

# Design of Concrete Overlays



**Fall 2013 TTCC/National Concrete Consortium**

Asheville, NC

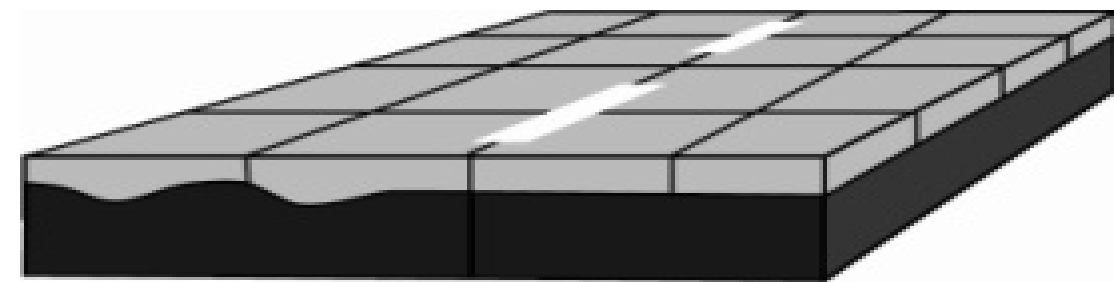
Sept. 23, 2013

Presented by: Julie M. Vandebossche, P.E., Ph.D.  
University of Pittsburgh

# Bonded Concrete Overlays of Asphalt Pavements (BCOA)

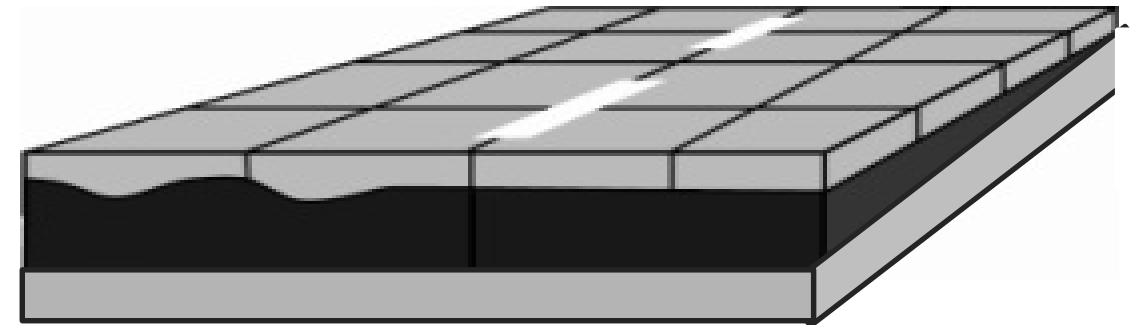
- Thin or ultra-thin whitetopping or BCOA - Bonded concrete overlays of existing HMA surfaces.

