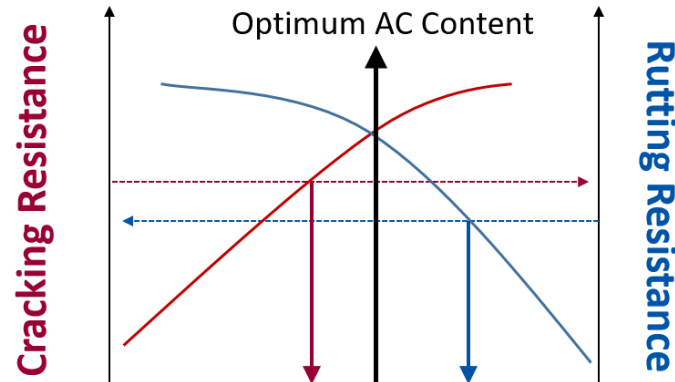




Florida Department of  
**TRANSPORTATION**

# Balanced Mix Design



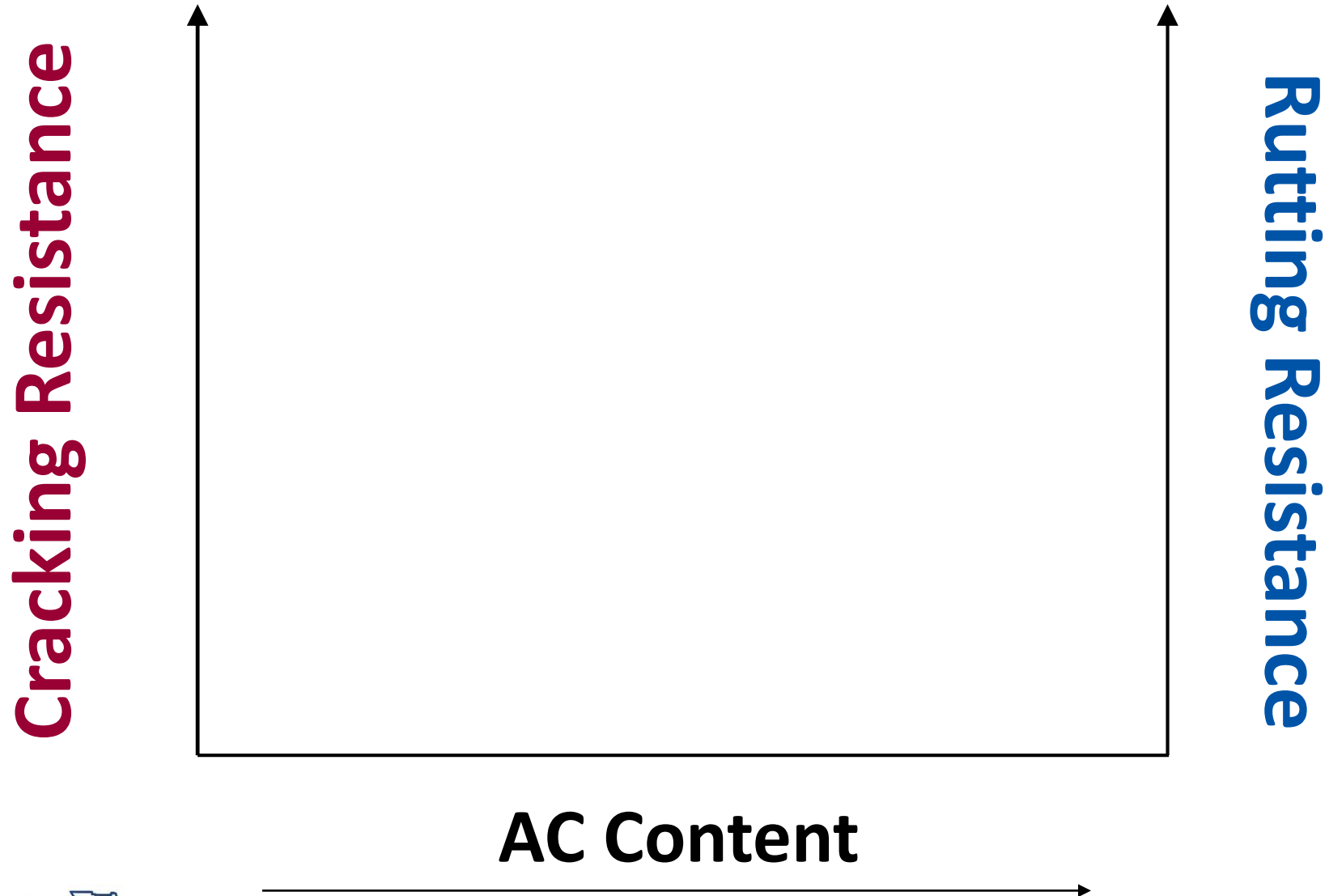
**Howie Moseley**  
**State Bituminous Materials Engineer**

