

CA and USB Sections

Nam Tran

SEVENTH  
RESEARCH CYCLE

NCAT TEST TRACK CONFERENCE

Mam Train

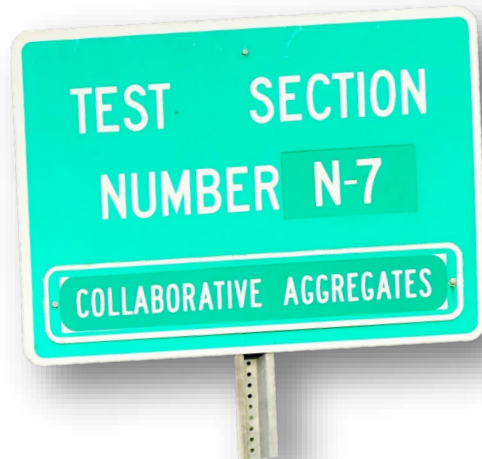
Hailey Tran 6/19/21



Happy Father's Day!

# Objectives

- To design, produce and pave asphalt mixes with bio-based materials on Test Track
- To compare their field performance with that of conventional asphalt mixtures



# Collaborative Aggregates Study



1st Paving

Reconstruction

8/6/15

4/15/16

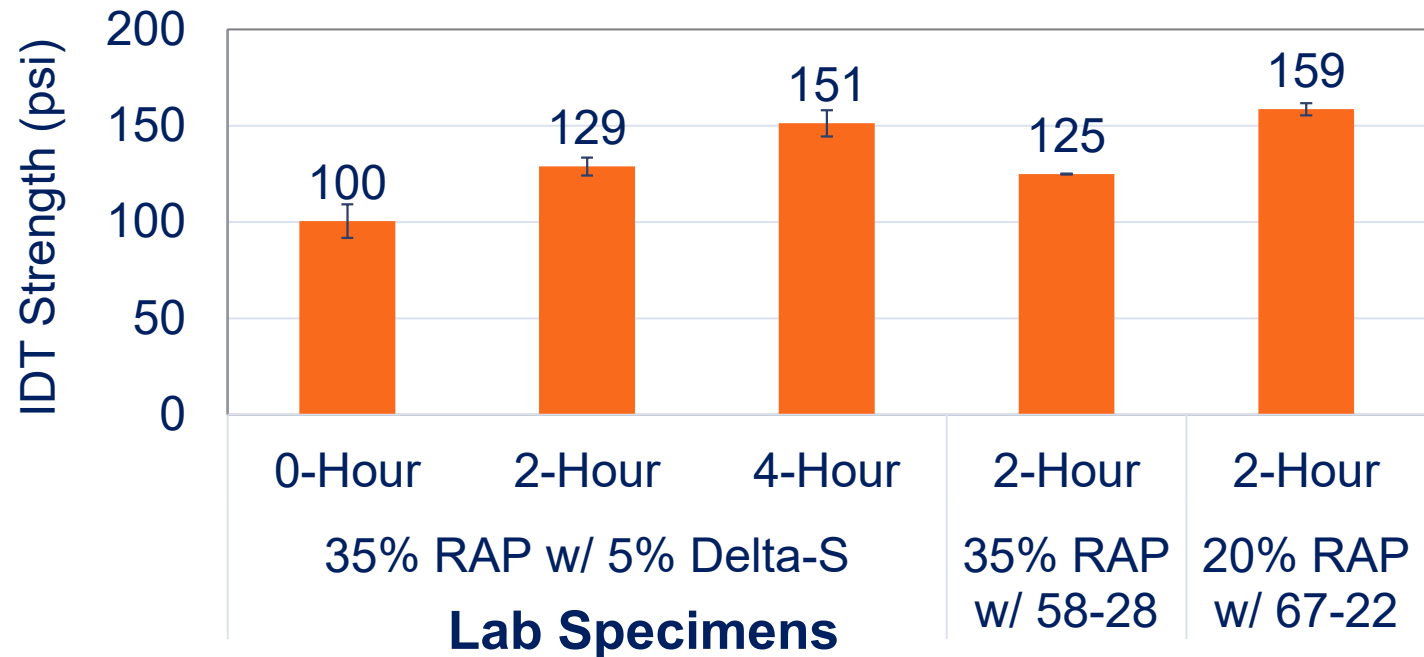
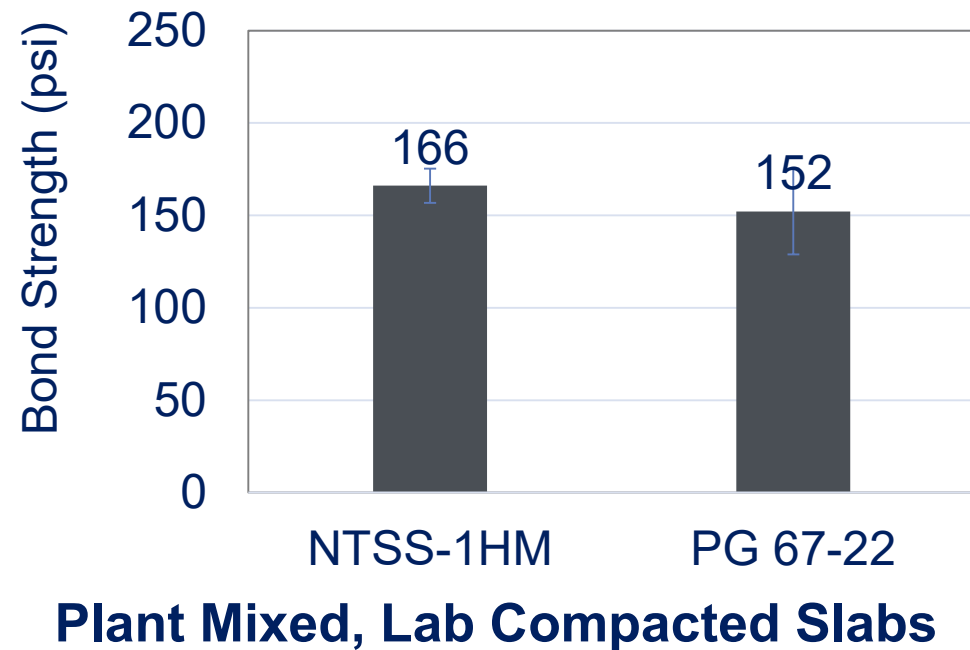
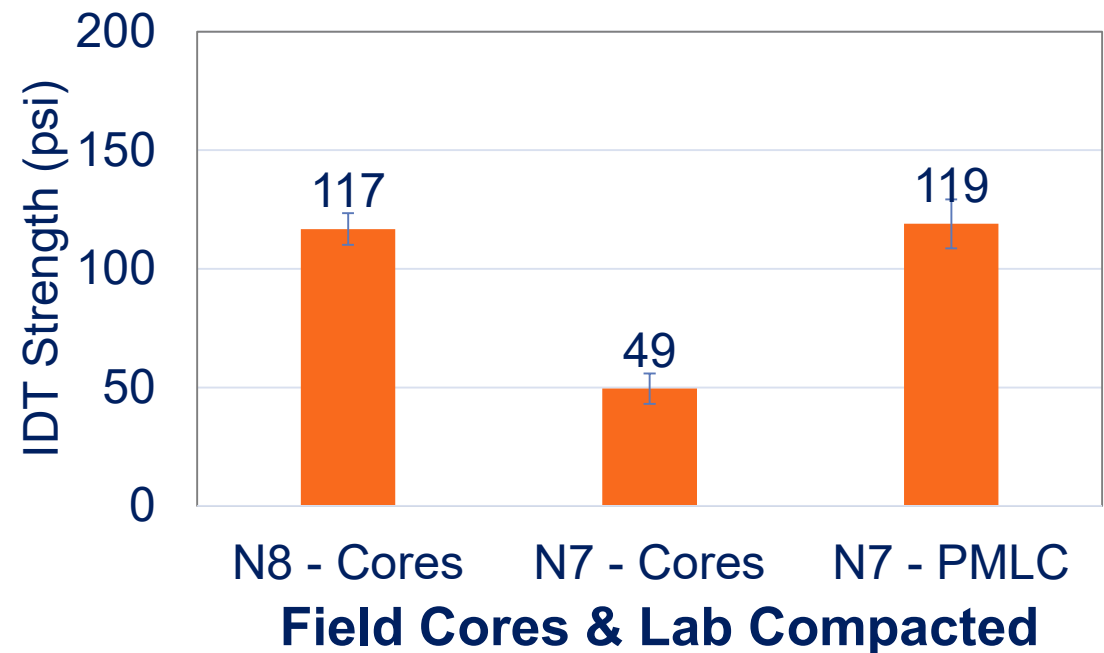
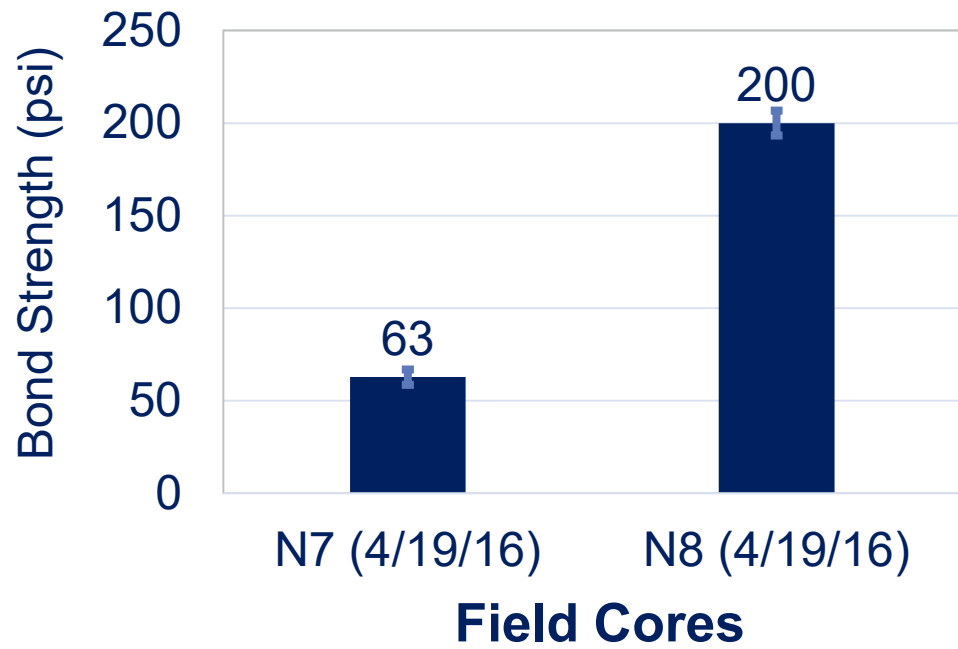
4/16/16