Typically 3 to 5 in and **smaller panel size**



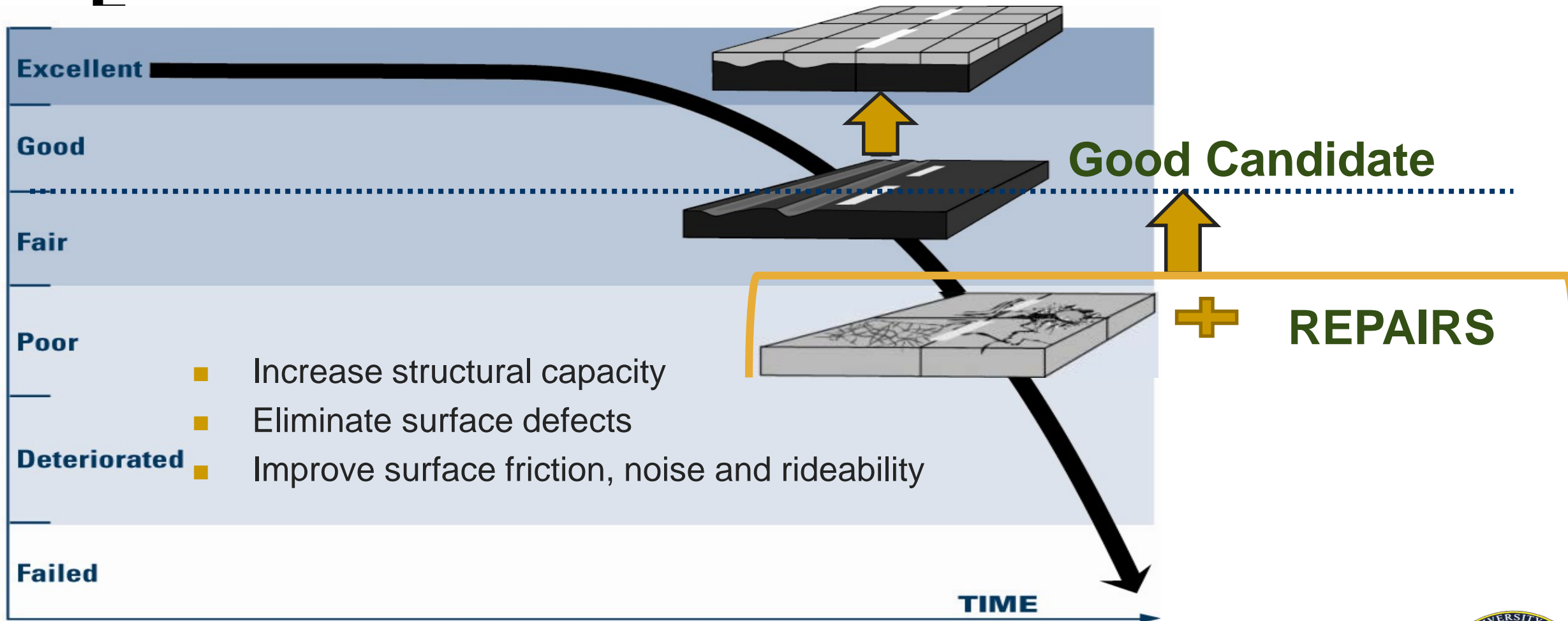
HMA pavement

or



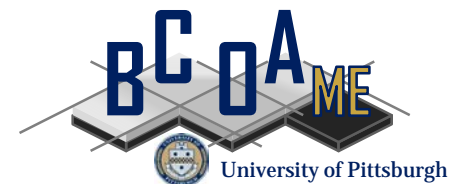
Composite pavement

# Suitable candidates



# Project Goal

- Rational mechanistic-empirical design procedure
  - Stand alone design procedure
  - Easily incorporated into Pavement ME
  - Address actual failure modes





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## J. Vandenbossche PhD

- Home
- Background
- Publications
- Courses
- Research
- Lab Tour



(Last site update Sept. 2013/Last guide update Sept. 2013)

The bonded concrete overlays of asphalt mechanistic-empirical design procedure (BCOA-ME) was developed at the University of Pittsburgh under the FHWA Pooled Fund Study TPF 5-165. This pavement structure has been referred to as thin and ultra-thin whitetopping. This site is a repository for all information relating to the BCOA-ME. The information has been sorted based on its intended use and can be retrieved by clicking on the appropriate tab below. The BCOA-ME can be run directly from this site by clicking on the "Design Guide" tab below.

