



# Asphalt Technologies in United States

*DR. NAM TRAN*





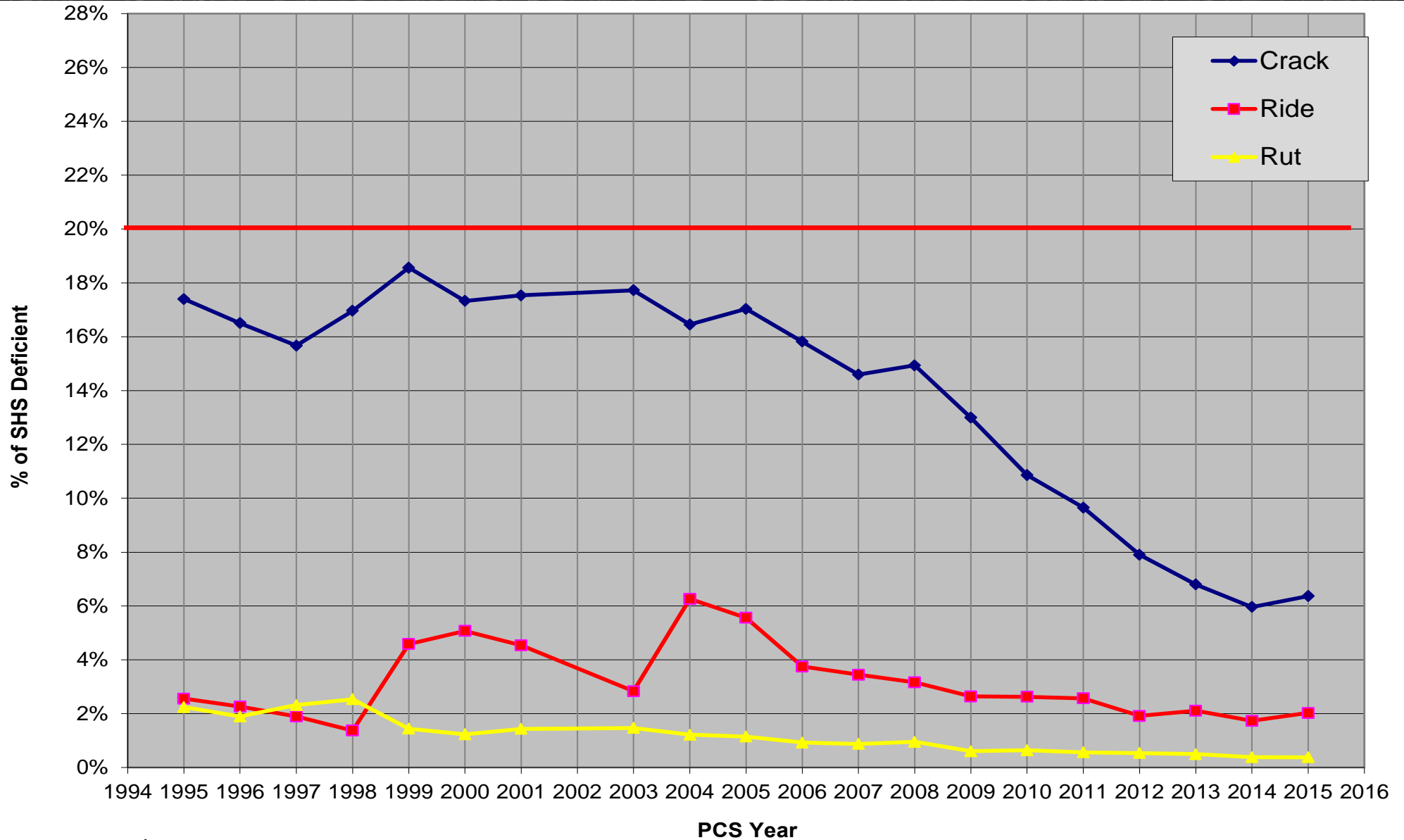
# Topics

- Historical Performance Data
- Overview of NCAT
- Responses and Distresses of Asphalt Pavements
- Superpave Binder and Mixture Specifications
- Structural Pavement Design Methods
- NCAT Test Track Key Findings