20% RAP + 5%  
RAP & 10%  
Delta S

Reconstructed  
with the same  
mixes

Slippage failure  
observed after  
a few hours





1st Paving

Reconstruction

Resurfacing

8/6/15

4/15/16

4/16/16

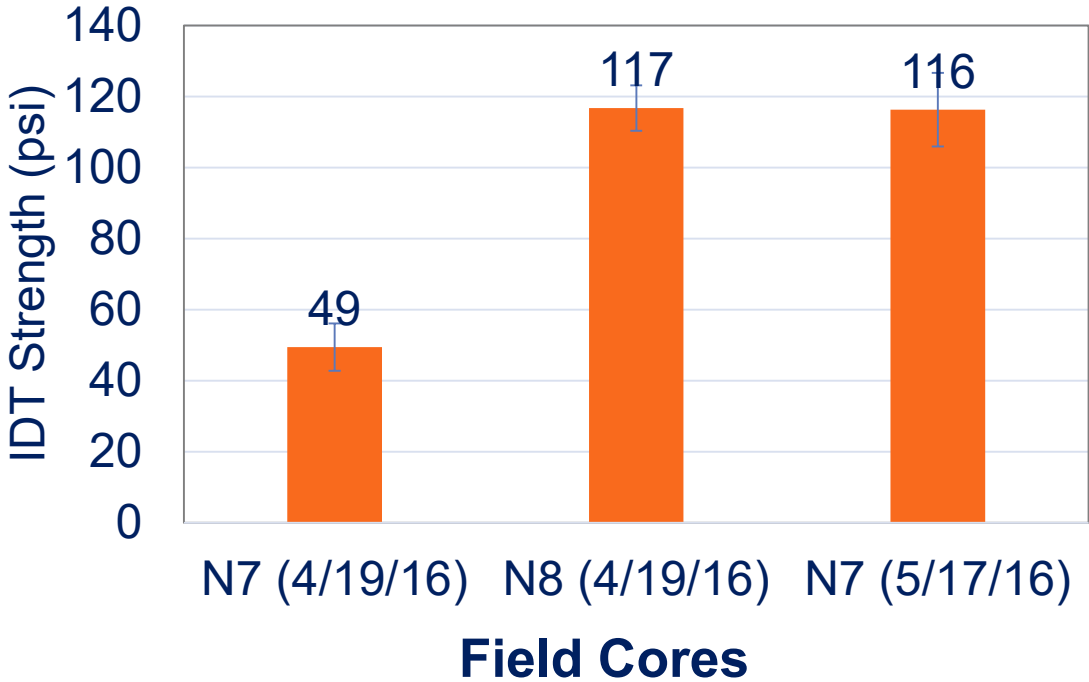
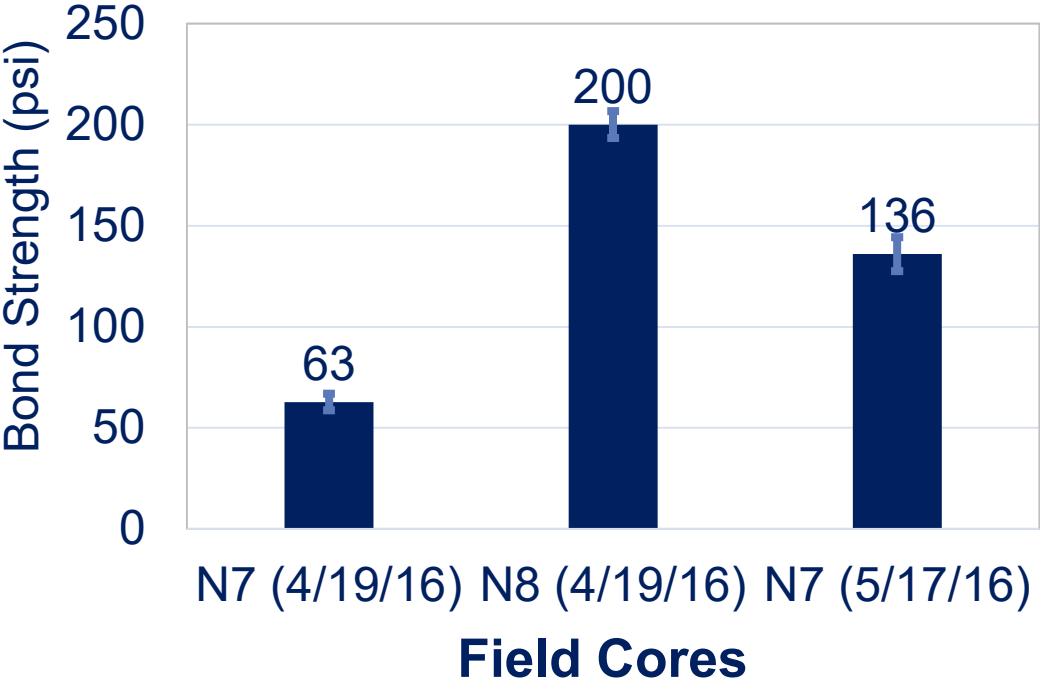
5/12/16

20% RAP + 5% RAP & 10% Delta S

Reconstructed with the same mixes

Slippage failure observed after a few hours

35% RAP & 5% Delta S  
2 hours of silo storage

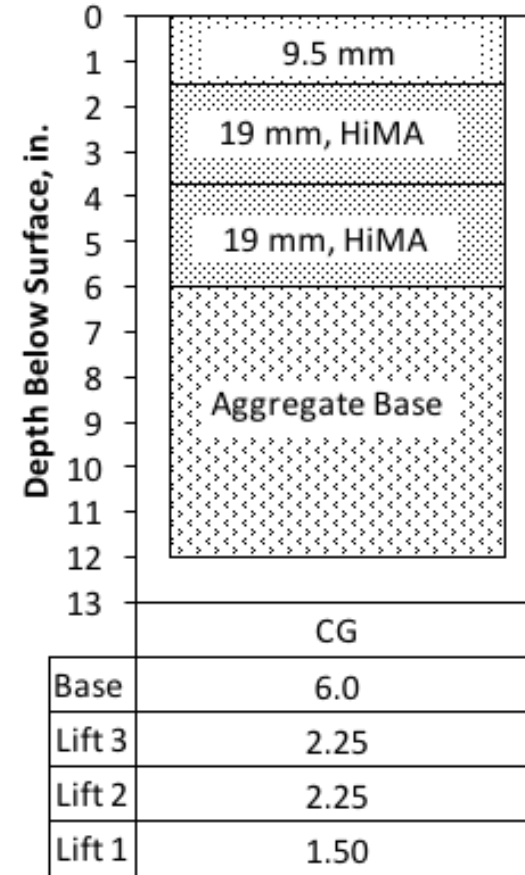


# Performance from 5/12/2016

N1: 20% RAP, PG 67-22



N7: 35% RAP, PG 67-22, Delta S



Both designed as Superpave mixtures to meet volumetric requirements with performance verification



# Laboratory Performance Testing

Mixture	Extracted	
	PG	$\Delta T_c$
N1 20% RAP	88.6–16.6	-9.4
N7 35% RAP + Delta S	94.5–16.4	-10.1

Mixture	Texas OT (Nf)	I-FIT (FI)
N1 20% RAP	25 (A)	3.58(A)
N7 35% RAP + Delta S	10 (A)	3.43(A)