# What is a Balanced Mix Design?

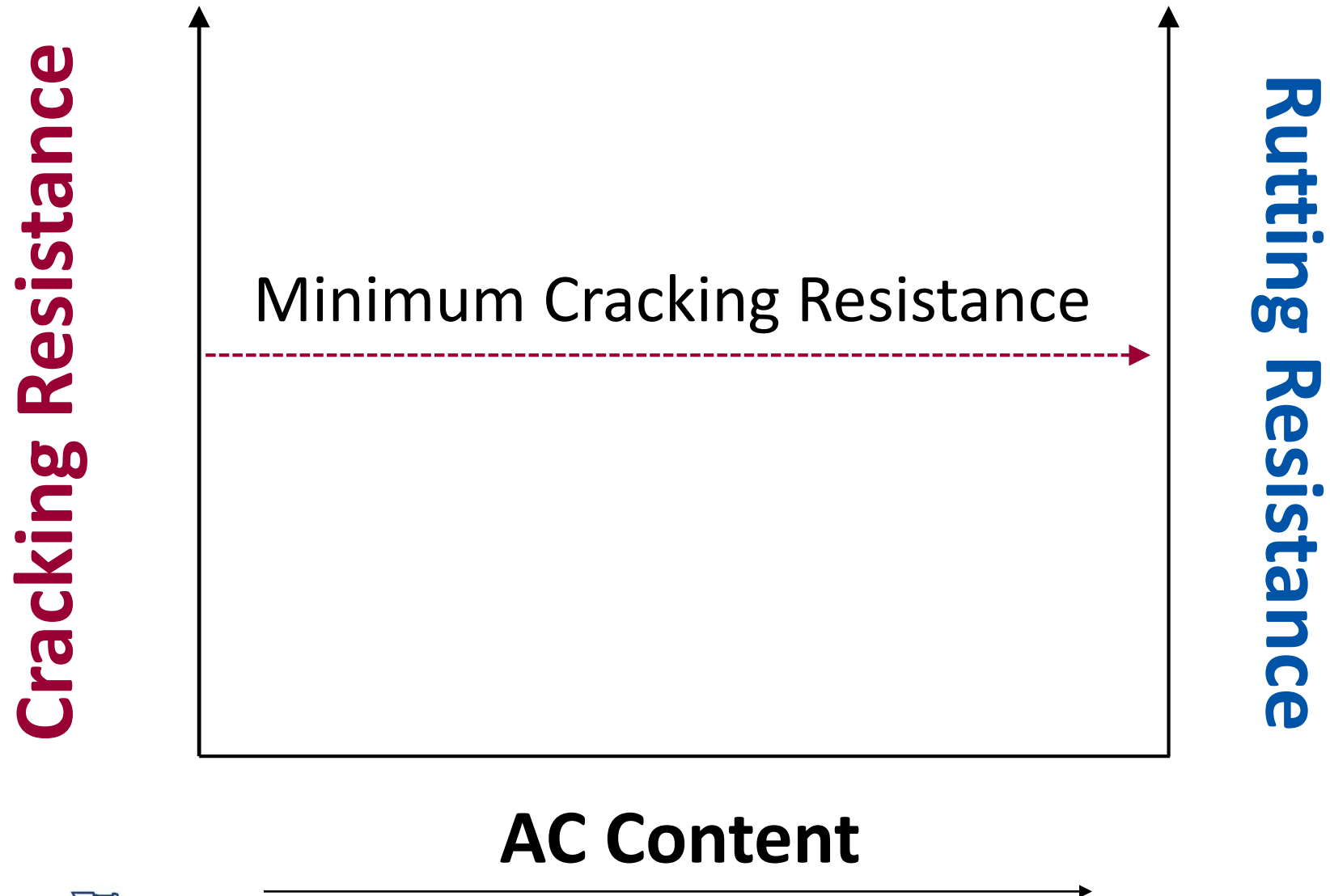
- Asphalt mix design using performance tests on appropriately conditioned specimens that address multiple modes of distress taking into consideration mix aging, traffic, climate and location within the pavement structure.
  - Asphalt Mix ETG definition



