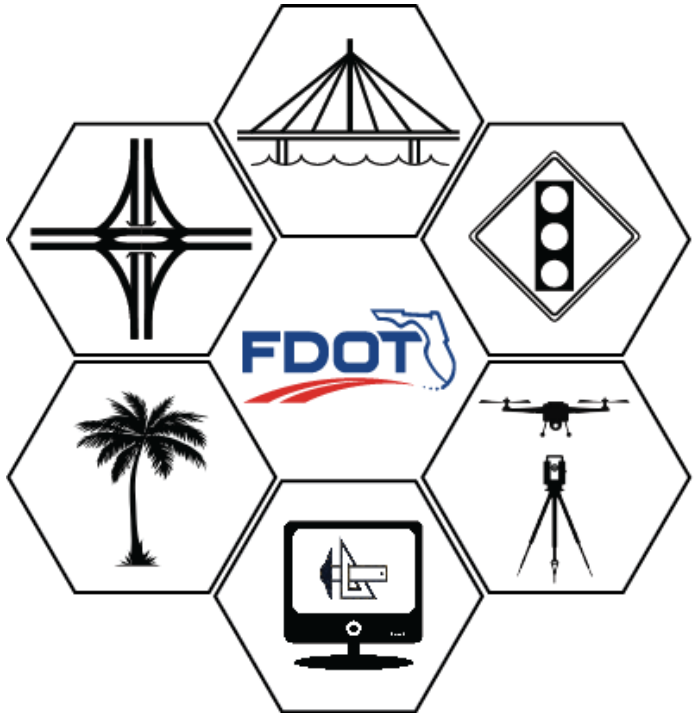


FDOT TRANSPORTATION SYMPOSIUM 2019

Flexible Pavement / Materials

Rhonda Taylor and Howie Moseley

Presentation Outline

- High Polymer Binder Usage
- Full Depth Fatigue Cracking
- SP-9.5 and FC-9.5 lift thicknesses
- FC-5 Usage (Ramps and other Areas)
- Asphalt Base in lieu of Stabilized Subgrade

What is High Polymer Binder?

- FDOT's premium binder to address severe rutting and full depth fatigue (alligator) cracking
- Replaced PG 82-22 binder in the July 2017 Specification Workbook
- Originally called PG 76-22HP in earlier developmental specifications
  - Changed the name to high polymer binder to avoid confusion
  - Called HiMA (highly modified asphalt) binder in other states

Where should High Polymer Binder be Considered?

- Flexible Pavement Design Manual (FPDM), Section 5.4
  - High polymer binder should only be used in travel lanes and turn lanes with slow moving or standing truck traffic or a history of rutting or severe cracking.
  - Examples: For toll booths, intersections with slow truck traffic, pavement sections with a history of rutting or severe cracking and existing weigh stations with standing traffic, use a PG 76-22 or High Polymer binder.
  - FC-5 areas with significant raveling.
    - Not currently discussed in the FPDM.

Where should High Polymer Binder be Considered?

- Areas with extreme rutting

Where should High Polymer Binder be Considered?

- Inspection and weigh stations

Where should High Polymer Binder be Considered?

- Projects with intersections with slow truck traffic or a history of significant rutting

Where should High Polymer Binder be Considered?

- Alternative to concrete intersection reconstruction

Where should High Polymer Binder be Considered?

- Interstate ramps with high truck volumes (truck stops) or a history of rutting.

Where should High Polymer Binder be Considered?

- Projects with full depth fatigue (alligator) cracking

Where should High Polymer Binder be Considered?

- Projects with significant FC-5 raveling.

Areas Where High Polymer Binder Should Not be Used*

- Inside travel lanes
- Median openings
- Turn-outs
- Turn lanes
- Hand work areas
- Other low production areas

* Unless there is severe rutting, fatigue cracking, or raveling FC-5.