1st Paving

Reconstruction

Resurfacing

8/6/15

4/15/16

5/12/16

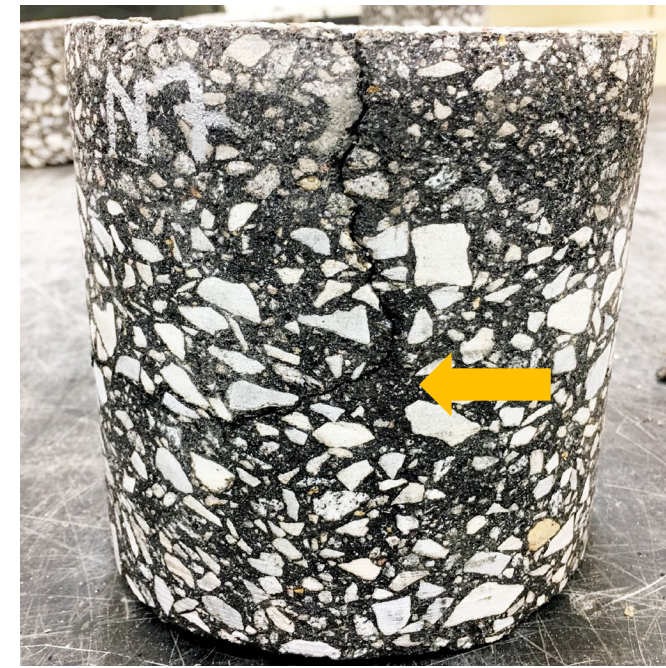
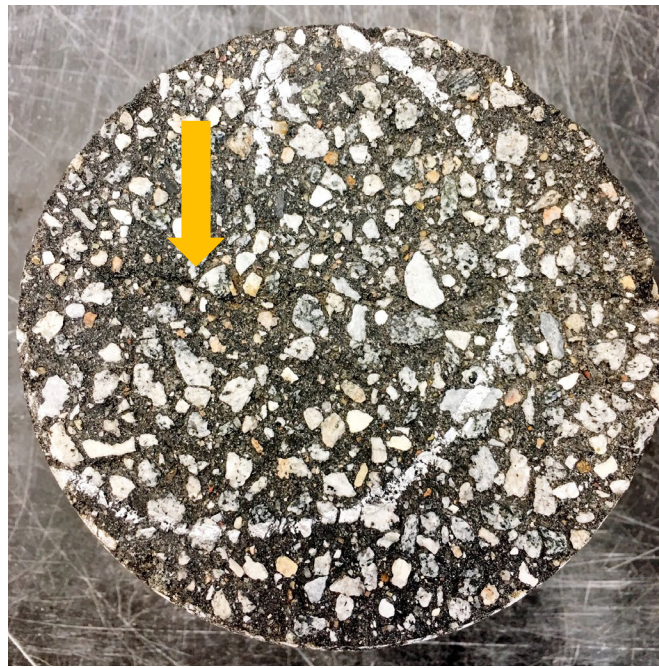
1/8/20