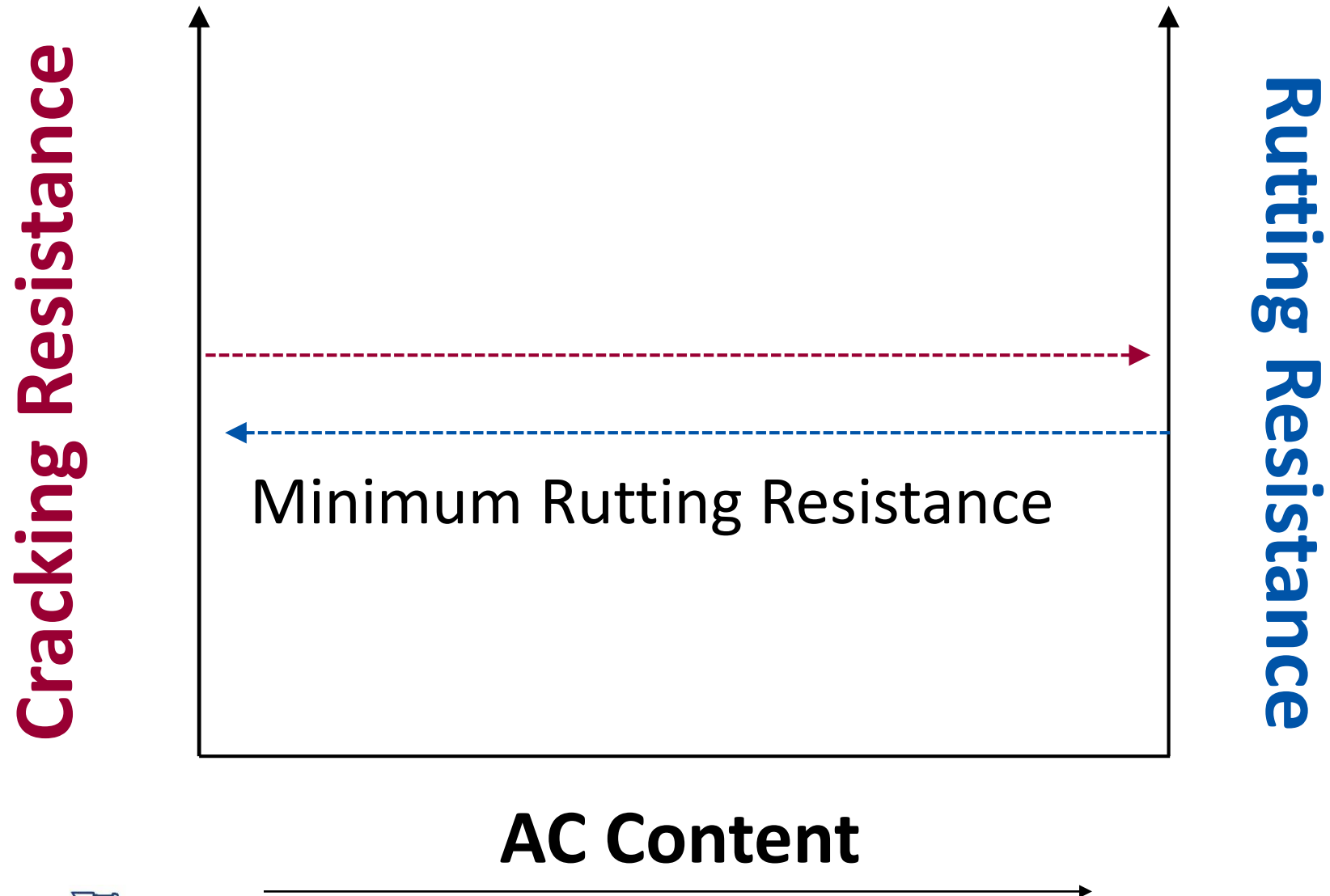
# Balanced Mix Design Illustration



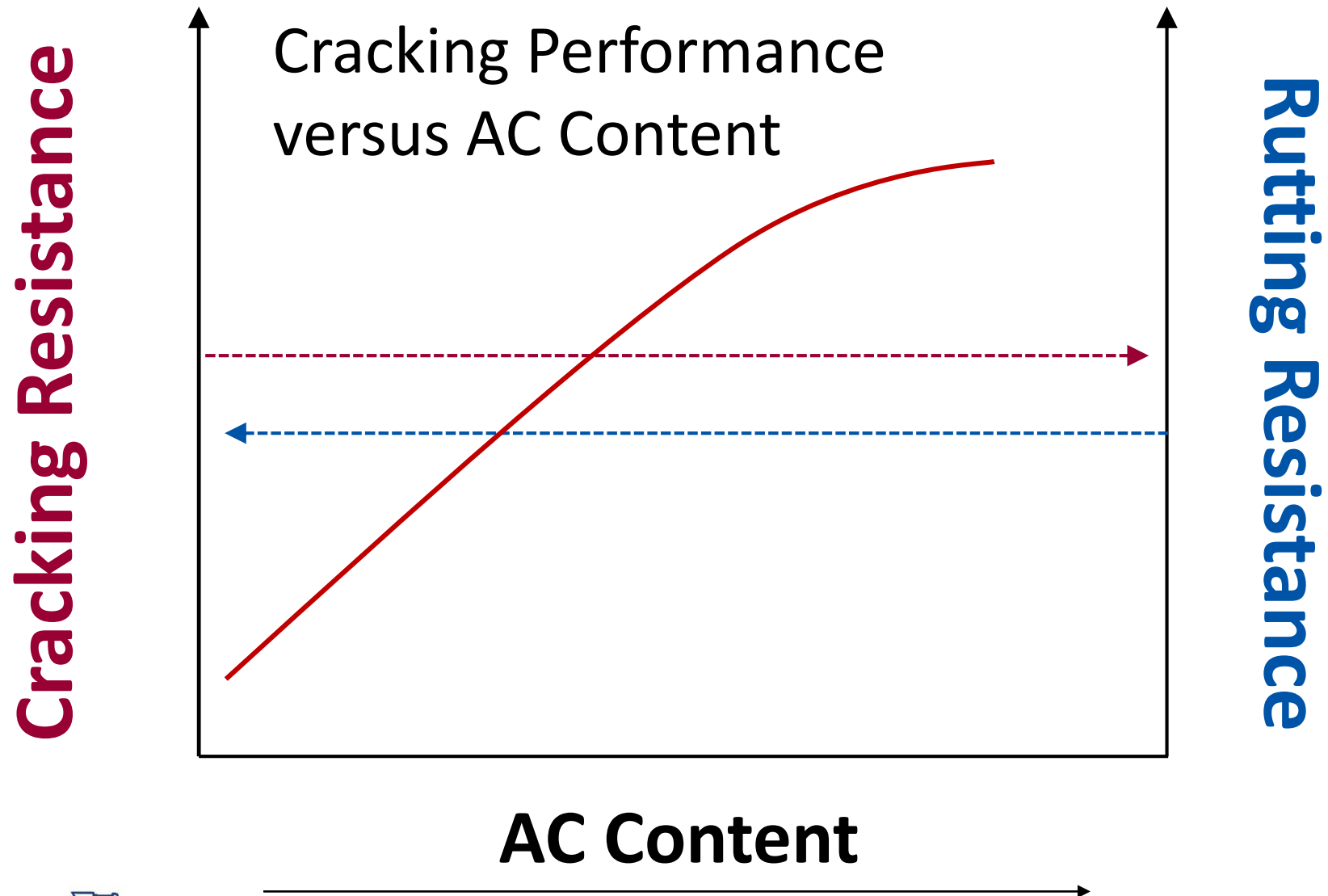
# Balanced Mix Design Illustration



