Design of Concrete Overlays

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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

Composite pavement
Suitable candidates

- Increase structural capacity
- Eliminate surface defects
- Improve surface friction, noise and rideability

Adapted from CP Tech Center Overlay Guide

cond1

Good

Fair

Poor

Deteriorated

Failed

Excellent

Good Candidate

REPAIRS

TIME
Project Goal

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

- Literature review and assembly of calibration database
- Laboratory study and field testing to characterize interlayer system performance
- Structural model development
- UCOCP procedure development
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 UCOCP
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?

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