20% RAP + 5%  
RAP & 10%  
Delta S

Reconstructed  
with the same  
mixes

35% RAP & 5% Delta S  
2 hours of silo storage

Cores cut to assess  
cracking



**Bottom-up cracking due to rapid reconstruction in 2016**

1st Paving

Reconstruction

Resurfacing

Spray-on Rejuvenator

Patching

8/6/15

4/15/16

5/12/16

2/21/20

5/22/20

20% RAP + 5%  
RAP & 10%  
Delta S

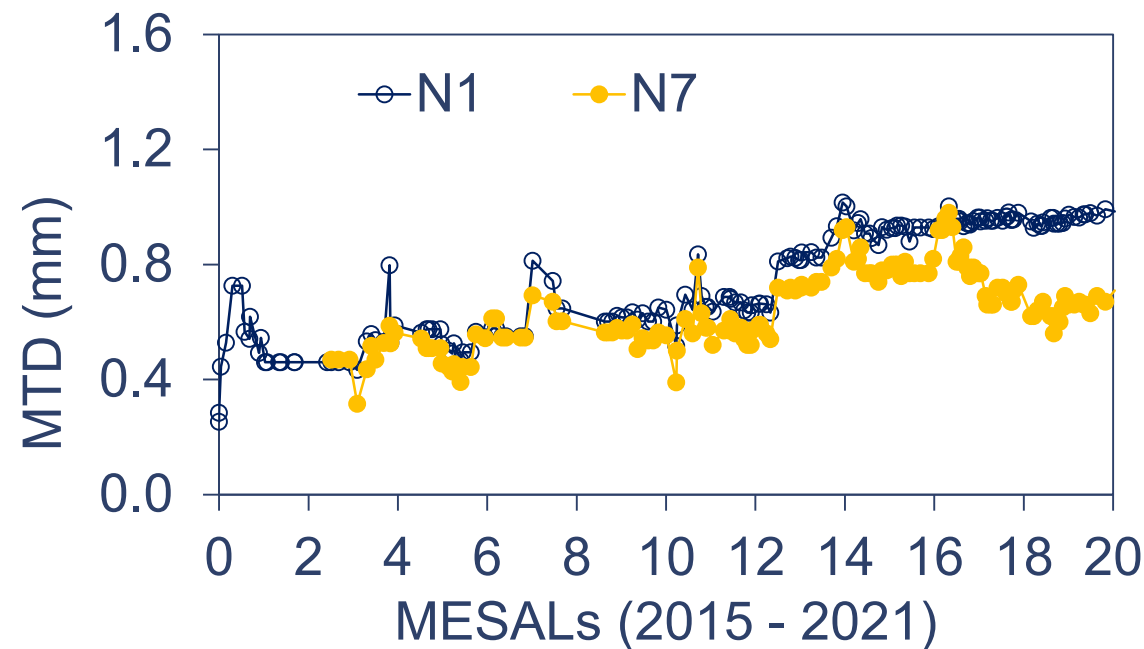
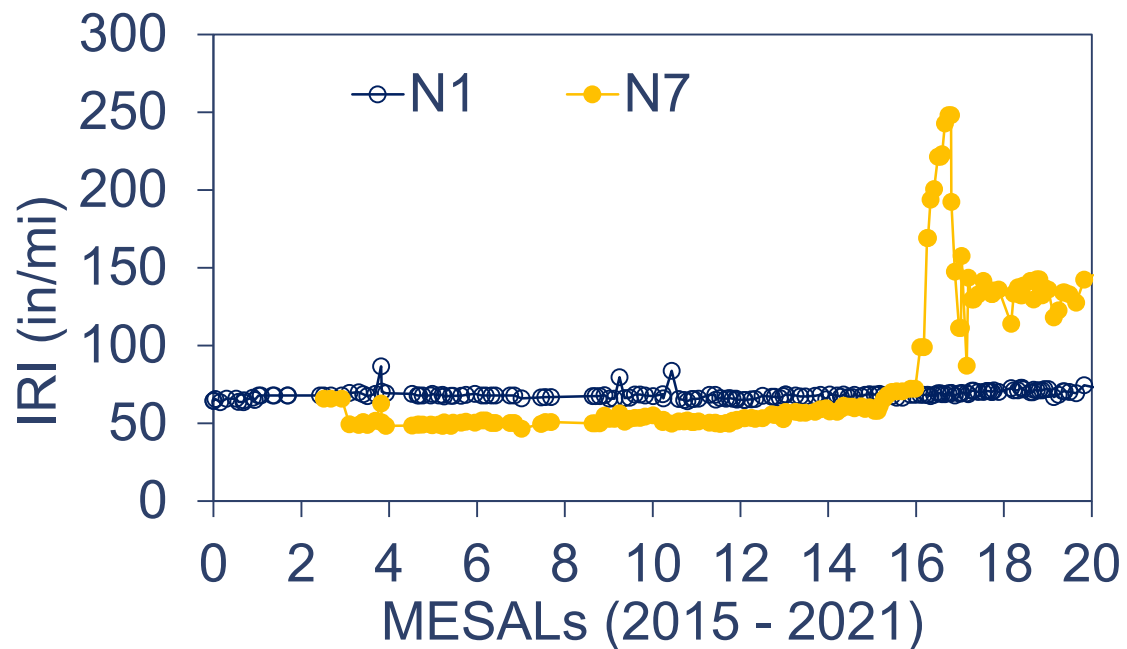
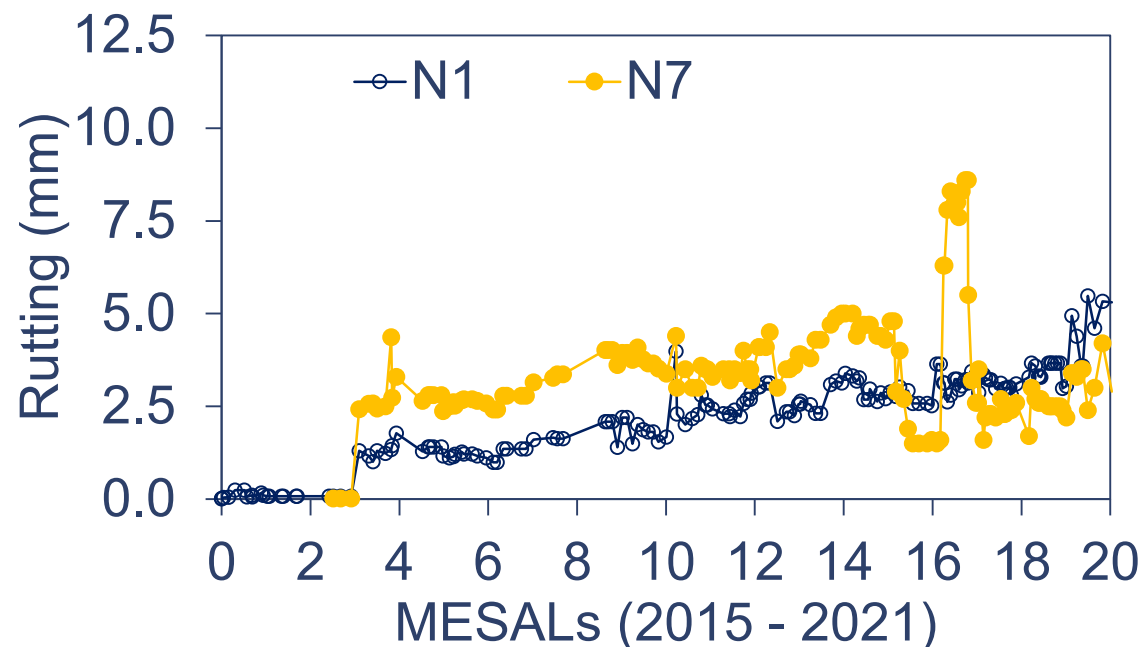
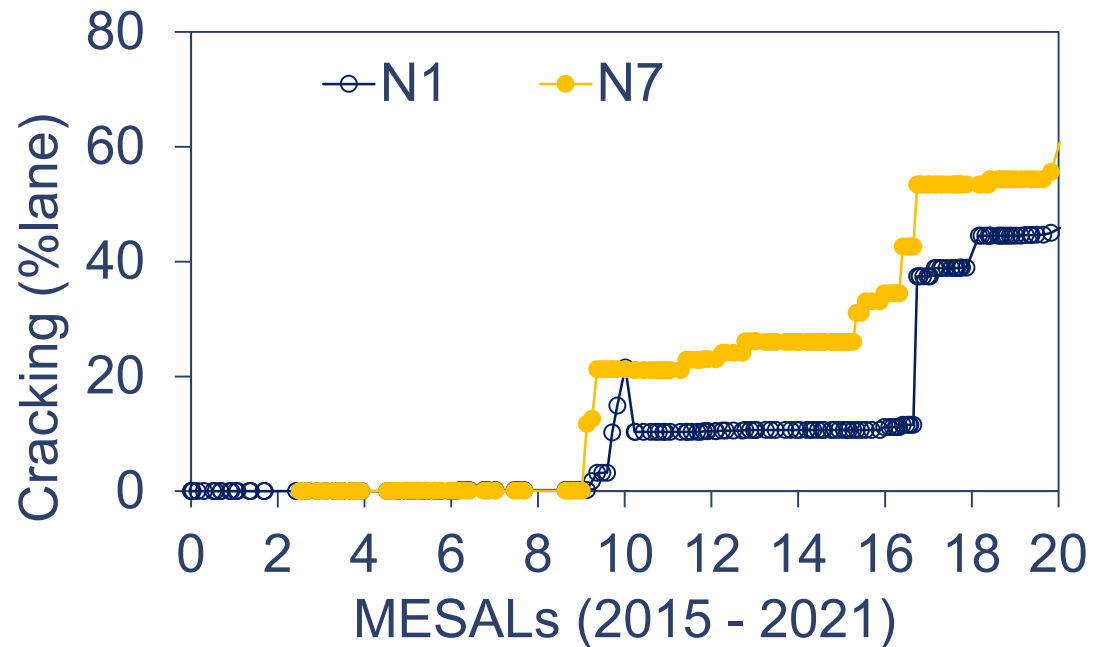
Reconstructed  
with the same  
mixes

35% RAP & 5% Delta S  
2 hours of silo storage

Delta-Mist applied at  
0.08 GSY

Maintenance mix





# Key Findings

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- Some reaction time needed when using Delta S with southeastern post-consumer RAS
- Lab cracking tests suggest N7 and N1 having similar performance
- Section N7 failed due to bottom-up cracking, possibly caused by rapid reconstruction in 2016
- Middle section repaired after about 14 MESALs in May 2020; the other last to the end of research cycle in March 2021 (17.5 MESALs)
- Lessons learned from N7 have led to other implementation efforts:  
<https://youtu.be/TKFYk1NIB-Q>

# United Soybean Board Study



TEST SECTION  
NUMBER E-5  
FLORIDA

TEST SECTION  
NUMBER W-10  
UNITED SOYBEAN BOARD  
IOWA STATE UNIVERSITY

# Two Surface Mixtures

Control (E5A): 20% RAP, PG 76-22 (SBS)



W10: 20% RAP, PG 70-22 (bio-polymer)