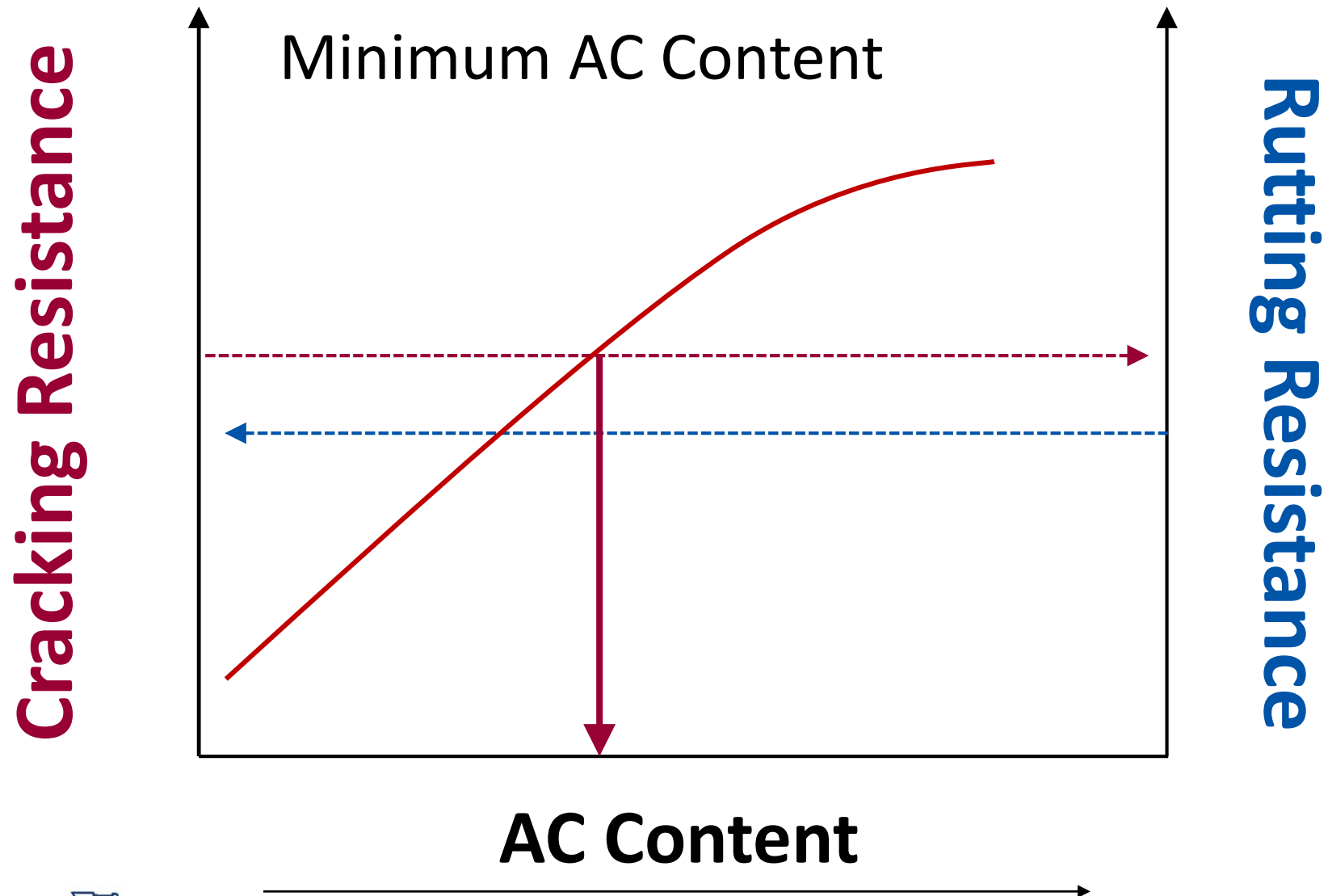
# Balanced Mix Design Illustration



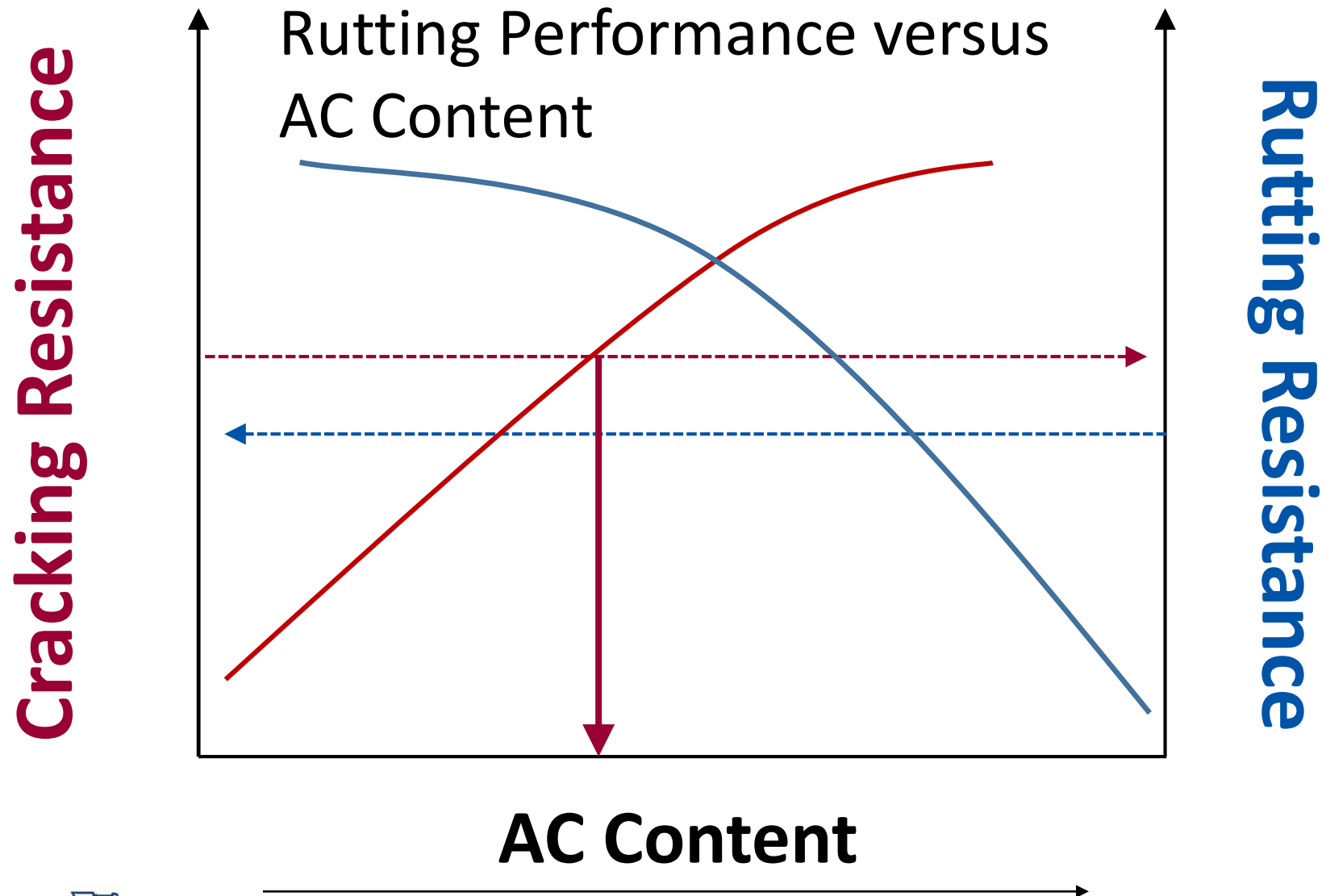
# Balanced Mix Design Illustration



# Balanced