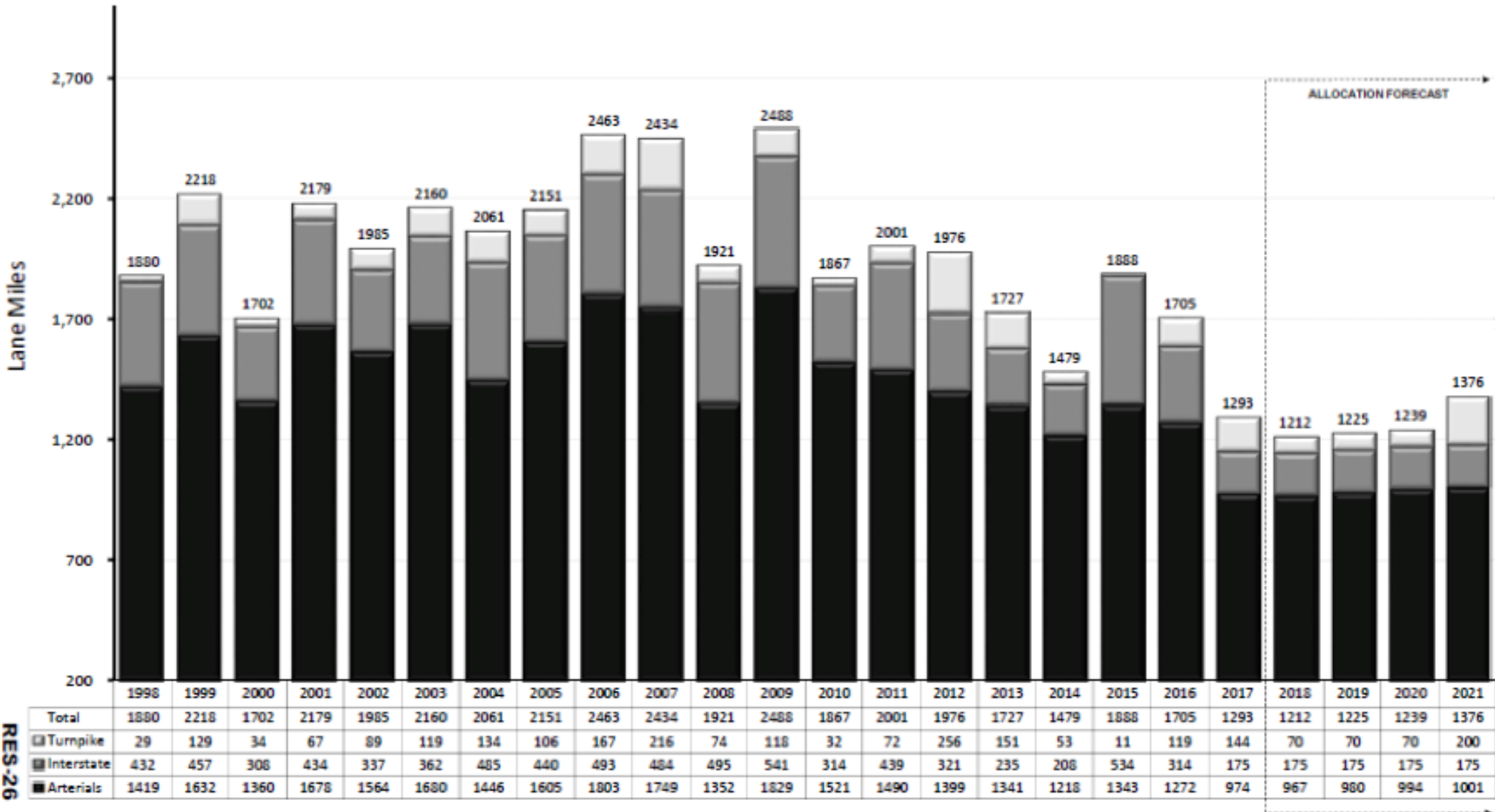


# Historical Pavement Performance Data

# Statewide Performance in Florida

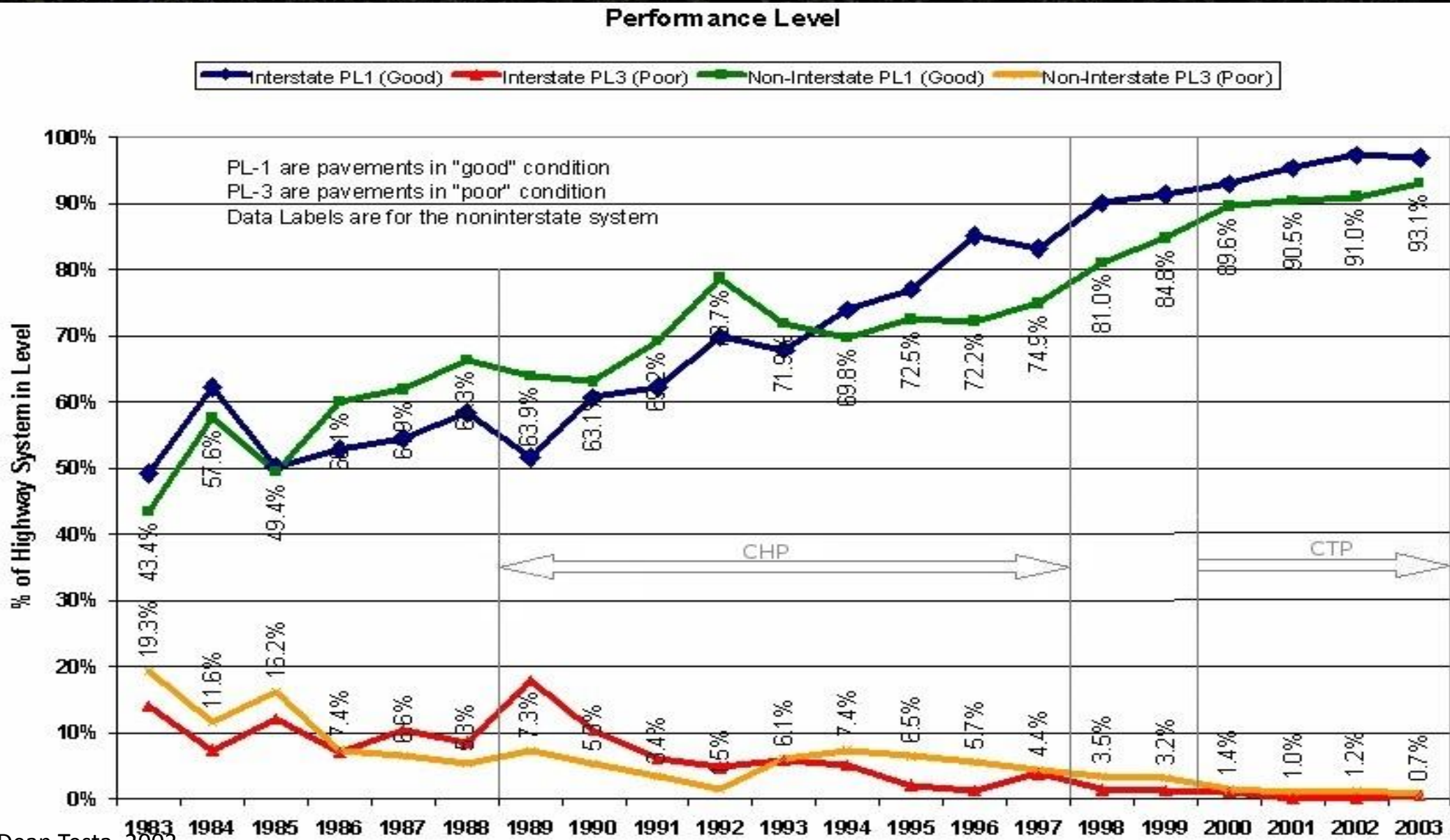


# Lane Miles to Be Resurfaced Tentative Work Program (04/06/15)





# Statewide Performance in Kansas





# Overview of NCAT



NCAT's mission is to be a world leader and authority in cost-effective asphalt pavement research, outreach, and education in the areas of:

- Structural design
- Construction methods
- Materials and testing
- Performance measurement and prediction
- Pavement preservation, rehabilitation, recycling and maintenance
- Environment and highway safety