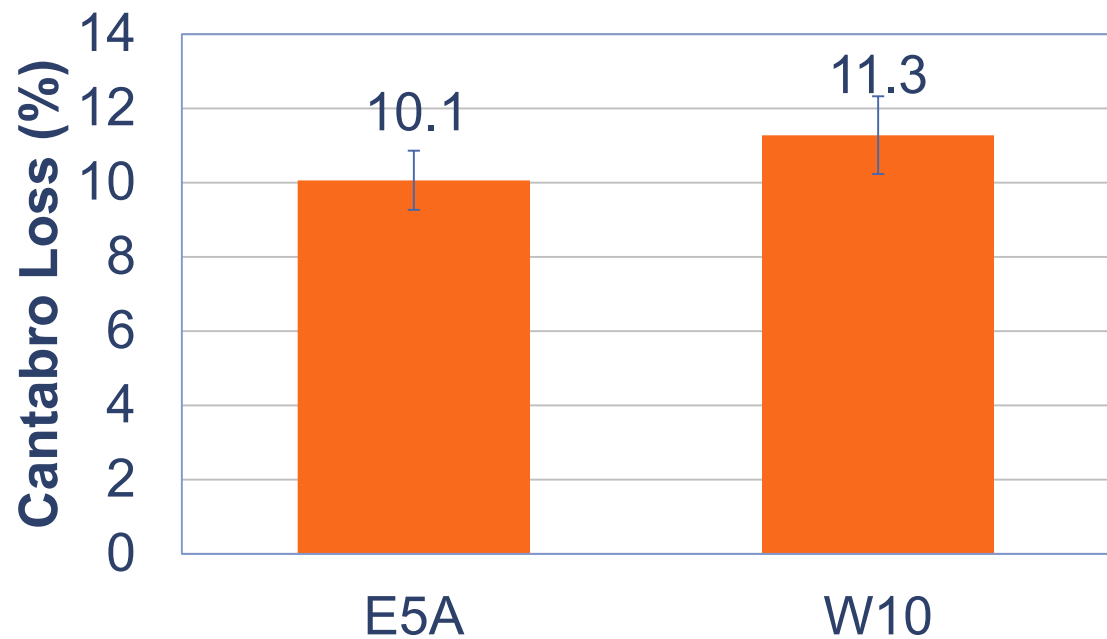
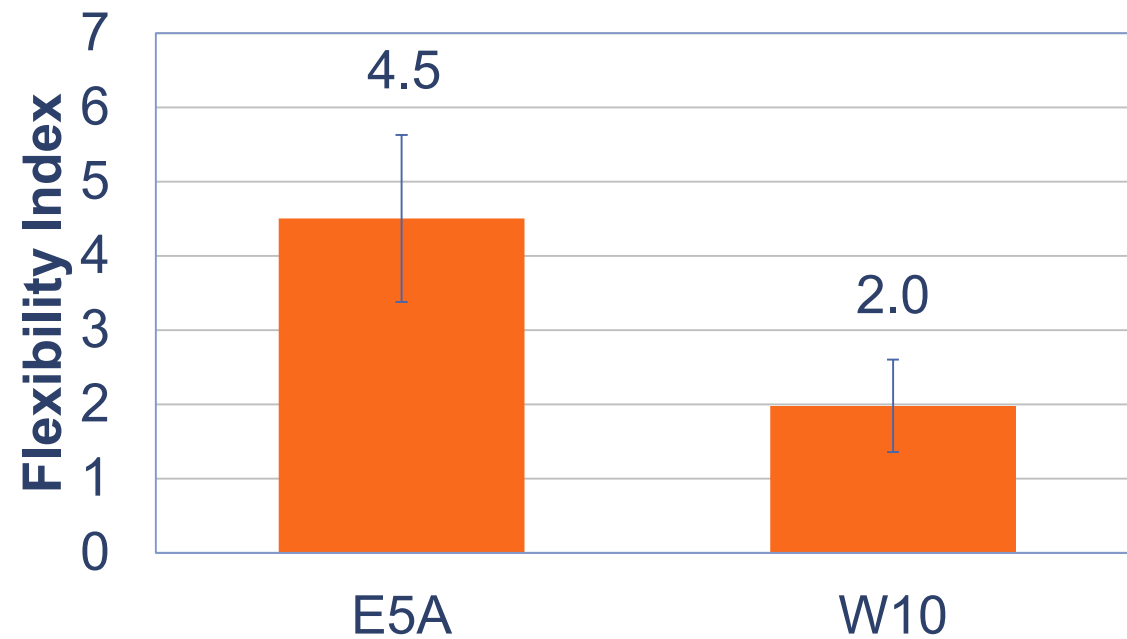
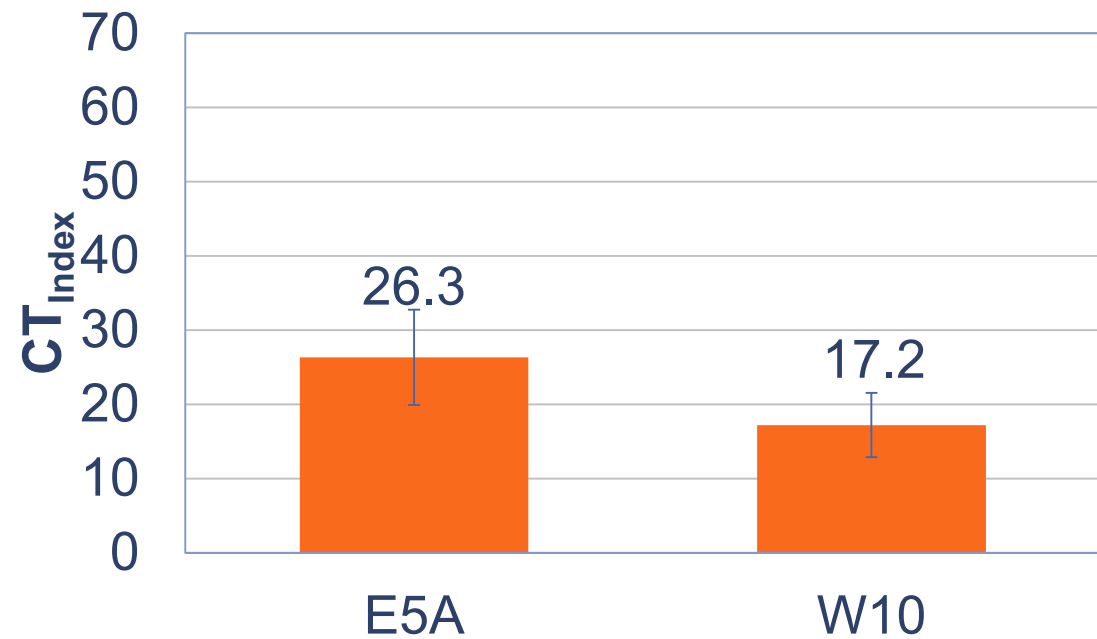
Both designed as Superpave mixes to meet the volumetric requirements

