

Open-Graded Friction Courses Suitable for Suburban Environments

Southeastern Asphalt User/Producer Group Meeting
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Use of OGFC

- Minimize hydroplaning
- Reduce splash & spray
- Improve friction



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Weather Impacts on Safety




Each year (2007-2016)
1,235,145 weather-related accidents
5,376 people killed

46%
happened during rainfall

https://ops.ftwa.dot.gov/weather/q1_roadimpact.htm

Success Story



93%
reduction in wet weather accidents after placement of OGFC

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Imagine Driving on a Rainy Day



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Use of FC-5 Mixtures in Florida

- Improve safety
 - Multilane
 - Flush shoulder
 - Speed 50mph or above
- Typical FC-5 course
 - 12.5mm NMA, PG 76-22
 - Placed at 3/4" thick
 - No structural value




(Source: ASPHALTER)

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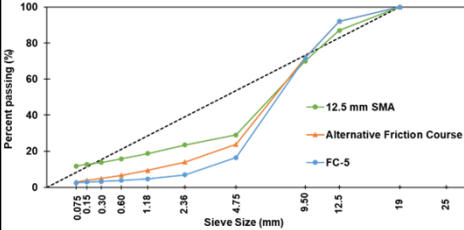
FC-5 Mixtures in Suburban Areas

- Experiences premature raveling
 - Due to high lateral stresses from turning, rapid acceleration, and braking



(Source: [E207](#))

Mix Designs for AFC



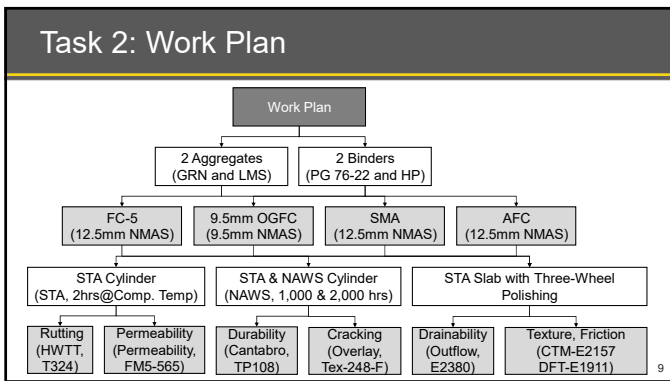
- Gradation
 - 12.5mm NMAS
- Air voids
 - 10% - 15%
- Cantabro loss
 - ≤ 10%
- Permeability
 - as measured

Strategies Considered to Mitigate Problems

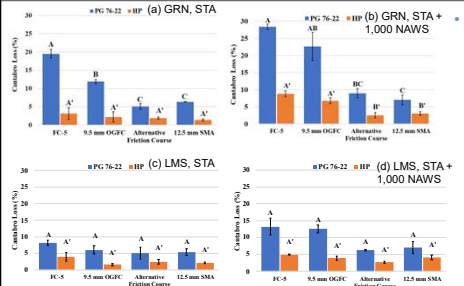
- HP binder
- 9.5mm NMAS
- Alternative friction course (AFC)
- Stone matrix asphalt (SMA)