Use of High Polymer Binder

- Section 5.4 of the Flexible Pavement Design Manual
  - When High Polymer binder is being considered for a project, coordinate this decision with the State Bituminous Materials Engineer's office at the SMO.
- Work with your local District Materials Office and only use high polymer binder when recommended.

Recently Completed High Polymer Binder Research

- Determine the Structural Coefficient for Asphalt Mixes Containing High Polymer Binder (BE321)
  - Research Organization: University of Nevada Reno
- The objective of this project is to determine the additional structural value of high polymer mixtures compared to asphalt mixtures containing PG 76-22 binder.
- Research showed there is roughly a 20% increase in structural capacity for high polymer binder mixtures.

Recently Completed High Polymer Binder Research

- Evaluation of FC-5 with High Polymer Binder to Reduce Raveling (BE287)
  - Research Organization: Texas A&M Transportation Institute
- The objective of this research is to determine if the use of high polymer binder in FC-5 mixtures (in lieu of PG 76-22 binder) will increase the performance/longevity of FC-5 mixtures.
- Research indicated a minimum of 2 year increase in pavement life for FC-5 mixtures containing high polymer binder.

Full Depth Fatigue Cracking

- Commonly called alligator cracking
- Needs to be investigated prior to determining rehabilitation strategy
- Rehabilitation strategies used in the past
  - Reconstruction
  - Full depth reclamation
  - Stress absorbing membrane
  - Full depth resurfacing

Full Depth Resurfacing

- Full depth fatigue cracking should be investigated prior to determining rehabilitation strategy.
- Minimal impact to traffic compared to other full depth fatigue cracking rehabilitation strategies.
- Can address isolated areas of full depth fatigue cracking effectively.
- Couple with high polymer binder for maximum benefit.

Current Full Depth Resurfacing Limitations

- Current specs and drop-off requirements limit the depth for a single lift of asphalt.
  - 5.5” maximum resurfacing depth in an area with FC-12.5.
    - 4.0” SP-19.0 & 1.5” FC-12.5
  - Up to 6.25” maximum depth in an area with FC-5 (if only one lane).
    - Resurface structural course in the adjacent lane first (0.75” below final grade)

334-1.4.1 Layer Thicknesses: The allowable layer thicknesses for Type SP Asphalt Concrete mixtures are as follows:

Type SP-9.5	1 to 1-1/2 inches
Type SP-12.5	1-1/2 to 2-1/2 inches
Type SP-19.0	2 to 4 inches

Full-Depth Resurfacing Improvements

- Research to study the performance of thicker lifts.
  - NCAT
  - Upcoming at the State Materials Office with the HVS
- Finalizing a developmental specification to allow thicker lifts of asphalt.
- Working with a couple of districts to construct demonstration projects.

Thickness of SP-9.5 & FC-9.5 Mixtures

- Contractors in each district have expressed constructability concerns with 1.0” lifts.
- 1.25” lifts are allowed for both SP-9.5 and FC-9.5.
- Avoid 1.0” lifts without increasing the overall resurfacing depth.
- FPDM, Section 7.8
  - In locations where there have been constructability concerns with 1.0-in lifts, 1-1/4-in lifts of Type SP-9.5 or FC-9.5 should be called for in the plans in lieu of 1.0-in lifts, however, ensure that the pavement design does not result in additional structure being added when it is not warranted by the SNR or the recommendation from the Materials Office.