# An Academic & Industry Partnership



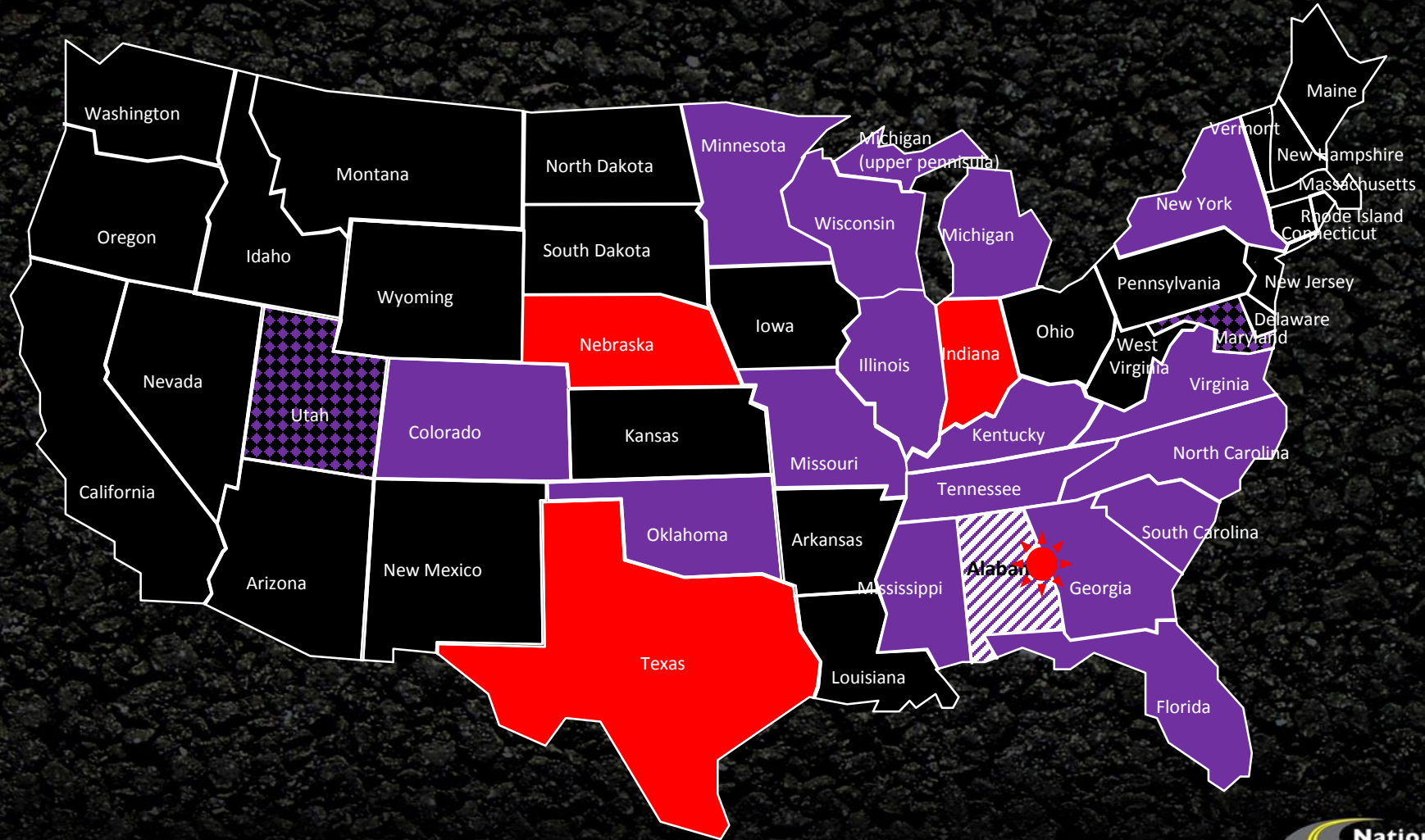


# NCAT Staff

- 35 full-time employees
  - 9 Ph.D. research engineers
  - 8 graduate engineer assistant researchers
  - technicians, accounting, drivers, and office support
- 10-15 engineering student employees
- Collaboration with AU faculty researchers in a wide range of academic disciplines