<http://www.engineering.pitt.edu/Vandenbossche/BCOA-ME/>

**Design Guide**

**Practitioner's Information**

**Training Tools**

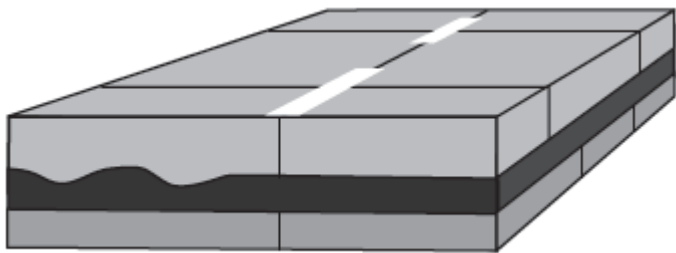
**Technical Documentation**

**Sponsoring Agencies**

**User's Feedback**

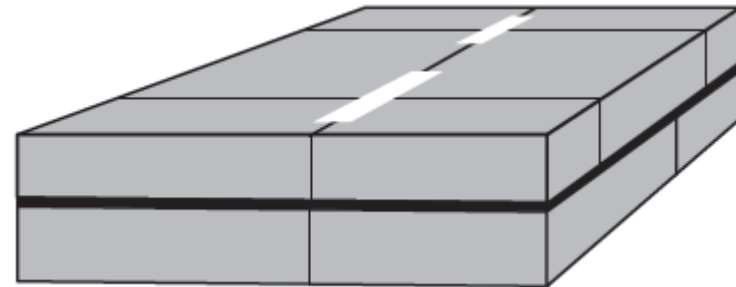
# Unbonded Concrete Overlays of Concrete Pavements (UCOCP)

- Performs as new pavement
  - Existing structure provides stable base
- Thicker than bonded concrete overlays – typically 4 to 11 inches
- Restore structural capacity
  - Moderately to significantly deteriorated pavements
- Interlayer system used



Composite pavement

or



Existing concrete pavement

# Interlayer

- Prevents distress from reflecting into overlay
- Common types: HMA & Fabric
- Primary factor affecting performance



Photos courtesy of John Donahue of MoDOT



# Project Goal

- Rational mechanistic-empirical design procedure
  - Stand alone design procedure (most likely packaged with BCOA)
  - Easily incorporated into Pavement ME
  - Account for performance of interlayer system

Similar to BCOA design procedure developed for bonded whitetopping (TPF 5-165)