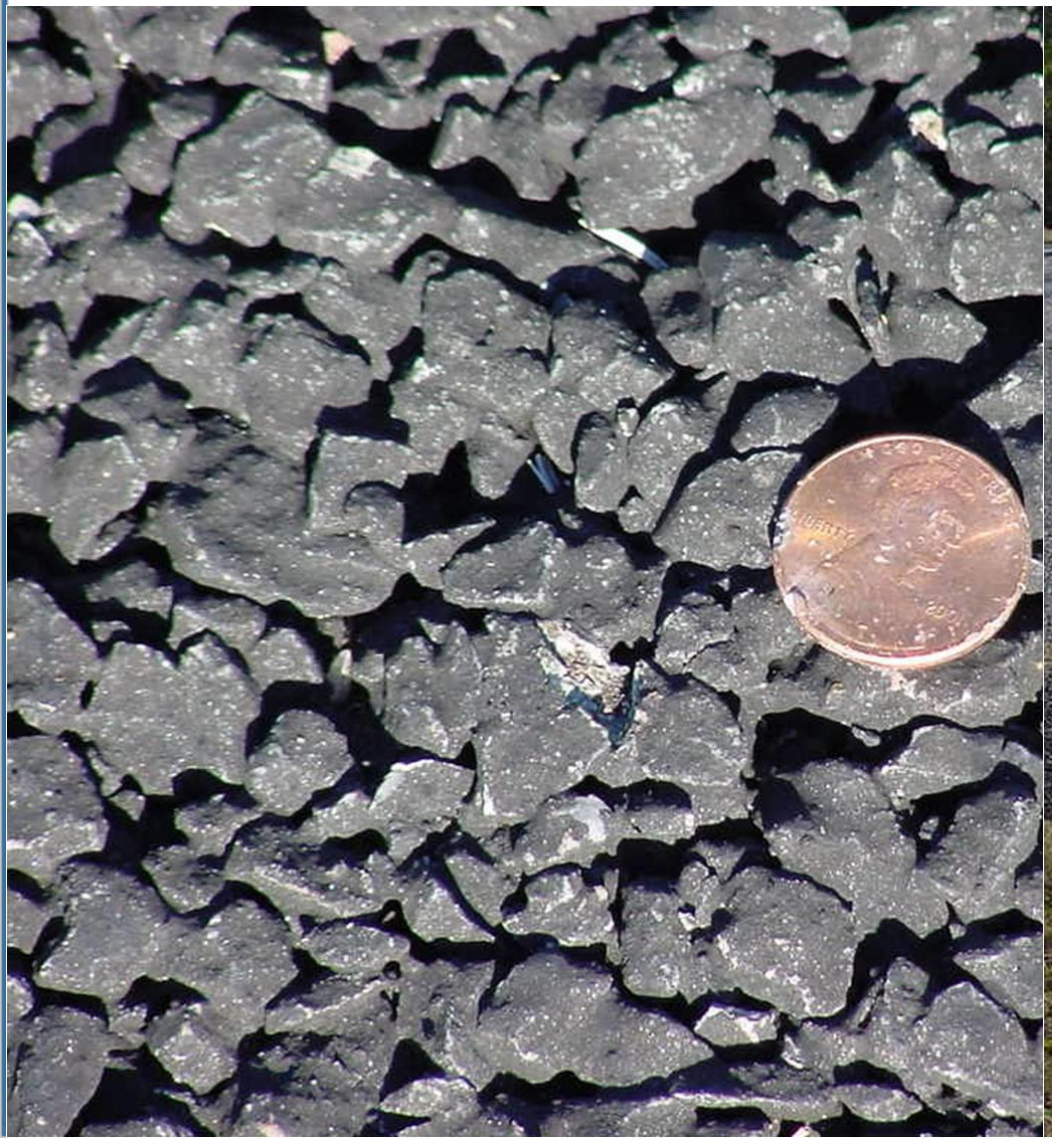
Reasons to Avoid 1.0” Lifts

- The target density is always reduced to 92.0%.
  - Less than three times the nominal maximum sieve size.
  - Vibratory compaction not allowed on 1.0” lifts.
  - Potential of shortening the pavement life with reduced density.
- The available time for compaction is reduced.
  - 1.0” versus 1.25” lift: 50% more available time for compaction.
  - 1.0” versus 1.5” lift”: 100% more available time for compaction.
- Reduced chance of slippage failure.
  - Thicker lifts are better for resisting slippage failures.
  - Potential to eliminate a slippage plane.