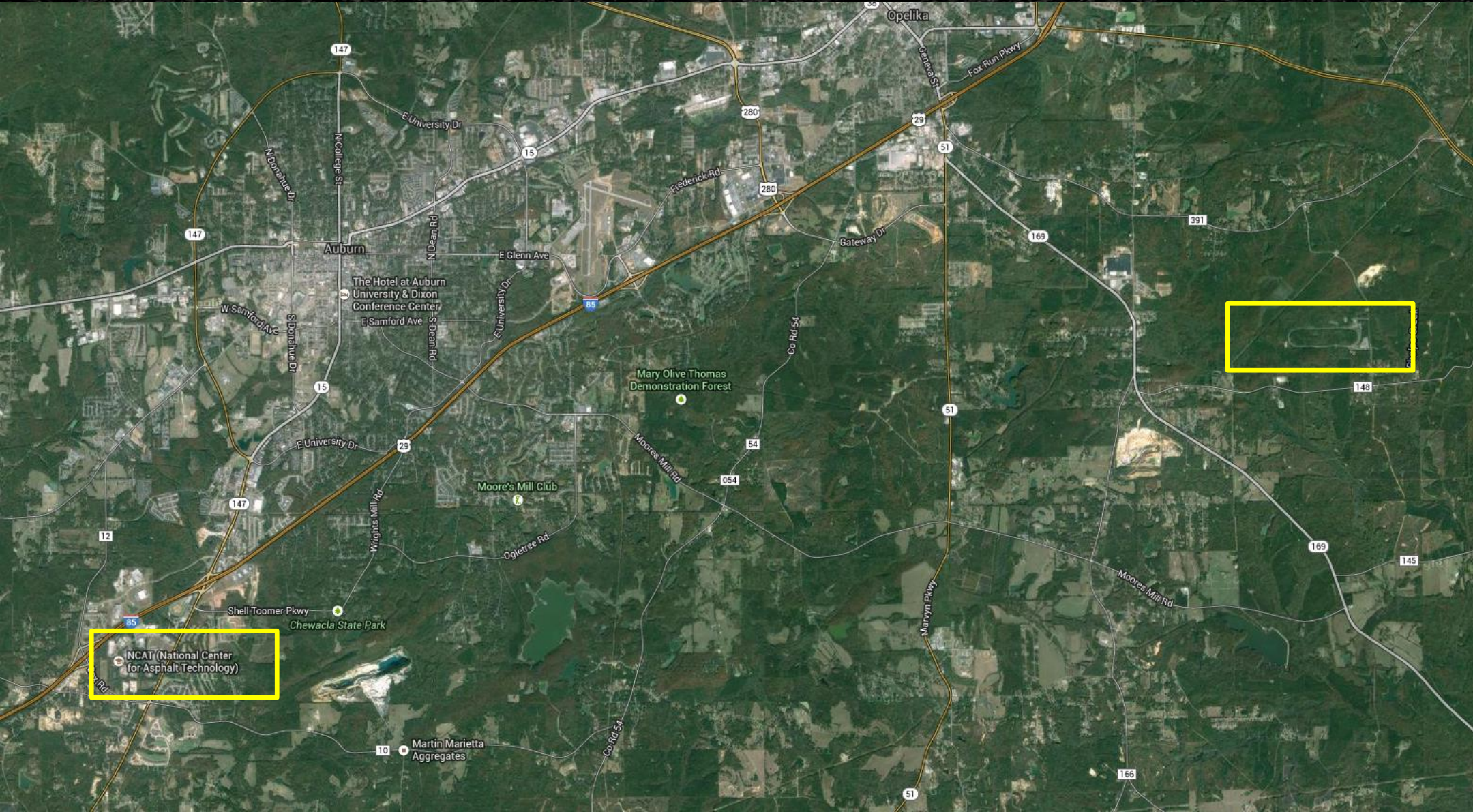


# NCAT Facilities





# NCAT Facilities





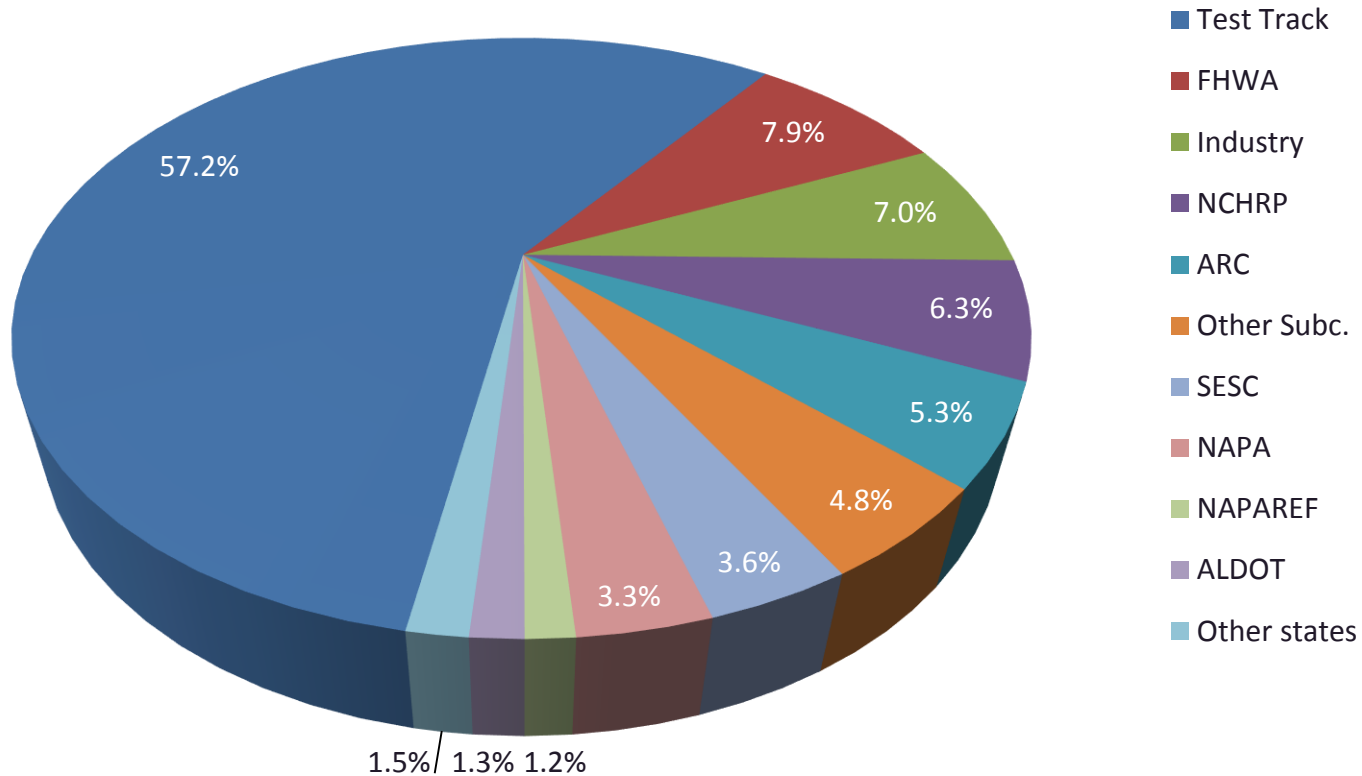
# NCAT Facilities

- 40,000 ft<sup>2</sup> (3716 m<sup>2</sup>) Office and Lab
  - 22,000 ft<sup>2</sup> (2044 m<sup>2</sup>) laboratory space
  - 18,000 ft<sup>2</sup> (1672 m<sup>2</sup>) educational and office space
- NCAT Test Track
  - 1.7 mile (2.7 km) oval track with 46 pavement test sections
  - Accelerated loading via 5 heavily loaded triple- trailers



# Funding Overview

- Approx. \$5 million in research and training executed each year
- Majority of funding is from competitive or negotiated contracts





# NCAT Lead Researchers



Dr. Ray Brown



Dr. Buzz Powell



Dr. Mike Heitzman



Dr. Randy West



Dr. David Timm



Dr. Carolina Rodezno



Dr. Nam Tran



Mr. Don Watson



Dr. Richard Willis



Dr. Mary Robbins



# NCAT Test Track

National Center for  
Asphalt Technology  
**NCAT**  
at AUBURN UNIVERSITY



## Asphalt Pavement Proving Ground



# Lab Testing



04/09/2010





Google Custom Search Search

NCAT

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- SEAUPG AMPT User Group
- NCAT Board of Directors
- Files