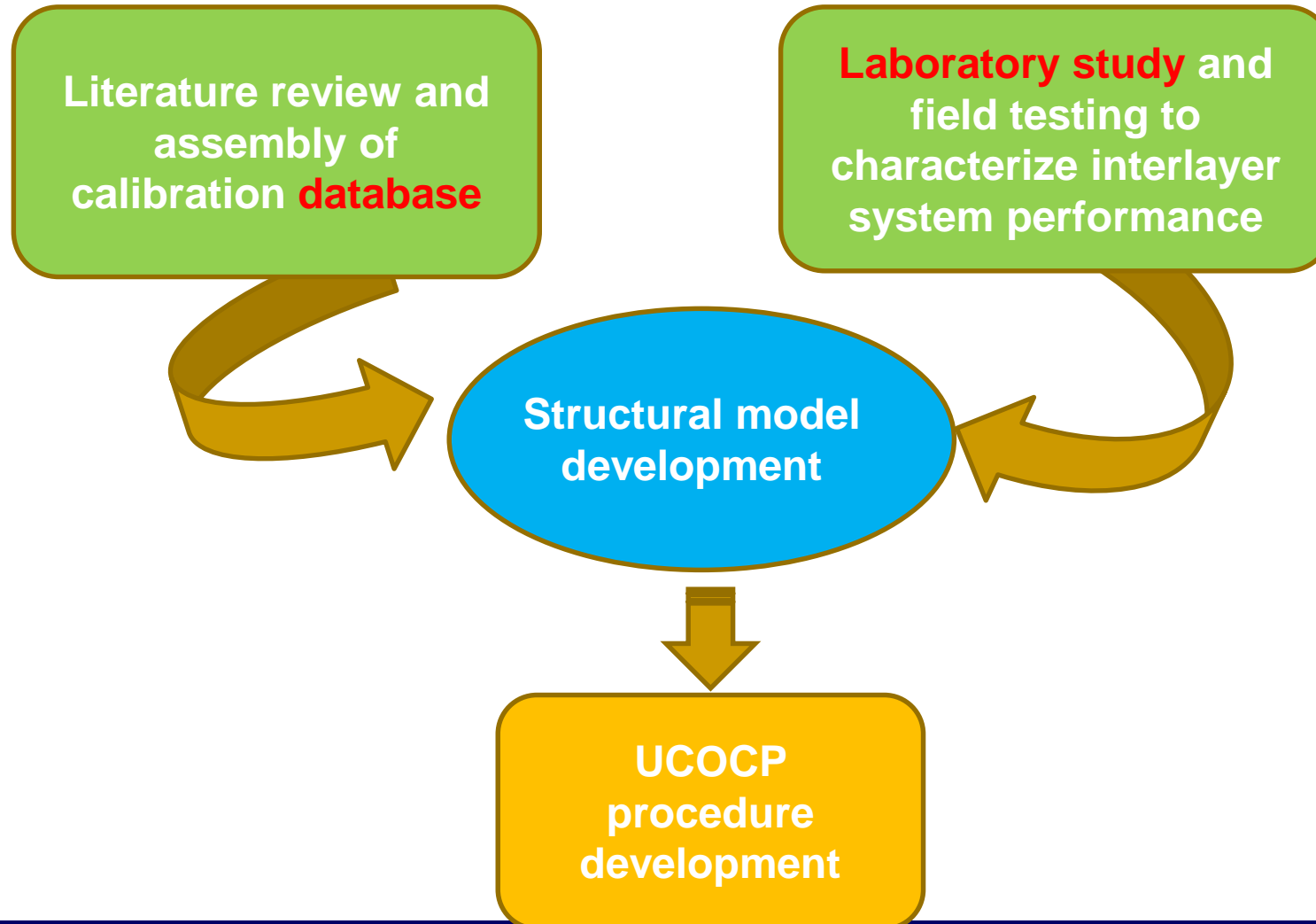
# FHWA Pooled fund study

FHWA Pooled Fund Study 5-269: Development of Design Guide for Unbonded Concrete Overlays of Concrete and Composite Pavements

- Minnesota – **Lead**
- Missouri
- Michigan
- Iowa
- North Carolina
- Kansas
- Oklahoma
- Georgia



# Primary Project Tasks



# Lab Testing

- Four interlayer systems examined:

- Thick fabric
- Thin fabric
- Open graded HMA layer
- Dense graded HMA layer

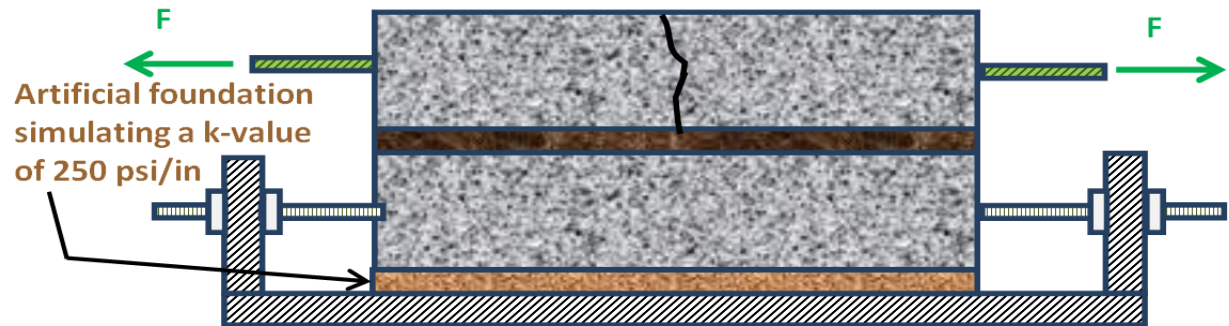
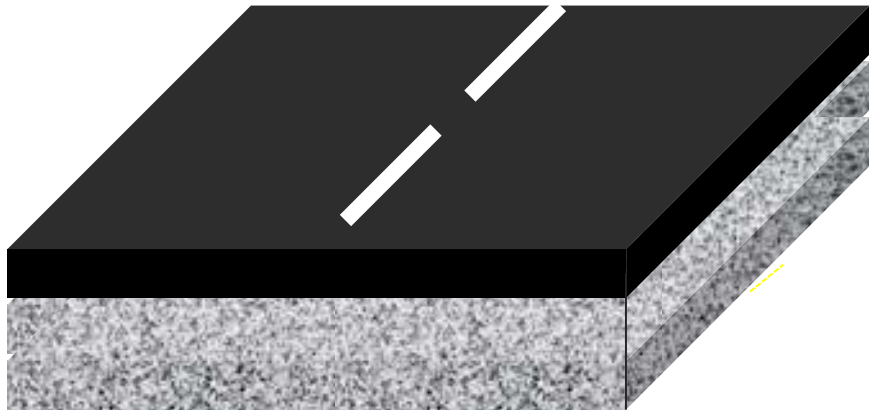