Summary of Mix Designs

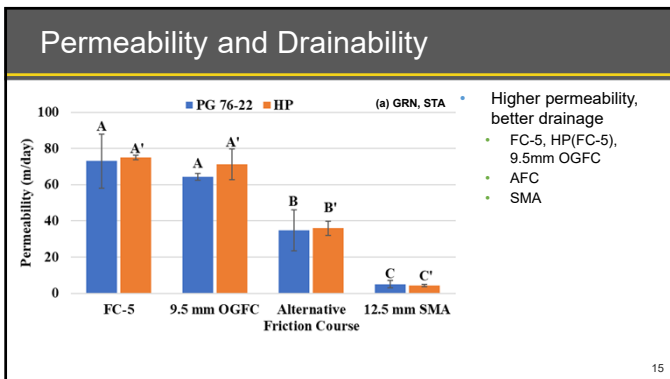
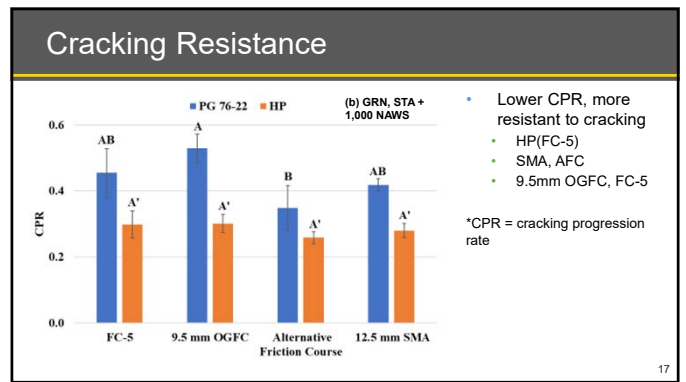
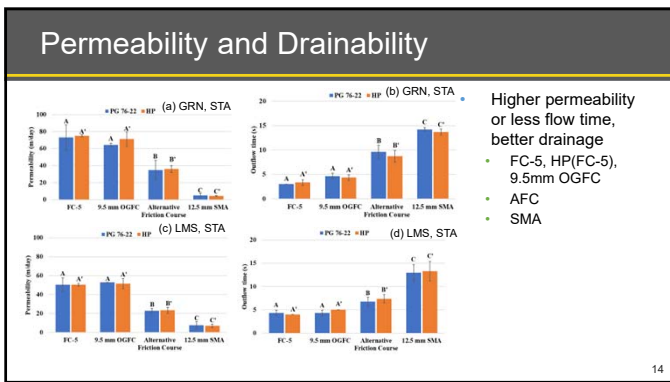
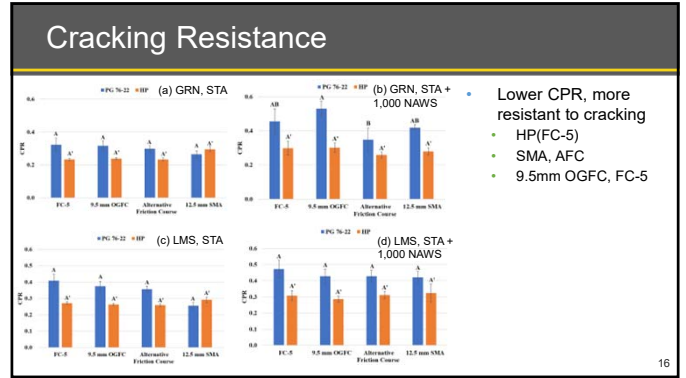
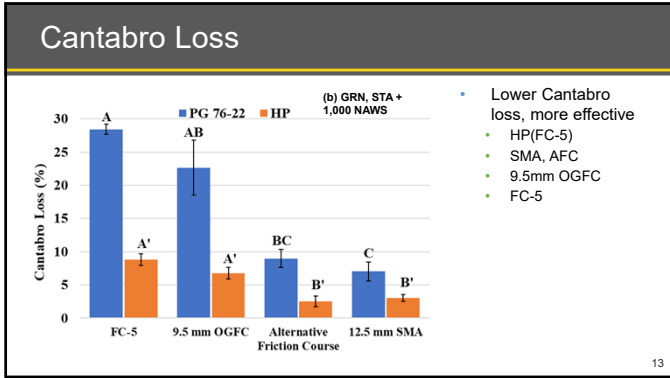
Mix Type	GRN		LMS	
	OBC (%)	Va (%)	OBC (%)	Va (%)
FC-5 (N _{design} = 50)	6.3	19.6	7.0	15.1
9.5mm OGFC (N _{design} = 50)	6.3	19.6	7.3	15.3
Alternative Mix Design (N _{design} = 50)	6.5	13.5	7.3	11.0
12.5mm SMA (N _{design} = 35)	6.5	4.0	7.5	4.0