View the webinar and download informational slides on the NCAT/MnROAD partnership

[LEARN MORE](#)

Spotlight



Fall 2014 Newsletter

Check out our latest version of Asphalt Technology News

Read more >>

Upcoming Events

- 58th Annual Transportation Conference  
February 09 - 10 (Renaissance Montgomery Hotel & Spa at the Convention Center)
- 2015 Pavement Test Track Conference  
March 03 - 05 (Hotel at Auburn University and Dixon Conference Center)
- SEMINAR: AASHTO-Based Bridge Design – A History of Adaptation  
April 08 (TBA)
- Baja SAE Auburn  
April 09 - 12 (National Center for Asphalt Technology (NCAT))

NCAT News

- AAPA 2014 International Knowledge Transfer Study Tour Visits NCAT
- NCAT Is Now on Facebook
- International Conference on Perpetual Pavement 2014

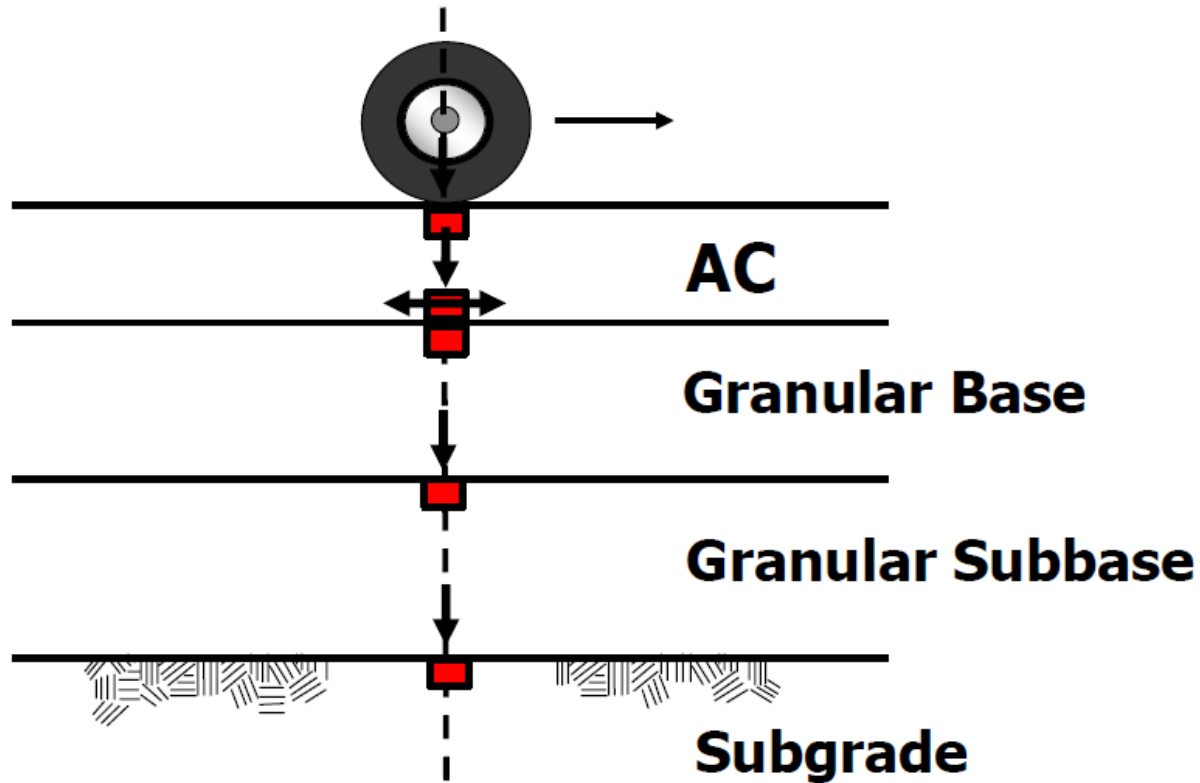


# Responses and Distresses of Asphalt Pavements



# Critical Responses (1/3)

- Conventional AC

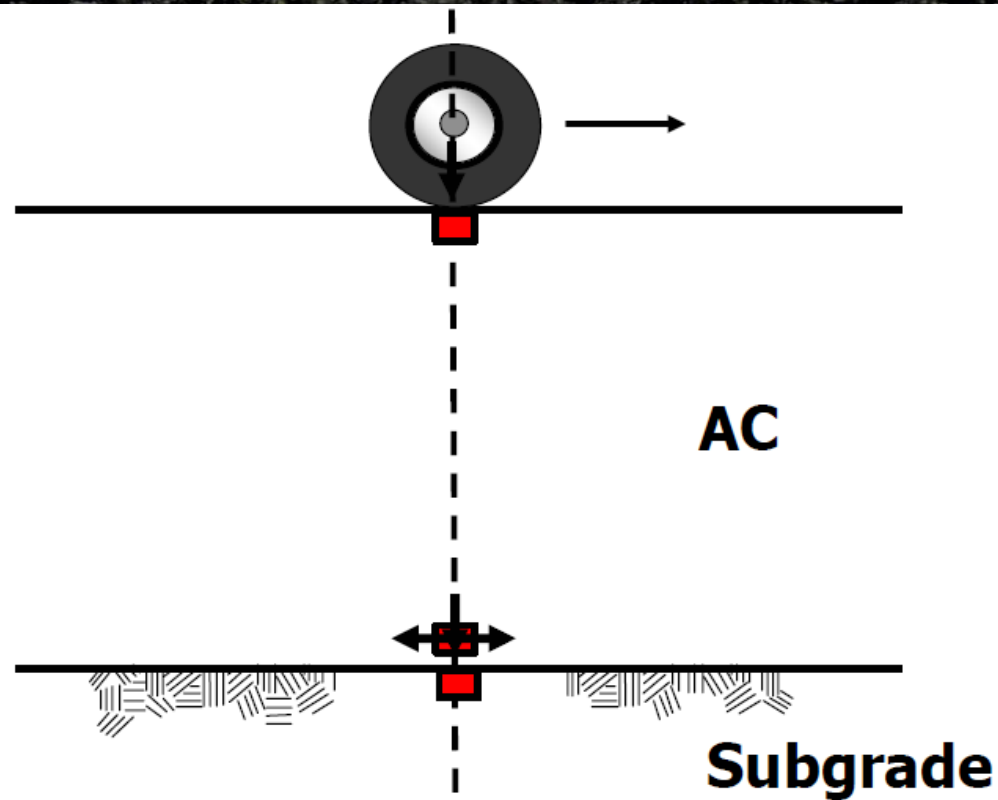


(NHI Course 131064)