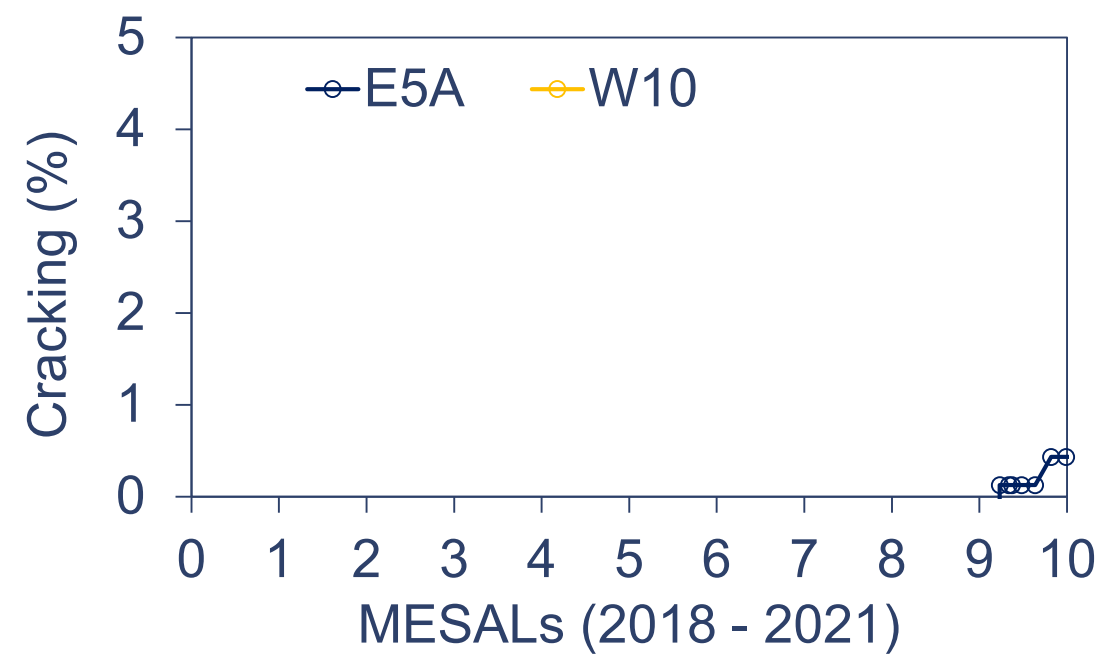
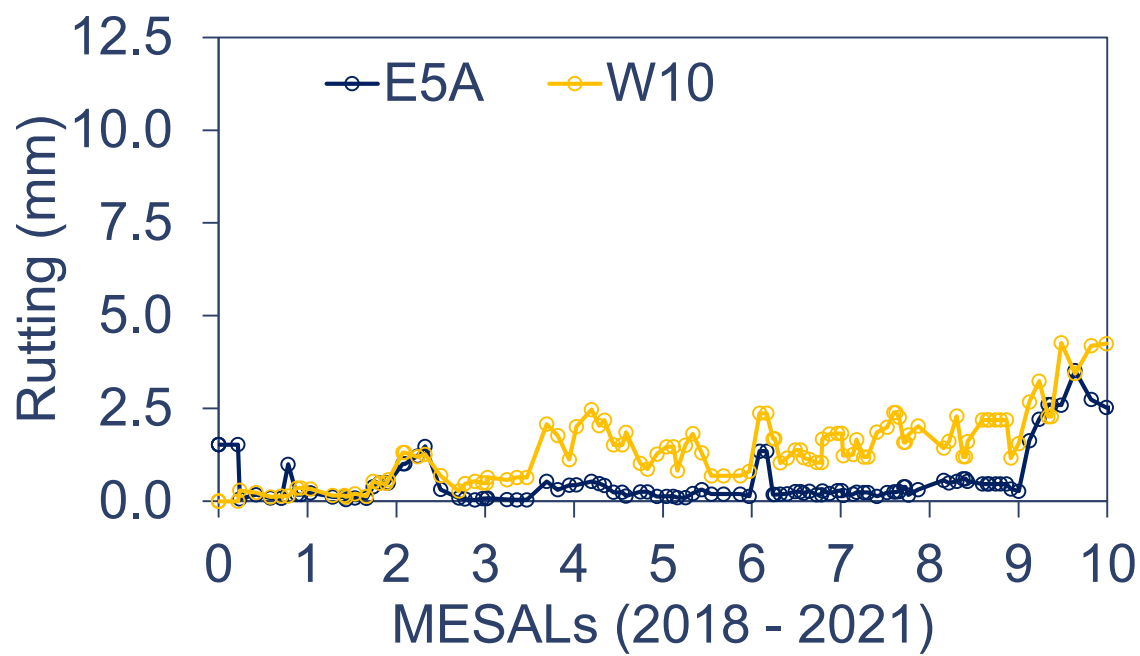
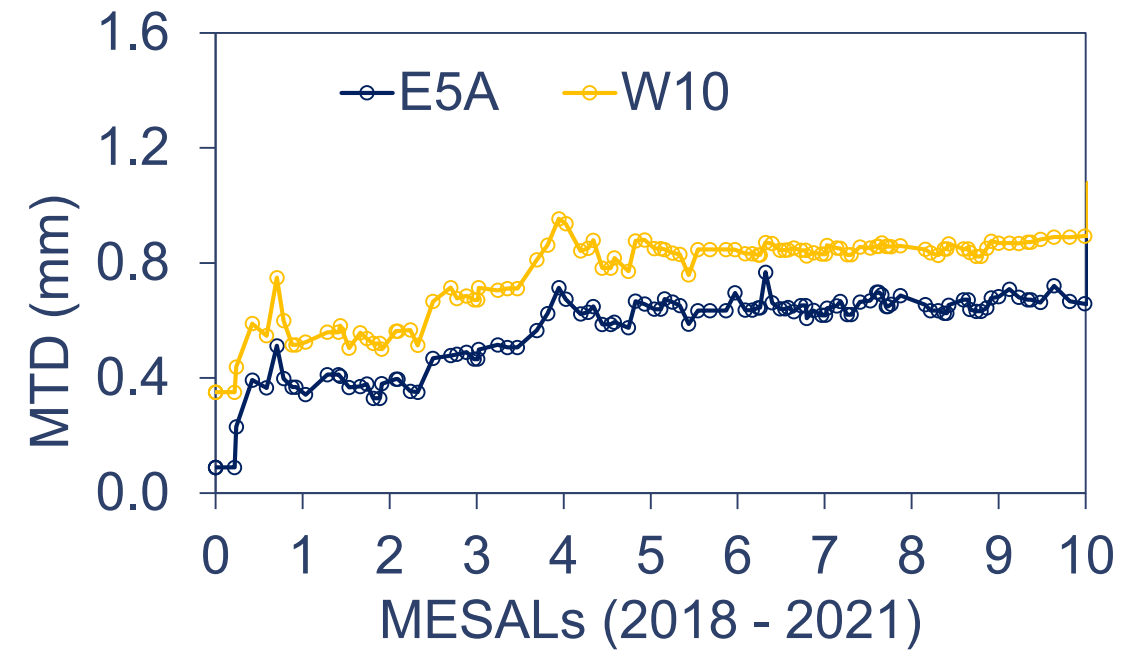
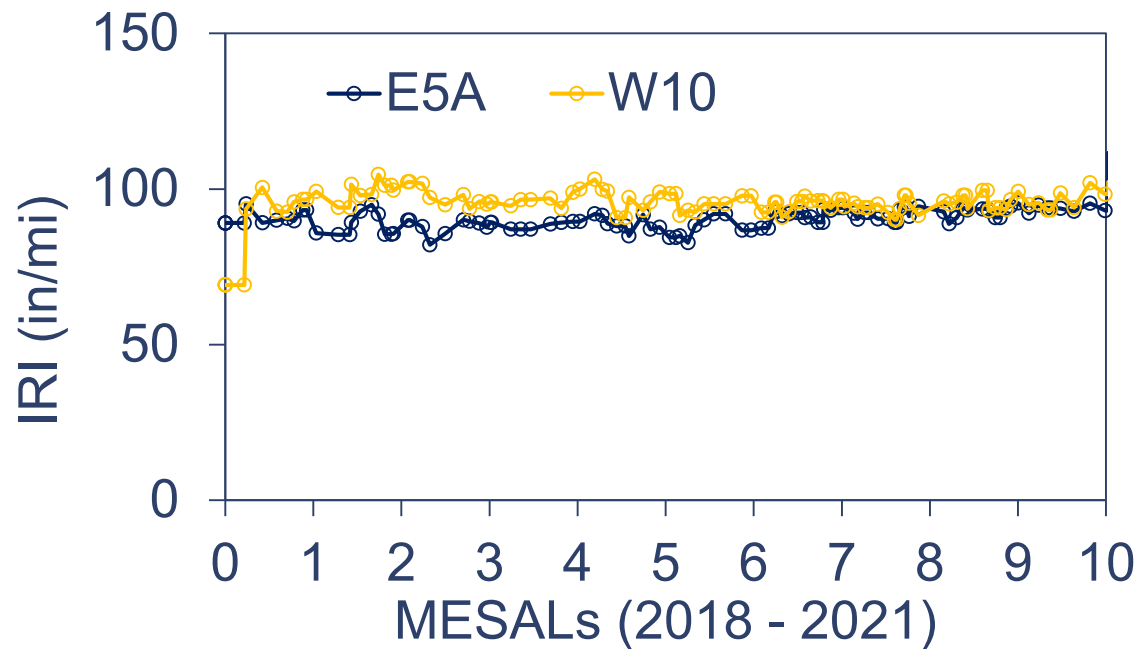
# Construction

