mixtures**

Paving Considerations (Contractor input)

- **Temperature is everything!**
  - 330-335°F Mixture cools rapidly
- **“Overtruck” – Make sure they have adequate trucks for a continuous supply to the paver**
- **Handwork is a major problem – difficult to rake; gets stiff very quickly;**
  - Avoid using it in turnouts and cross-overs
- **Material Transfer Vehicle is a must**
  - Mixture visually looks different when not using one
- **Density: Keep the roller at the paver (i.e., bump the screed)**
  - Two 12-ton breakdown rollers
  - One 10-ton finish roller
- **Hauling: Trucks must be tarped and strapped down; mix will “crust over”**
- **Use the “A” Crew for HP mixtures**
- **OGFC – Tends to pull a little more;**
- **Opinions:**
  - No real problems; had some growing pains but they worked through them
  - Overall, no density or smoothness issues

Thank you.
Comments/Questions?

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