Avoiding 1.0” Lifts without Increasing Thickness

- Milling depth = 2.0”
  - Resurface with 2.0” FC-12.5
- Milling depth = 2.5”
  - Resurface with 1.25” SP-9.5 & 1.25” FC-9.5
- Milling depth = 3.0”
  - Resurface with 1.5” SP-12.5 & 1.5” FC-12.5 or
  - Resurface with 1.75” SP-12.5 & 1.25” FC-9.5

FC-5 Usage



FC-5 Background

- FC-5 is an open graded asphalt friction course
- Required on multi-lane flush shoulder roadways with a design speed of 50 mph or greater
- The open graded texture of these mixtures provides for the rapid removal of water from between the tire and the pavement to reduce the potential for hydroplaning at higher speeds
- Permeable (18 – 20% in-place air voids)
- FC-5 usage outlined in the FPDM, Chapter 4

FC-5 Usage on Limited Access Facility Ramps

- FPDM, Section 4.2
  - Dense graded friction course will be placed on limited access ramps and should extend to the edge of the travel lane of the intersecting street. An exception to this would be where two limited access facilities are connected by a high-speed ramp, in which case FC-5 will normally be used.

When can FC-5 be Used on a Ramp?

- Two limited access facilities connected by a high-speed ramp.
- Multi-lane ramp where the design speed is ≥ 50 mph.
- When the ramp is still connected to the limited access facility travel lanes.

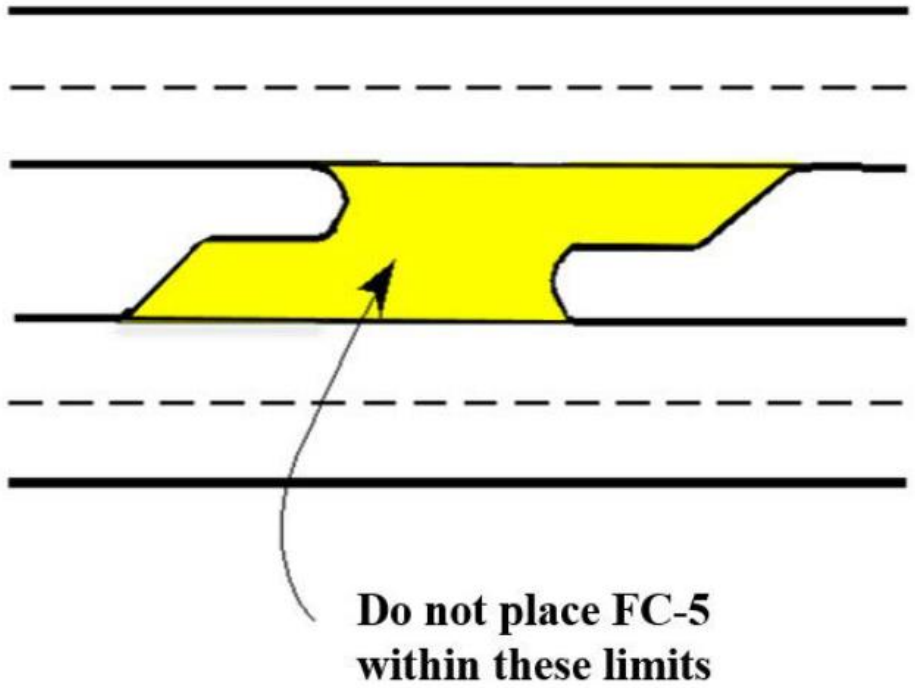

55 mph, single-lane ramp transitioning to a two-lane arterial
55 mph, two-lane arterial transitioning to a single-lane ramp
275
93
275
275