Section	In-place Density
E5A	93.6%
W10	93.3%







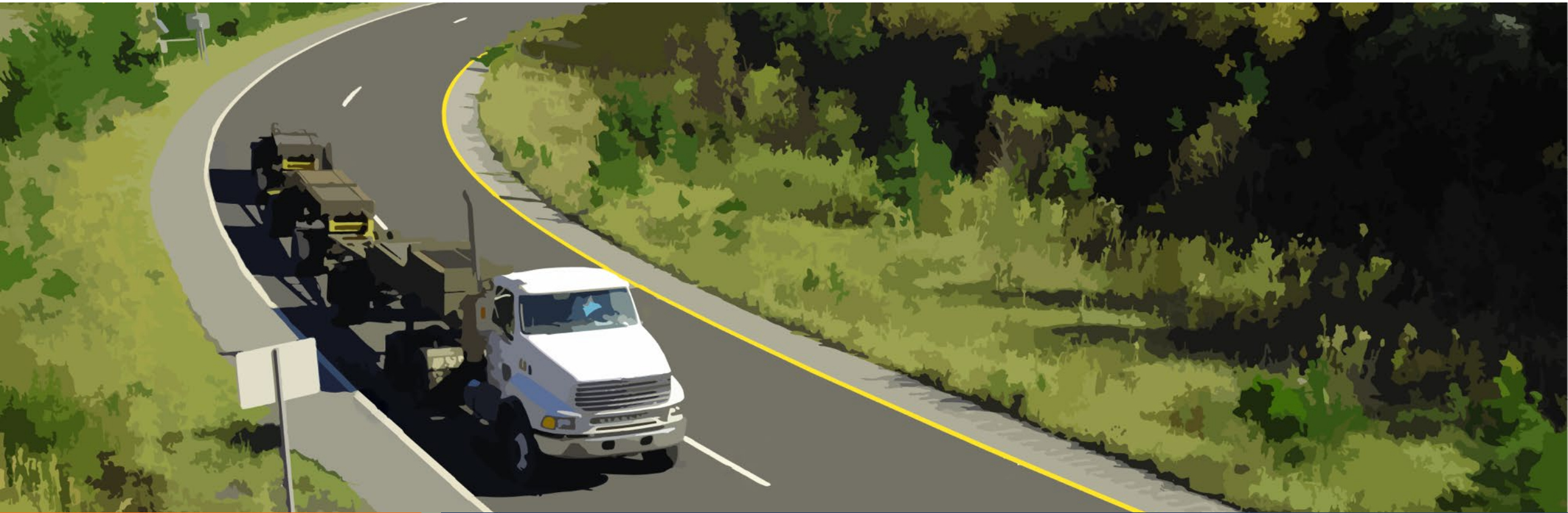


# Key Findings

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- W10 and E5A mixes were designed to meet the volumetric requirements
- Both mixes were compacted to achieve similar density (~ 93.5%)
- Two mixes have relatively low lab cracking test results with E5A showing slightly better results
- Initial cracking observed in E5A while no cracking seen in W10 after 10 MESALs

# Questions and Answers



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