Mix Design Illustration

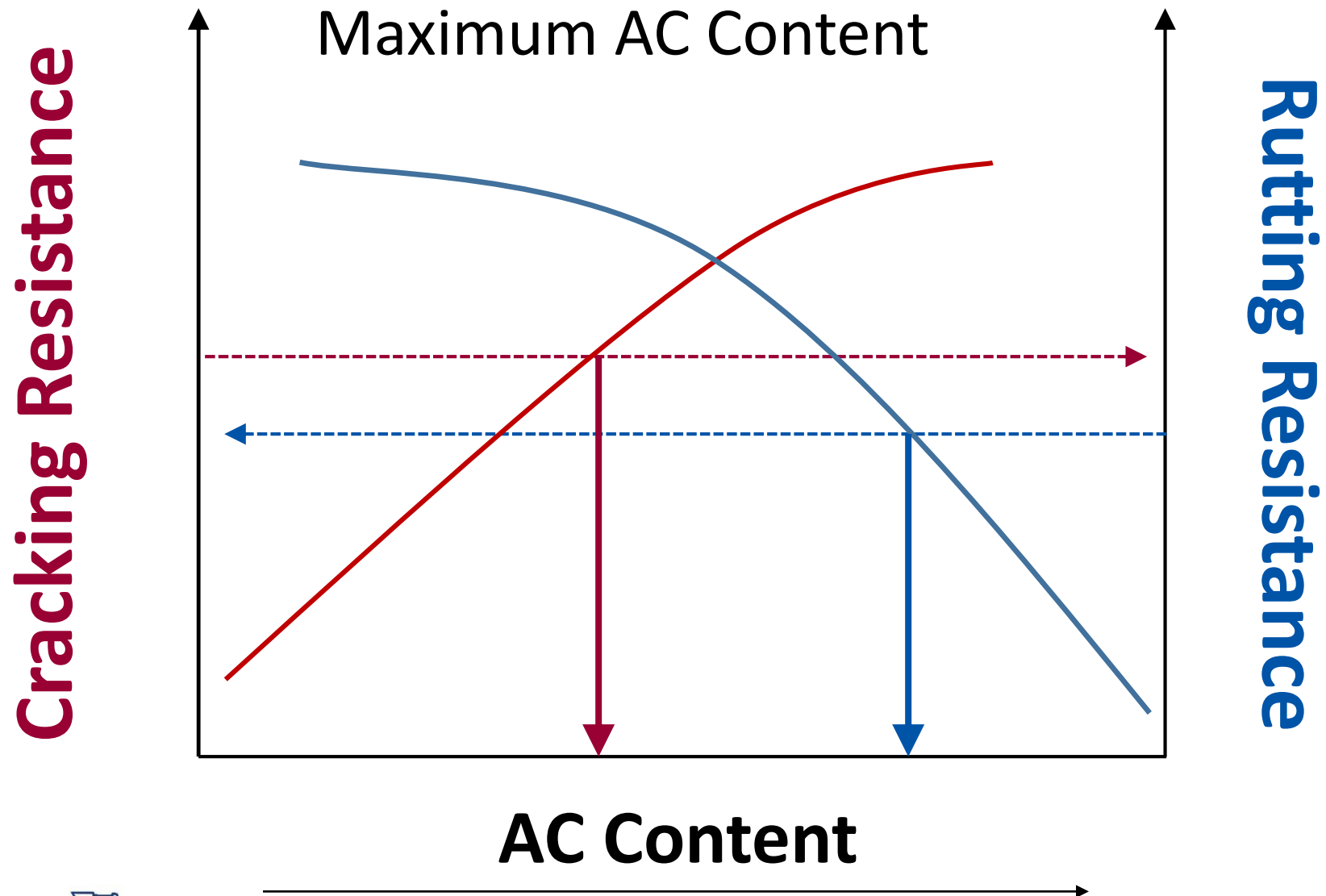


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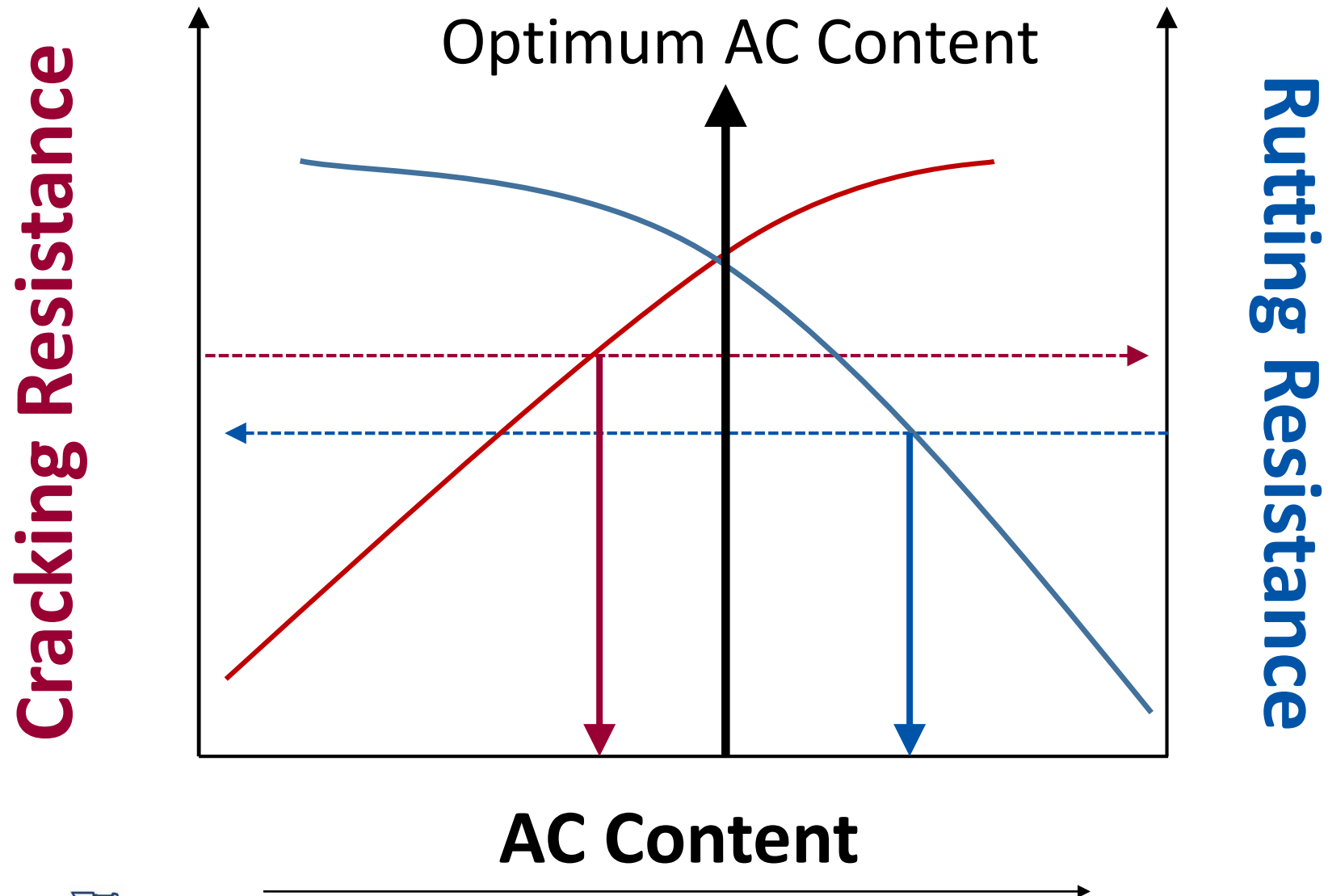