# Critical Responses (2/3)

- Full depth AC

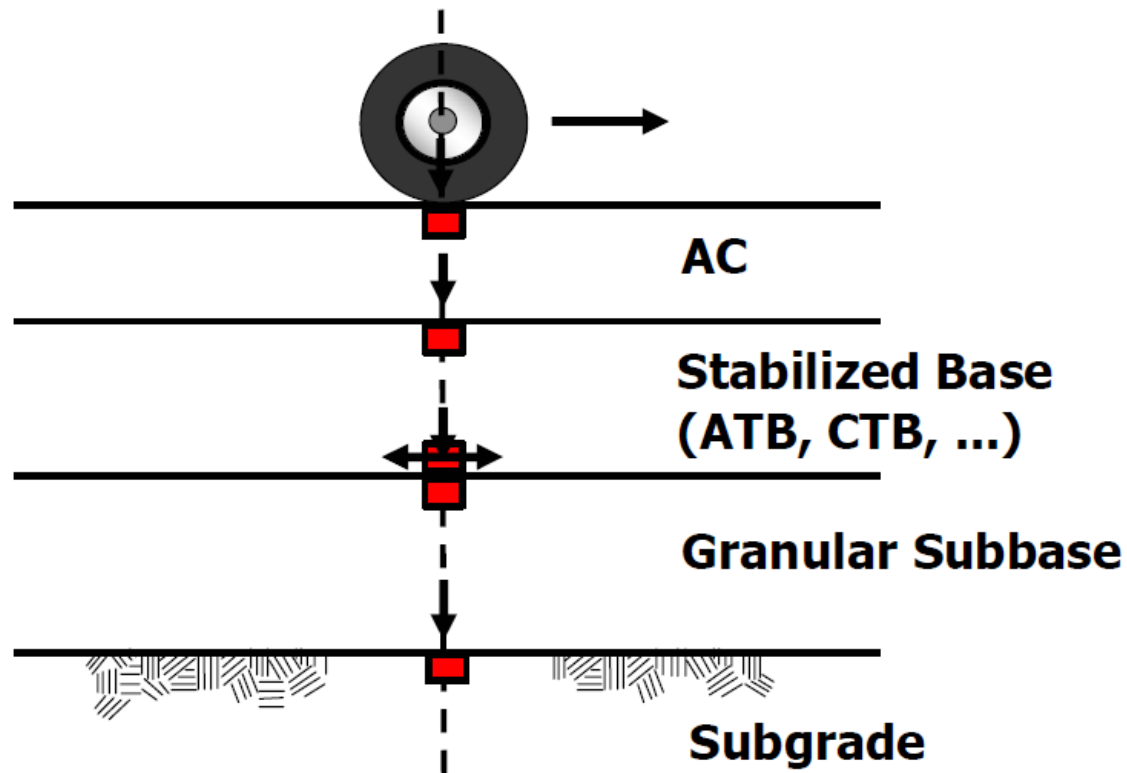


(NHI Course 131064)



# Critical Responses (3/3)

- AC over stabilized base



(NHI Course 131064)



# Major AC Pavement Distresses

- Load-associated distresses
  - Rutting
  - Surface-down cracking
  - Bottom-up fatigue cracking
- Non-load associated distress
  - Low temperature cracking
  - Moisture damage\*

