



# **WHY MODIFIERS in FLORIDA ?** **(Why Not ?)**

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# Florida's Past History

- ⇒ No Extensive Use of Polymer Modifiers
- ⇒ Response to Rutting Crisis of the 1980's
  - Monitor Air Voids of Plant Produced HMA
  - Control P200 of Plant Produced HMA
  - Some Limited SBR, Gilsonite, etc
- ⇒ Use of SBR in OGFC in Late 1980's
  - Increased Binder Content for Improved Durability

# Eyeopener - Testing with the HVS



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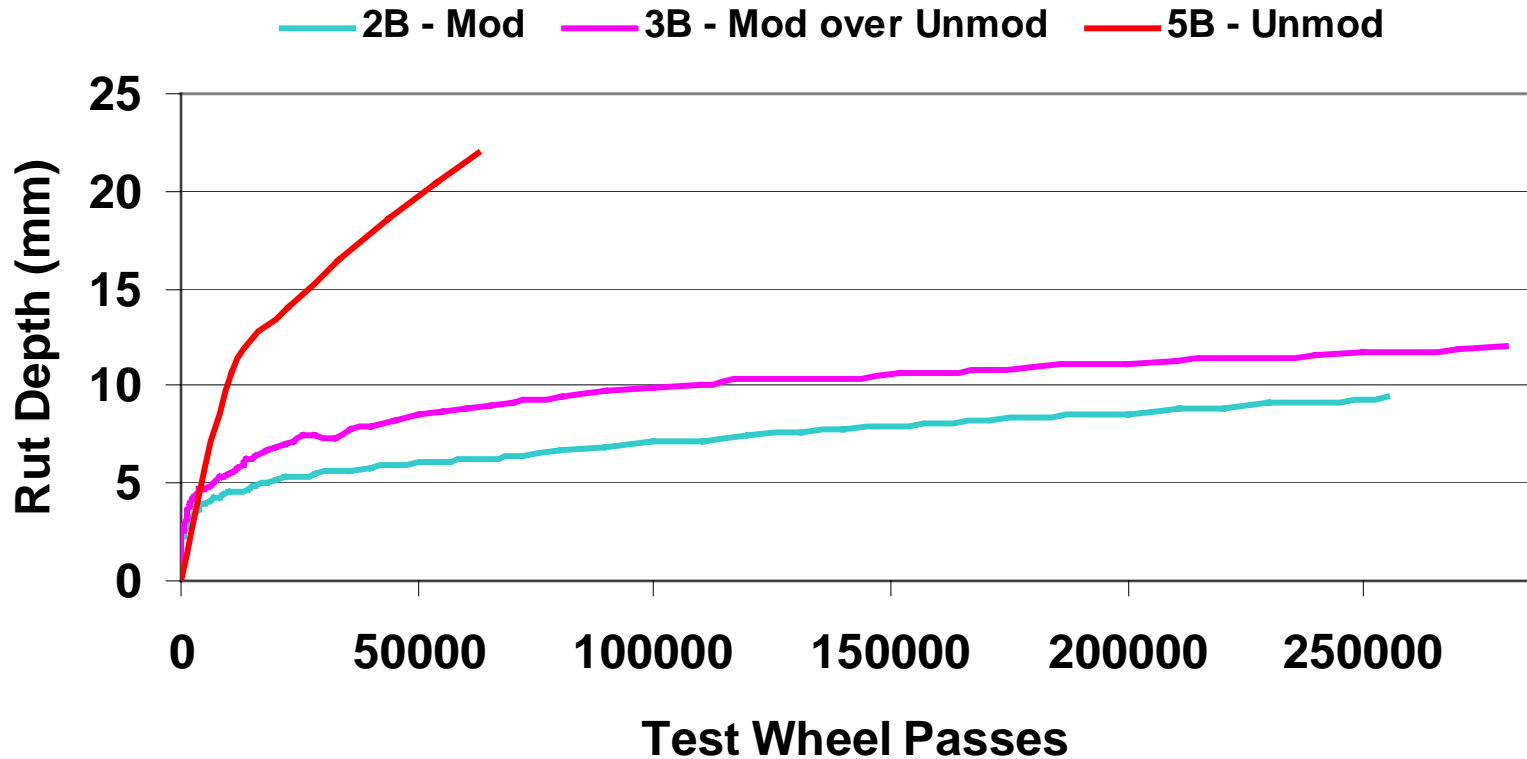
- ⇒ First Tests with Florida's HVS
- ⇒ Compare Mix with/without Polymer Modifier
- ⇒ Superpave 12.5 Fine 10M-30M EASL's
- ⇒ 3 Test Sections (4-inch)
  - 2 Lifts Unmodified
  - 2 Lifts Polymer Modified
  - 1 Lift Polymer Modified above 1 Lift Unmodified