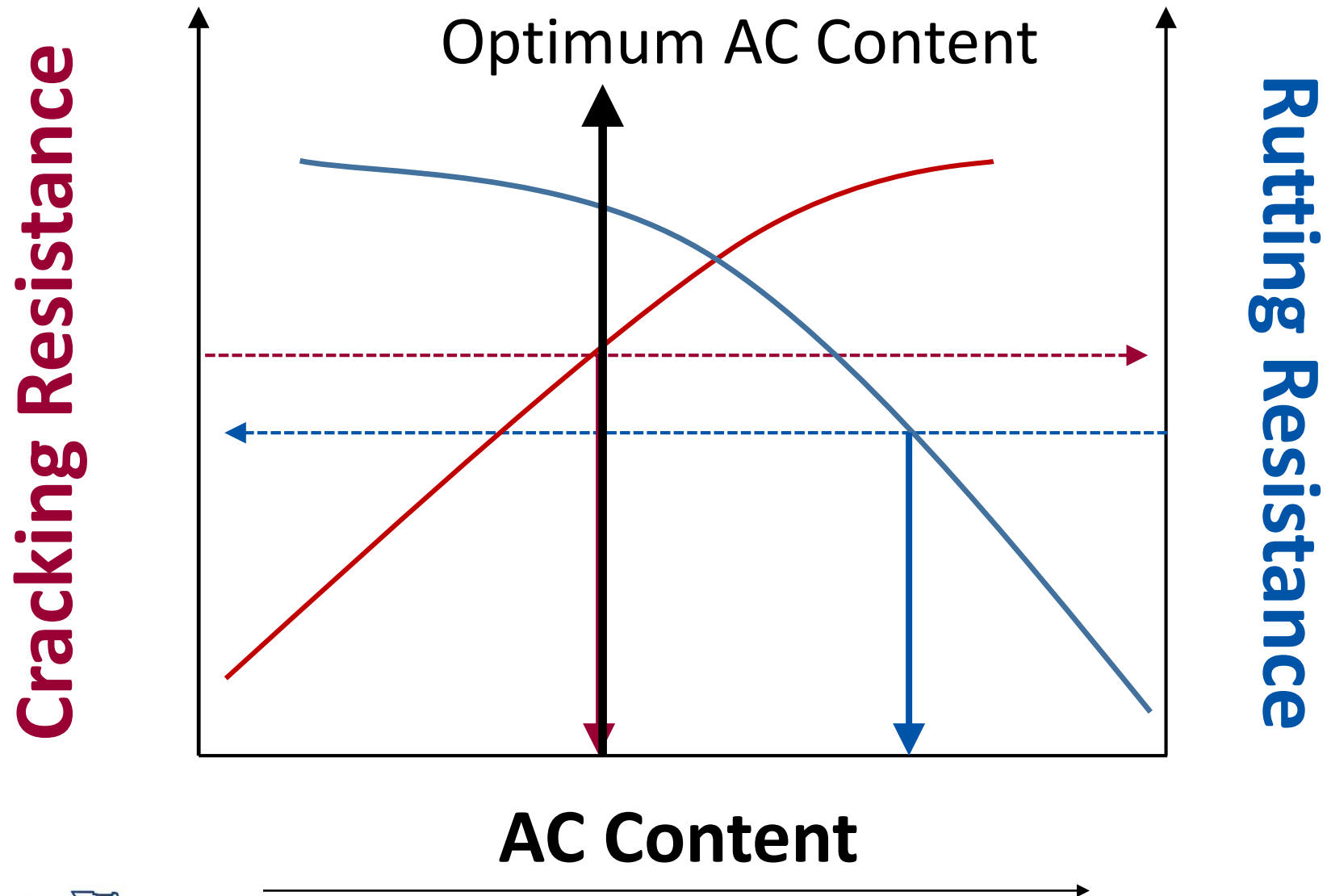
# Balanced Mix Design Illustration



# Balanced Mix Design Illustration



# Balanced Mix Design Illustration

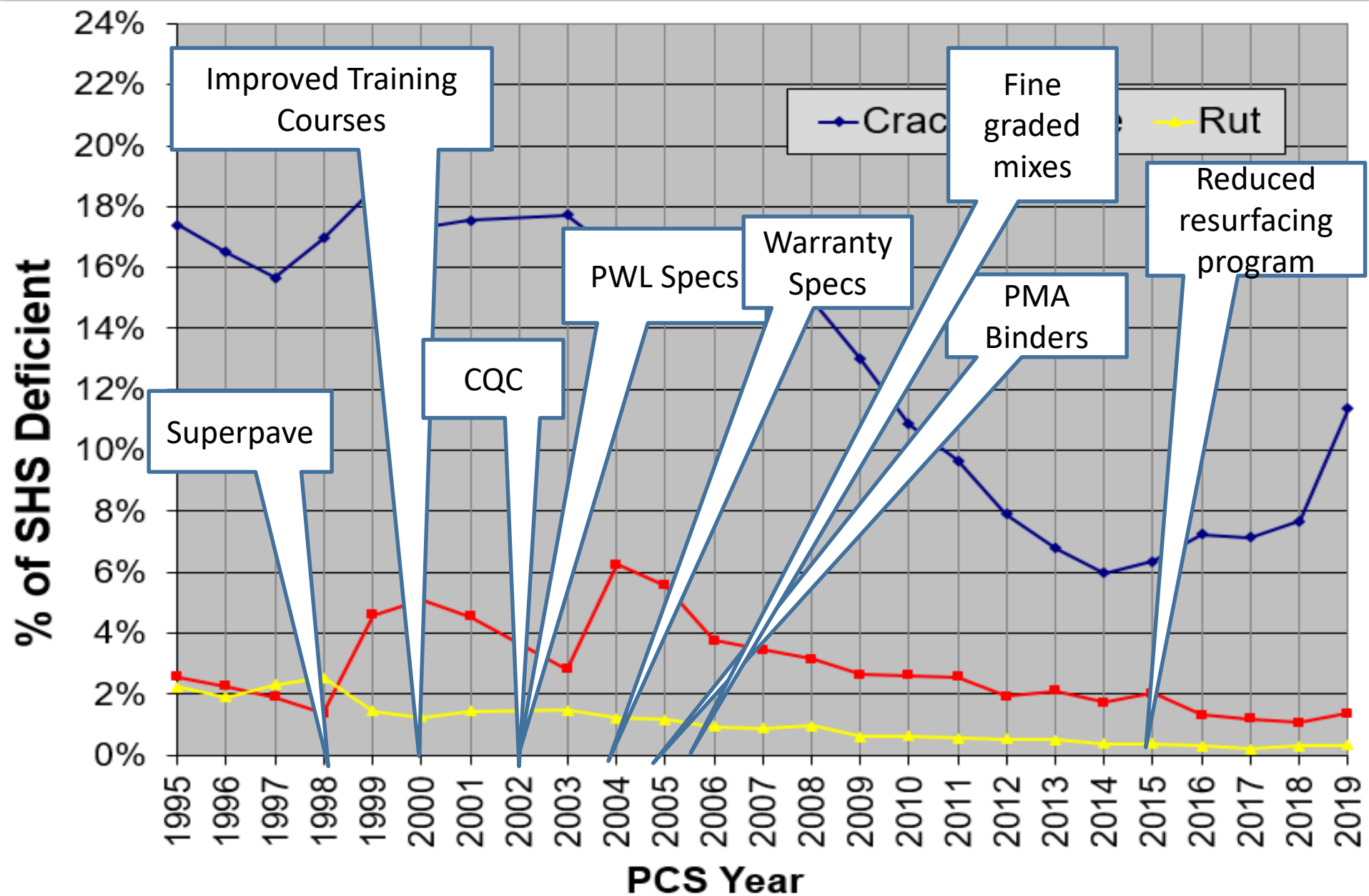


# Three Balanced Mix Design Approaches

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- Volumetric Design and Performance Verification
  - What we do today plus a rutting and cracking test
- Performance-Modified Volumetric Mix Design
  - What we do today, but the mix design can be tweaked based on the rutting and cracking test data
- Performance Design
  - Volumetrics not required, the designer optimizes the mix design to achieve the desired minimum performance criteria

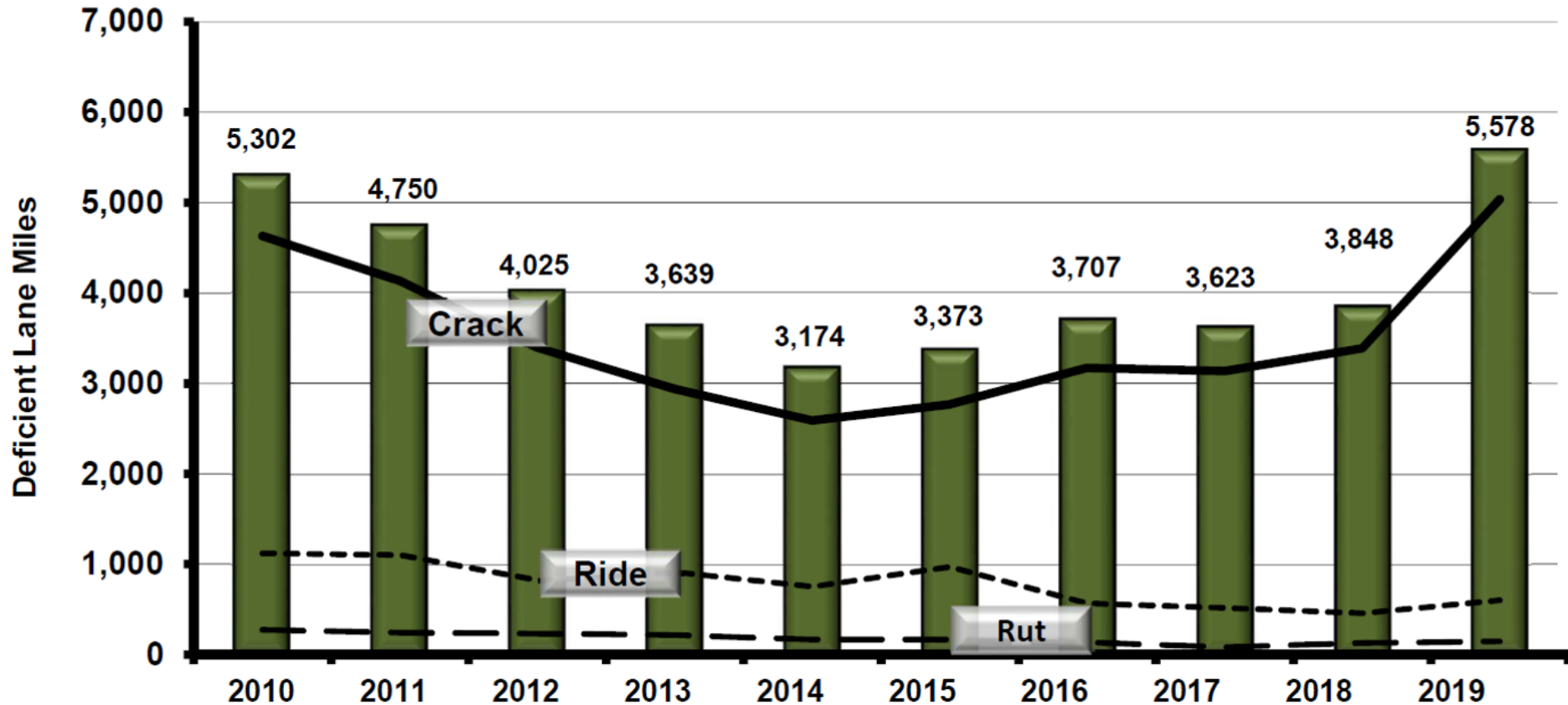
# What about Florida's Performance?



# Are Florida Mix Designs Balanced?

## PAVEMENT CONDITION SURVEY HISTORY

Crack, Rut and Ride Ratings & Single-Combined Rating



# Should Florida Mix Designs be Balanced?

- Yes and No
- Rutting is a safety hazard and usually occurs early in the pavement life
- Top down cracking (Florida's primary distress) usually occurs later in the pavement's life and is relatively inexpensive to address compared to rutting or bottom up cracking



# Should Florida Pursue Balanced Mix Designs?

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- Yes – There is room for improvement
- Given the current level of performance in Florida, mixtures may be a little dry
- A small increase in AC content could improve durability and hopefully result in an increase in density
- Increased density would further improve durability
- Concerns with rutting would be addressed with a rutting performance test





# What's the Hold Up?

- There are numerous cracking tests, but no consensus on which one is the most effective.
- Many of the available rutting and cracking performance tests are expensive and complex.