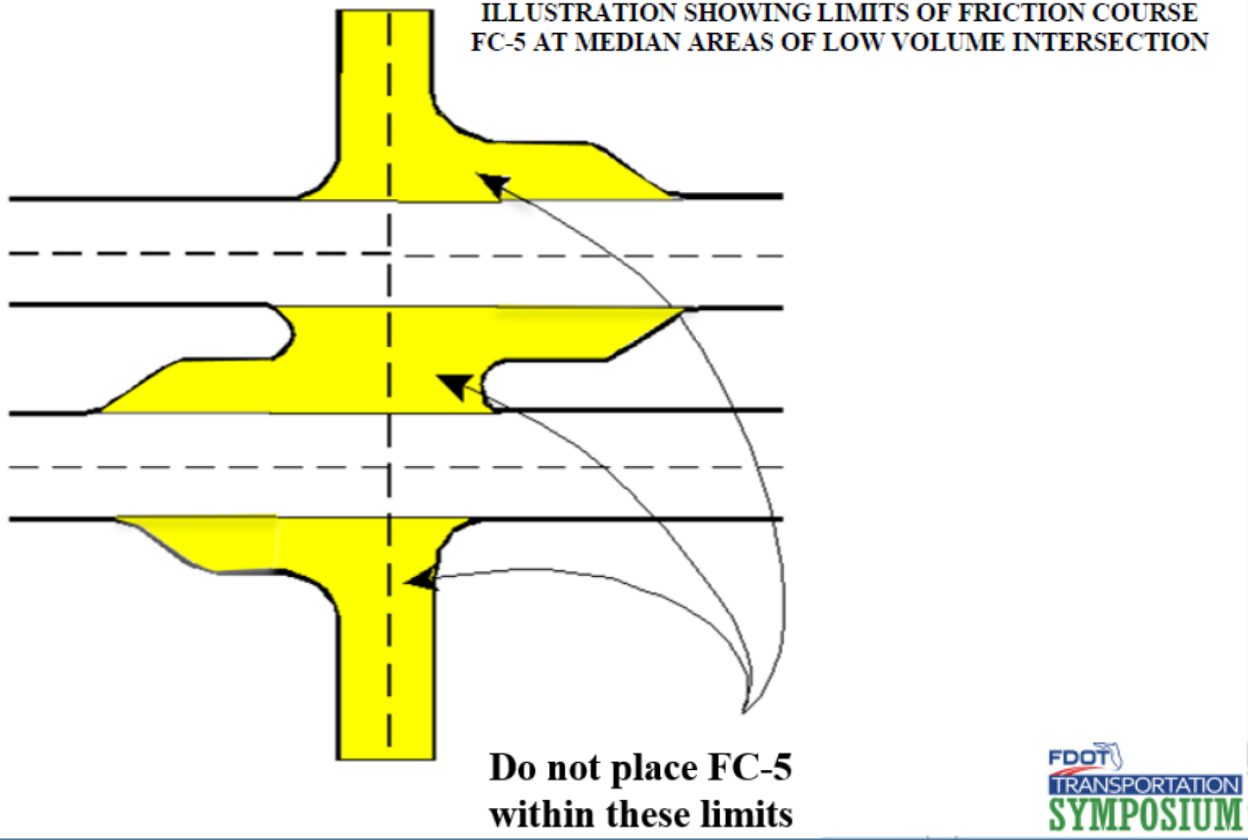
FC-5 Usage on Limited Access Facility Ramps

- FC-5 is NOT an alternative for substandard ramp geometry or improper super-elevation.
- Dense graded friction courses generally have higher friction values compared to FC-5.
- A high friction surface treatment should be considered if the ramp geometry or super-elevation cannot be corrected adequately.

Median Openings and Turnouts

- FPDM, Section 4.3
  - FC-5 is not to be placed in median crossovers, turn outs, or gore areas of multilane, high speed facilities.