# Results of Florida HVS Testing

- ⇒ Polymer Modifier Improved Rut Resistance
- ⇒ Significant Impact in Top Layer
- ⇒ Results Confirmed by NCAT Test Track
  - Florida Did Not Evaluate Effect of Modifier

# Results of Florida HVS Testing

Rut Depth -- Modified vs. Unmodified -- Controlled Temperature (50 C at 50 mm)



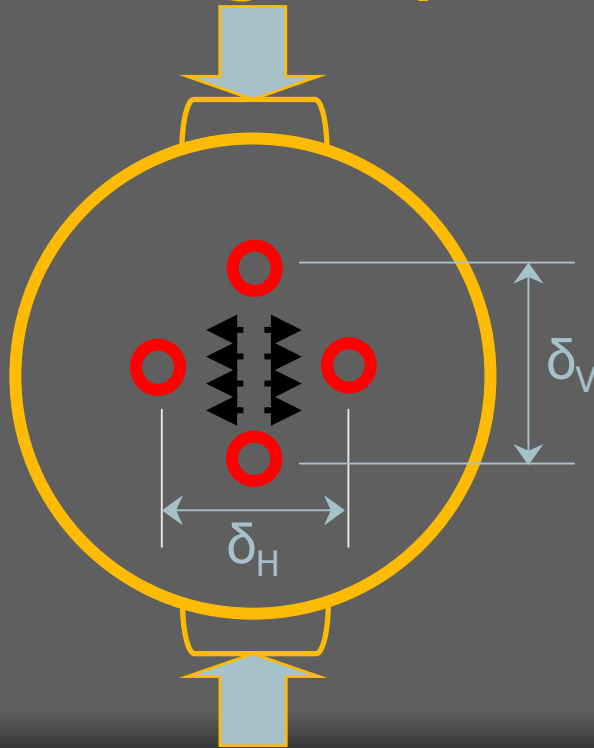
# University of Florida Research

- ⇒ Basic Material Property of HMA Related to Top Down Cracking (The Holy Grail)
- ⇒ Energy Ratio using DCSE
- ⇒ Polymer Modification Improves
  - Resistance to Cracking (TRB 2003 paper)
  - Resistance to Rutting (other research)

# Mixture Properties

Superpave Indirect Tensile Test:

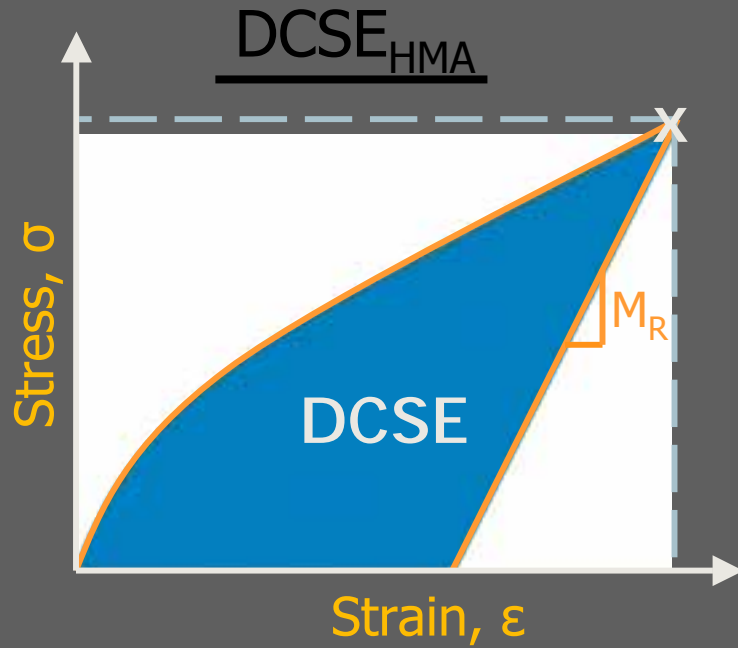
1. Resilient Modulus (cyclic loading)
2. Creep (constant load with time)
3. Strength (increase load until fracture)



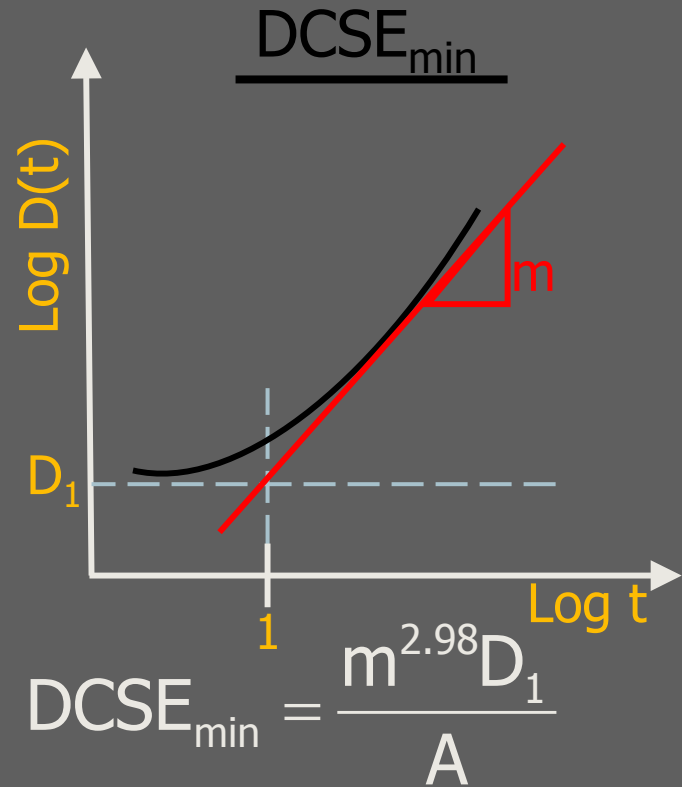
- ➔ Apply vertical load
- ➔ Measure vertical & horizontal deformations

# Energy Ratio Concept

→ The  $DCSE_{HMA}$  has to be greater than the  $DCSE_{min}$  for good cracking performance:



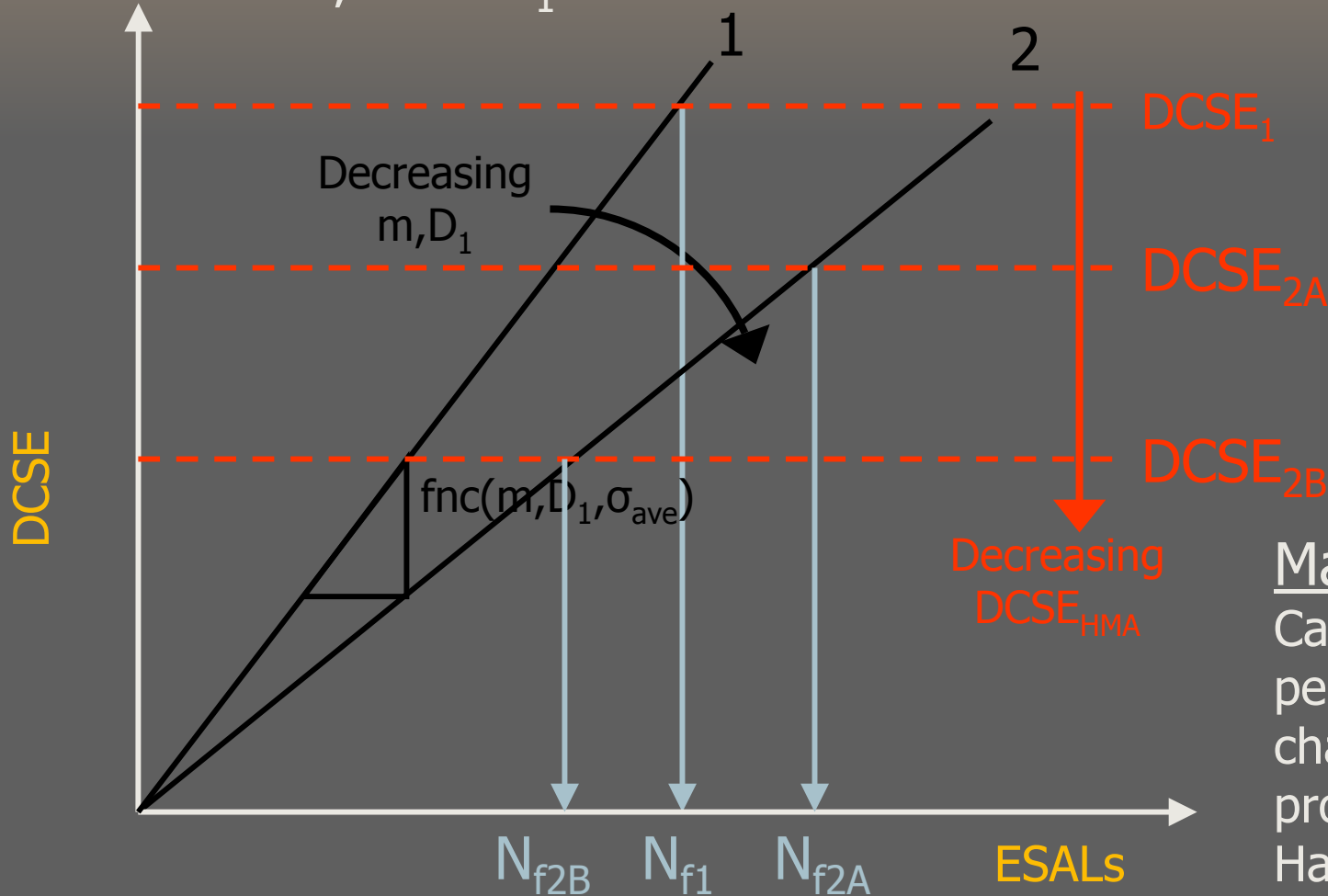
–  $DCSE_{HMA} = \text{AREA}$



$$\text{ENERGY RATIO} = \frac{DCSE_{HMA}}{DCSE_{min}} > 1$$

# HMA Fracture Model

DCSE,  $m$  &  $D_1$  are interrelated

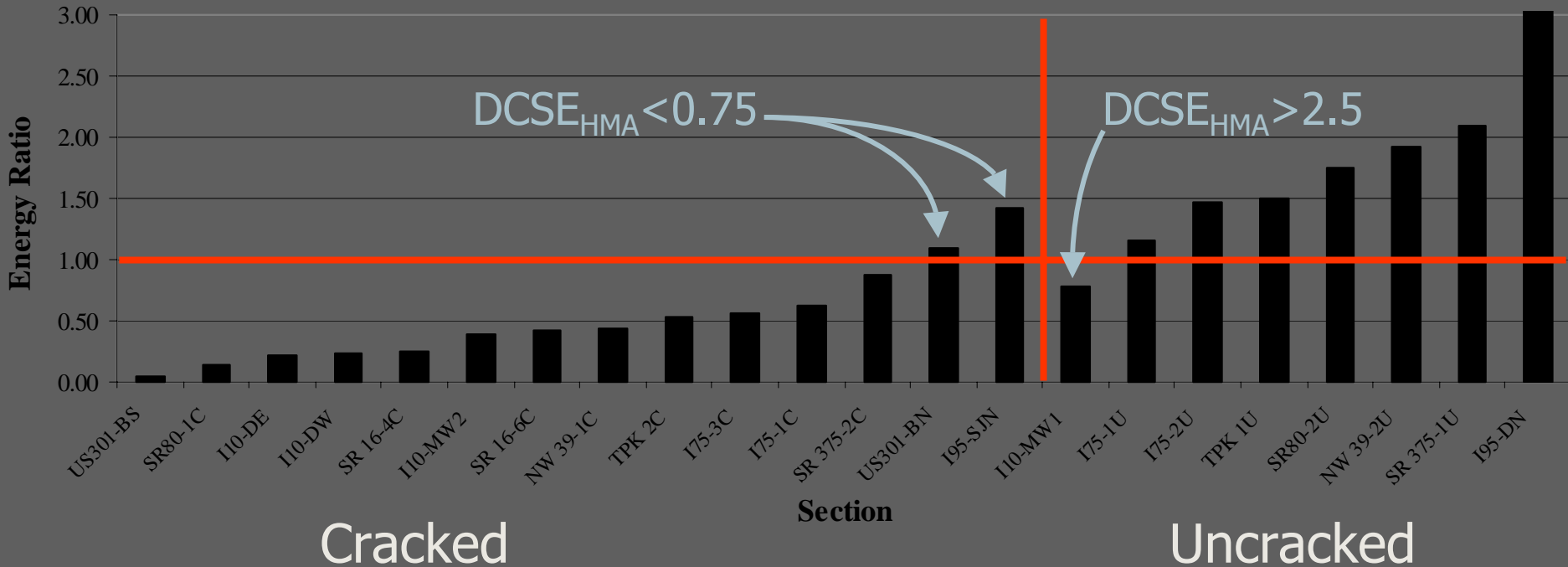


Can go either way

Main Idea:  
Can not improve performance by changing a single property.  
Have to consider the entire system.

# Energy Ratio Results

- ➔ Examined all sections
- ➔ Performance criteria:  $ER > 1$  ;  $DCSE_{HMA} > 0.75$



# FL DOT Concerns on Modifier Use

- ⇒ Increased Cost of HMA with Polymer Modifier
- ⇒ Impact of Current Use of Asphalt Rubber

# Current FL DOT Modifier "Policy"

- ⇒ Based on Available Money
- ⇒ Use Last Layer (min) on Interstates
- ⇒ Use on Projects with Current Rutting Problems
- ⇒ Alternate for all FC (surface) Mixes (using AR)
  - Small Quantities Only
- ⇒ Encourage Trial Sections on On-going Projects

# Personal Modifier Vision & Payoff

- ⇒ Require for Structural Layers on Interstates
- ⇒ Require for FC12.5 & FC9.5
  - Dense Uniformly Graded
  - Surface Course Used Primarily in Urban Areas
  - Currently Using Asphalt Rubber (5% GTR)
- ⇒ Allow Alternate for OGFC
  - Currently Using Asphalt Rubber (12% GTR)

# So Why Polymer Modified HMA ? (How to Sell the Product)

- ➡ If Polymer Modified HMA Solves a Problem
  - Cost Is Usually Secondary
  - It Becomes Standard Practice
- ➡ If Polymer Modified HMA Will Improve Performance
  - This Approach Takes Time
  - Cost Is a Concern
  - Need Convincing Data

# Process of Modifier Acceptance

- ⇒ Find a “Believer” Inside
- ⇒ “Show Me the Money”
  - Examples of Performance and Cost
- ⇒ Construct Demonstration Projects
  - Keep Costs Realistic and Representative
  - Do Not Screw Up
- ⇒ Be Patient



**Thank-you...Questions?**