- Three different mechanisms affecting interlayer performance:

1. Stiffness of interlayer (cushioning effect)
2. Ability to prevent reflective cracking
3. Friction that develops along interlayer system

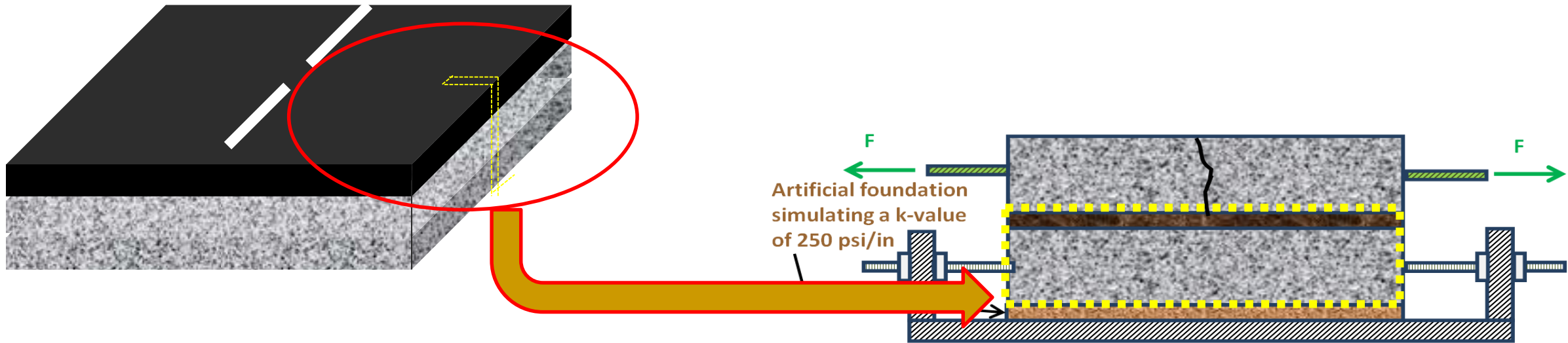
# HELP! - Specimens needed

- HMA (dense and open graded) on PCC from pavements with paved interlayer



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- HMA (dense and open graded) on PCC from pavements with paved interlayer



# UCOCP Performance Database

- LTPP data
  - 24 sites available (20 JPCPs and 4 CRCPs)  
(16 sites used in M-E PDG rehab model calibrations)
- NCHRP Project 10-41
- ACPA National Overlay Database
- State DOTs (construction reports, evaluation reports, PMS data, etc.)



# HELP! – BCOA and UCOCPP

## Performance data needed

- Existing Pavement
  - Design
  - Material properties (*can be obtained from cores*)
- Overlay
  - Design
  - Material properties (*can be obtained from cores*)
- Interlayer
  - Type and thickness
- Traffic (AADTT, ESALs, ...)
- Performance data
  - Distress surveys
  - FWD data
- Maintenance and rehab activities (pre and post overlay)



[ Thank You ]



Any Questions?

<http://www.engineering.pitt.edu/Vandenbossche/BCOA-ME/>