FC-5 Usage on Deceleration Lanes

- "On multi-lane non-limited access facilities, the FC-5 will cover the deceleration areas of turn lanes and shoulder pavement."
  - *Language to be added with next update: "*An exception to this would be low-volume intersections as shown in Figure 4.3."

deceleration lane noun

Definition of *deceleration lane*

: a speed-change area or lane consisting of added pavement at the edge of through-traffic lanes to permit drivers to diverge from the through-traffic flow without reducing speed until after the diverging maneuver is completed

FC-5 Median Opening

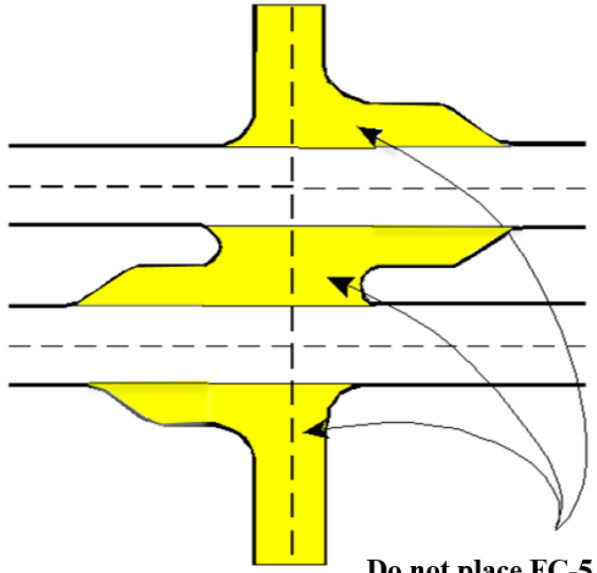
Dense Graded Median Opening

FC-5 Turn-out

Dense Graded Turn-out

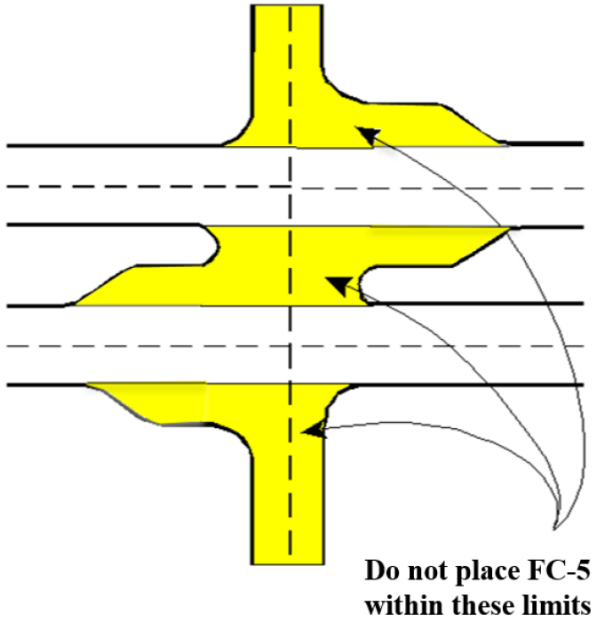
FC-5 Longitudinal Joints

- Maintain positive drainage.
- When the dense graded median opening, turn lane, or turn-out is on the high side, the FC-5 in the adjacent travel lane can be paved flush with these areas.



FC-5 Longitudinal Joints

- Maintain positive drainage.
- When the dense graded median opening, turn lane, or turn-out is on the low side, the FC-5 in the adjacent travel lane needs to have a lip.



FC-5 Transverse Joints

- FC-5 transverse joints should be flush with adjacent pavement.

Asphalt Base in Lieu of Stabilized Subgrade?

- Stabilized subgrade has a history of good performance and provides strength to the pavement system at a low cost.
- Stabilized subgrade is usually necessary to support curb and gutter, and provide a stable shoulder condition.
- In some situations, project conditions dictate elimination of stabilized subgrade:
  - Limited working areas at intersections or in medians
  - Shallow existing utilities that are impractical to relocate
  - Areas of urban projects where it is essential to accelerate construction

Asphalt Base in Lieu of Stabilized Subgrade?

- The difficulty of achieving compaction of the first course placed on an unstable subgrade must be considered.
- Consult the District Construction Design Engineer prior to deciding to eliminate stabilized subgrade in design.
- The reasons for eliminating must be documented in the project file.
- FPDM Section 5.6.1

Questions?