# Now What?

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- Some of the more recent performance tests are less expensive and less complex.
  - IDEAL-CT (cracking)
  - Hot IDT or IDEAL-RT (rutting)
  - Cantabro (durability)
- However, these tests are relatively new and still being researched
  - NCAT test track cracking study
  - ACAF IDEAL-CT working group
  - FHWA performance test rodeo



# What about Production?

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- Lab mix and plant mix are similar, but not the same.
- Materials change over time
- Balanced Production
  - In my opinion, performance testing needs to happen at the plant if you are doing any level of balanced mix design past performance verification.
  - Plant testing needs to be relatively quick, but relate to performance

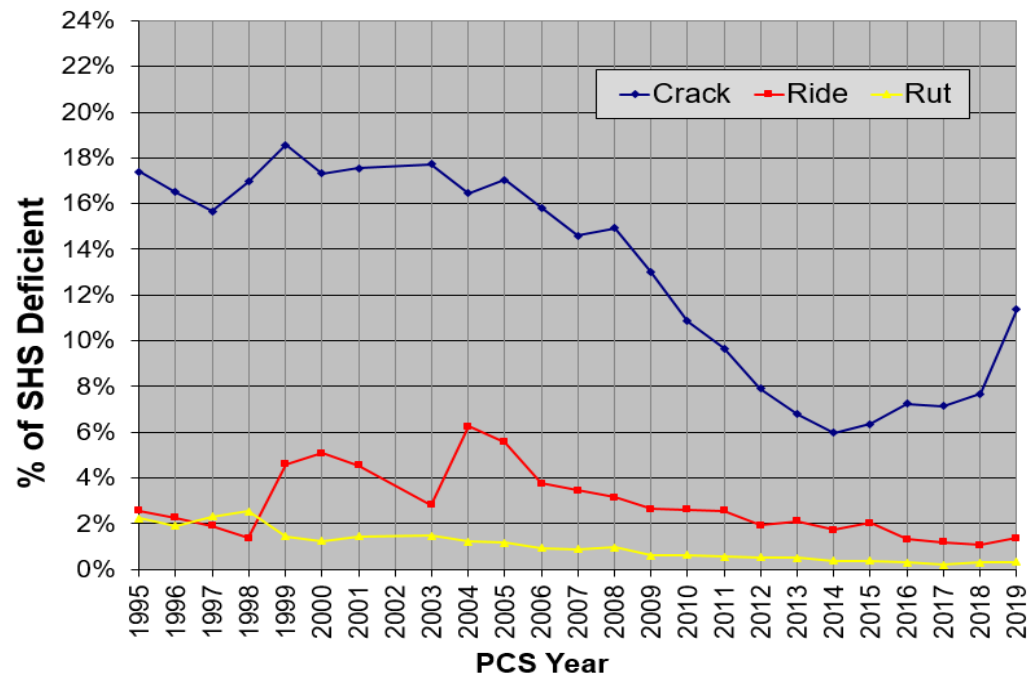
# What are Other States Doing?

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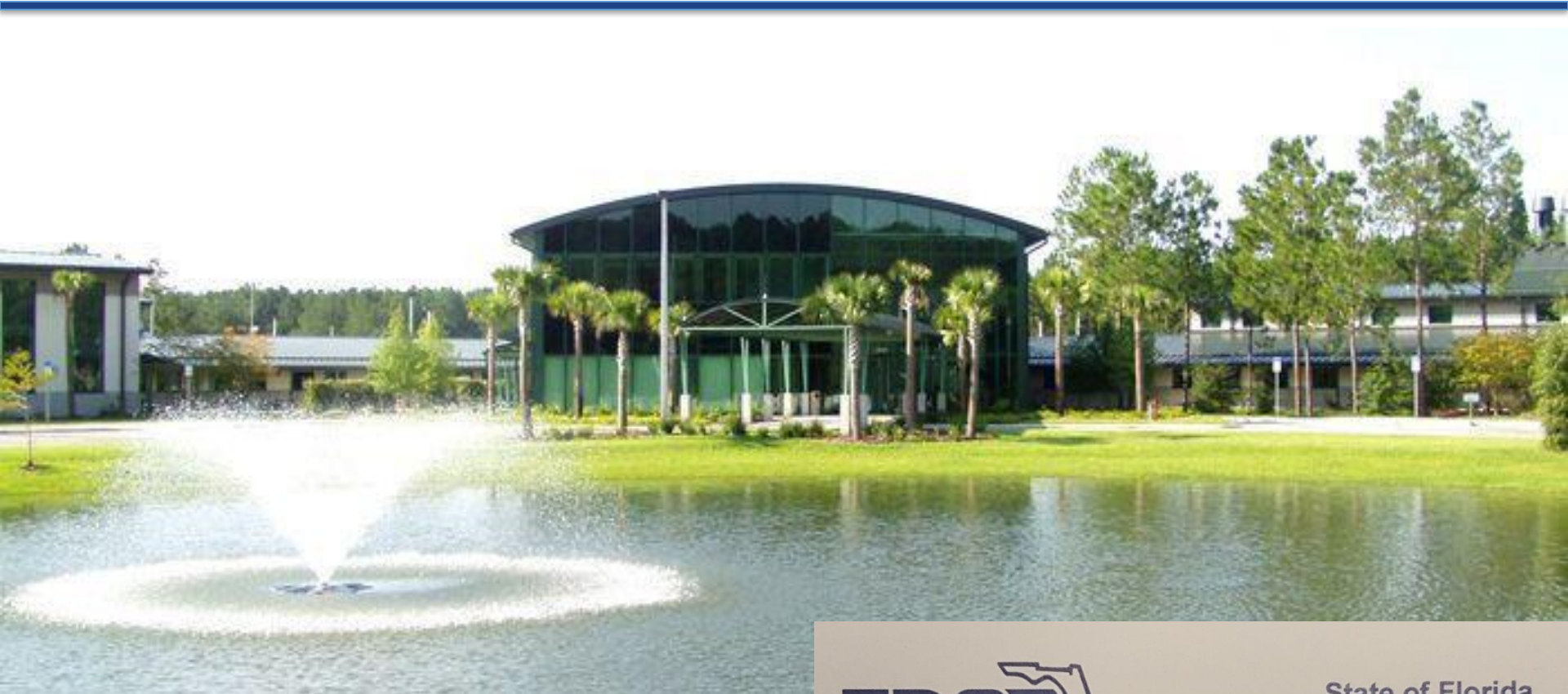
- Some states have implemented performance testing at mix design
- Most states are interested in balanced mix design
- Some states are looking to pilot performance testing at the plant
  - Alabama and Texas
  - More complex testing at mix design
  - Simpler testing during production

# What is Florida's Plan?

- Continue to monitor and research, especially the cracking tests
- Watch and learn from other states
- Continue to partner with Florida's asphalt industry



# Thank You



## Questions?



Florida Department of Transportation



State of Florida  
Department of Transportation

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