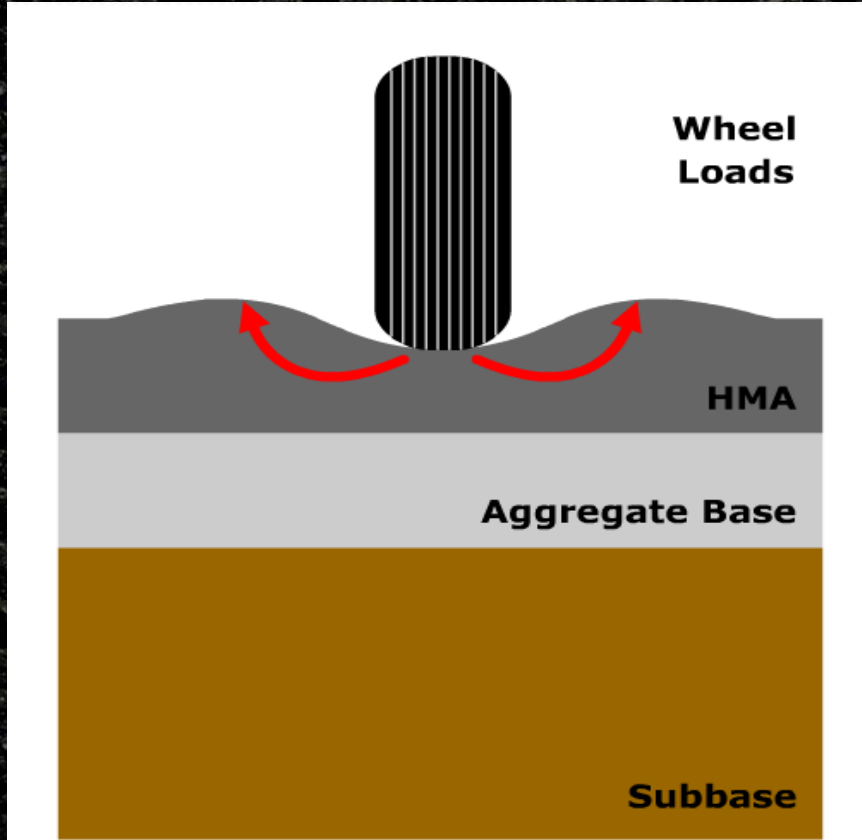


# Rutting





# Rutting in HMA

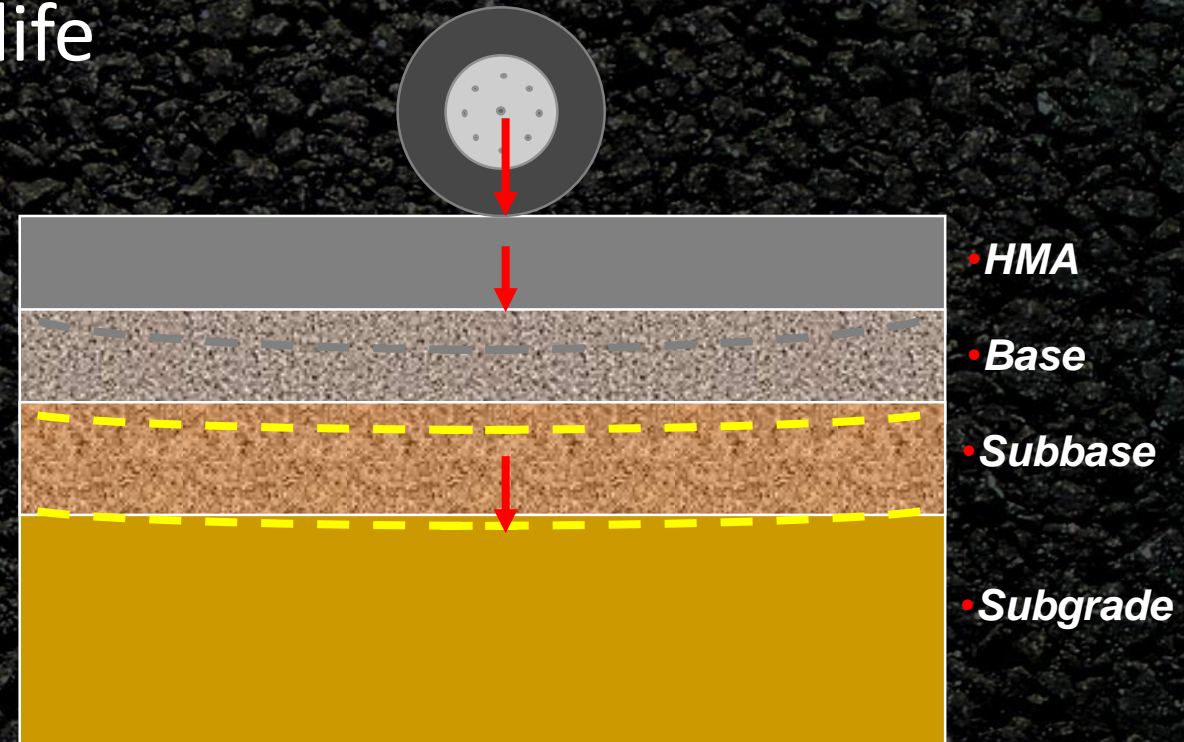


- Occurs early in service life
- Requires immediate repair
- Usually mix related
- Primary Factors
  - Binder grade
  - Aggregate angularity
  - Mixture volumetrics
  - Compaction



# Structural Rutting

- Occurs early in service life
- Requires immediate repair
- Structure related
- Primary Factors
  - Structure
  - Mix stiffness
  - Compaction