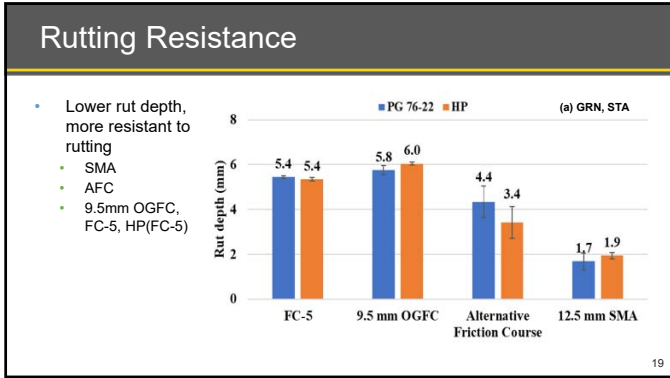


Cantabro Loss



- Lower Cantabro loss, more effective
 - HP(FC-5)
 - SMA, AFC
 - 9.5mm OGFC
 - FC-5



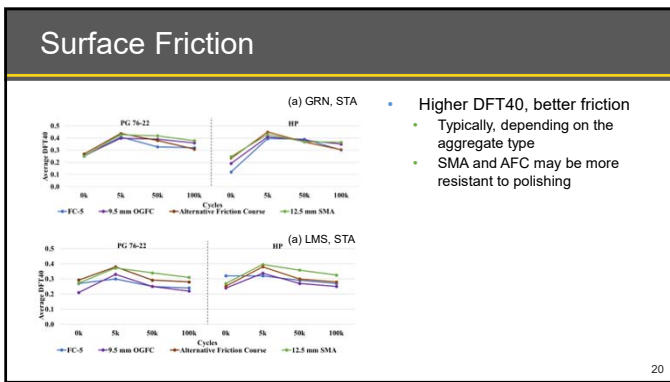


Summary of Findings

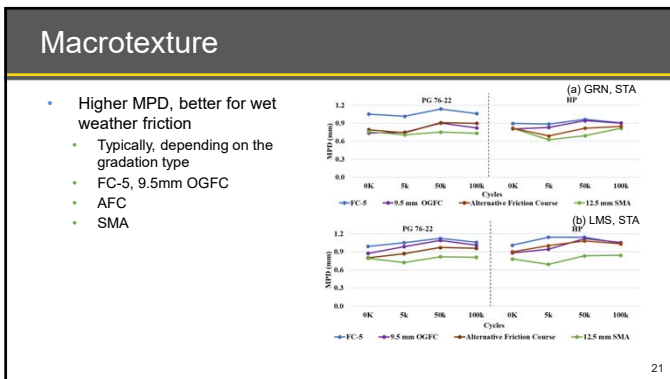
Factor	Durability	Permeability	Drainability	Cracking	Rutting	Friction	Macrotexture
FC-5	0	0	0	0	0	0	0
HP(FC-5)	+++	0	0	++	0	0	0
9.5mm OGFC	+	0	0	0	0	0	0
AFC	++	-	-	+	+	+	-
SMA	++	--	--	+	++	+	--

Notes: '0' = no change; '+' positive effect; '-' negative effect

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- ### Recommendations
- Strategies for improving the durability of OGFC for suburban environments
 - HP(FC-5)
 - Minimum specs changes, increase in cost
 - 9.5mm OGFC
 - Some specs changes, minimum to no cost increase
 - Alternative Friction Course
 - Some specs changes, minimum to no cost increase
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Implementation: Proposed Requirements for 9.5mm OGFC and AFC

Sieve Size	FC-5	9.5-mm OGFC	Alternative Friction Course
3/4"	100	100	100
1/2"	85 - 100	100	85 - 100
3/8"	60 - 75	85 - 100	60 - 75
#4	15 - 25	20 - 40	25 - 35
#8	5 - 10	5 - 10	10 - 15
#200	2 - 5	2 - 4	2 - 5
Mix Property	Test Standard	9.5-mm OGFC	Alternative Friction Course
N _{design}	N/A	50	50
Air Voids (%)	AASHTO T 331	≥ 15	10 - 15
Cantabro Loss (%)	AASHTO T 401	≤ 15	≤ 10

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Thank You

Questions?