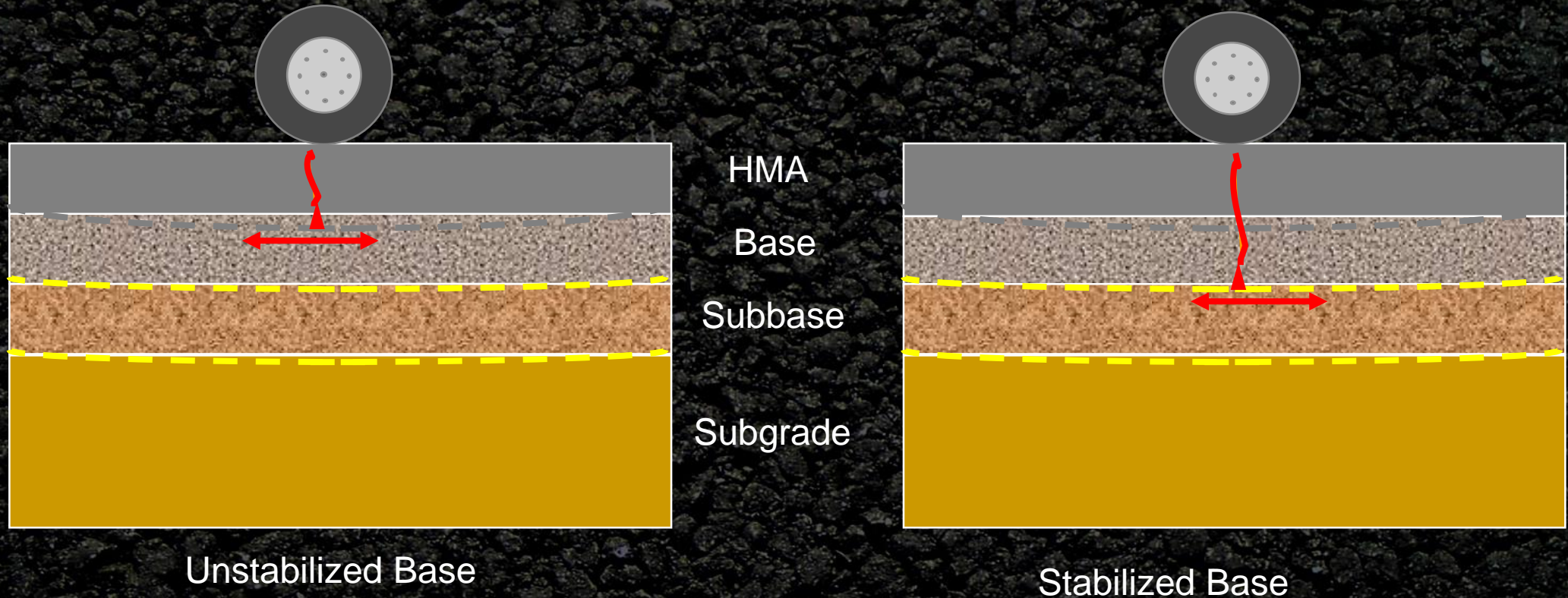


# Fatigue Cracking





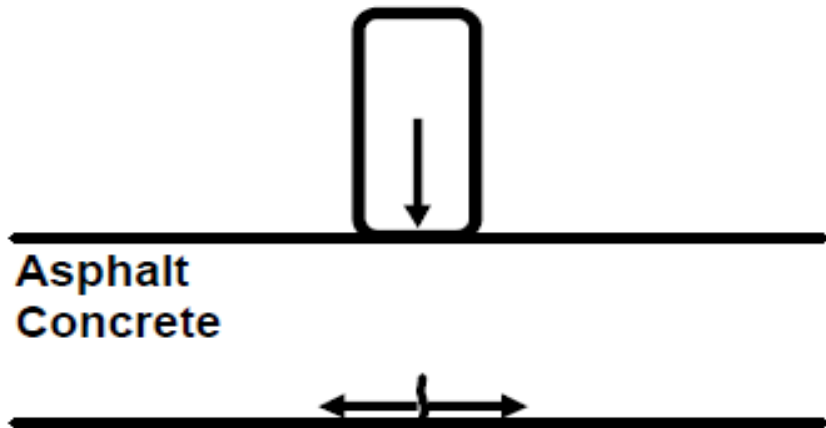
# Bottom-Up Cracking





# Bottom-Up Cracking

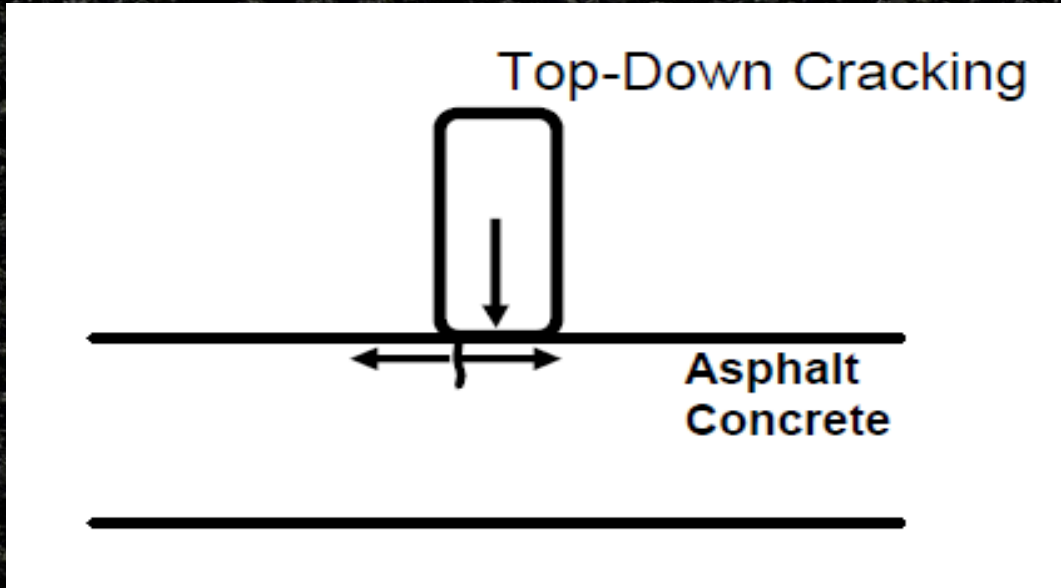
Traditional Fatigue Cracking



- Occurs late in pavement life
- Eliminated through structural design
- Primary Factors
  - Structure (high tensile)
  - Volume of asphalt
  - Binder grade
  - Compaction



# Top-Down Cracking



- Can occur early in life
- Removed by milling during rehabilitation
- Mechanism not well understood
- Likely Factors
  - Contact stresses
  - Thermal stresses
  - Mixture stiffness
  - Compaction



# Low Temperature Cracking

- Usually takes some time to develop
- Highly dependent on environment
- Progressive damage near cracks
- Primary Factors
  - Environment
  - Binder grade

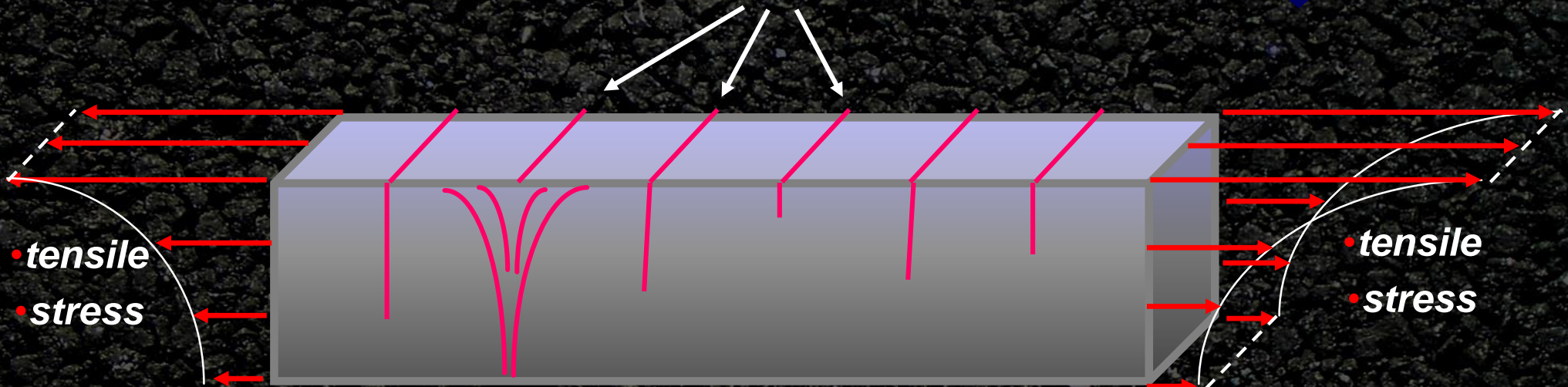




# Low Temperature Cracking



- *Low temperature cracks on surface*



- *tensile stress*

- *tensile stress*

- *Low temperature*
- *crack growth in HMA*



# Block Cracking

- Occurs late in pavement life
- Progressive damage near cracks
- Primary Factors
  - Aging
  - Daily temperature cycling
  - Binder grade

