UBOL Fabric Interlayer Research & UCOCP Design Procedure Pooled Fund

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Office of Materials and Road Research
Use of Non-Woven Fabric Interlayer for Unbonded Concrete Overlays

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Objectives:
- Develop performance data for UBOL with fabric interlayer
- Determine whether fabric supplies sufficient cushioning for overlay
- Evaluate drainage characteristics of fabric interlayer
Use of Non-Woven Fabric Interlayer for Unbonded Concrete Overlays

- Experimental Design:
  - 2 test sections loaded by “Minne-ALF2”
  - 6’ wide by 15’ long slab
  - Minimum of 7 million load repetitions per test section
  - Alternating 9000 lbs loads across underlying crack/joint
  - Increased loads (if needed) to fail overlay slab
  - October 31, 2012 estimated completion date
Test Section 1 – Base slab = 5” thick
Sawed joint & moisture sensor block-outs
Fabric & water inlets installed
Gutter on down slope edge of 5” thick overlay
Drainage experiment set-up
Use of Non-Woven Fabric Interlayer for Unbonded Concrete Overlays

Test Section 1:
- Measured deflections of 5” base slab for one week
  - No crack formed, had to saw joint
- Fabric and 5” concrete overlay constructed
  - 7 million reps at dual 9000 lbs loads (no cracks)
  - Increased loads to dual 15000 lbs to fail overlay (cracks?)
- Conducted drainage study (static & during loading)

Test Section 2 (proposed)
- 5” thick base slab with 3” overlay
- Subject to TAP approval
MnROAD Cells 505 & 605
Thin Unbonded Concrete Overlay on Fabric Interlayer

- Design details:
  - Original (1993) 7.5” thick PCC slabs
    - Panel sizes: 20’Lx14’W (D), 20’Lx13’W (P)
    - ½ natural joints, ½ mechanically cracked
  - Removed (2008) 1” PASSRC + 4” thick PCC overlay
    - Panels sizes: 15’Lx14’W (D), 15’Lx13’W (P)
  - Constructed (2011) 5” thick overlay on fabric interlayer
    - Panel sizes: 6’L x 7’W (D), 6’Lx6.5’W (P)
Development of an Improved Design Procedure for Unbonded Concrete Overlays

- Pooled Fund Proposal 1309
  - 3 year study
  - $480,000 proposed budget ($20k/yr from 8 states)
  - Current partners: GA, IA, KS, MI, MN (lead), OK
  - Commitments=$360,000

- Patterned after TPF 5-165 Whitetopping Design Procedure project
  - Stand-alone spreadsheet design for UCOCP (DARWin ME compatible)
  - No overlay thickness limit (3”-12”?)
  - Characterization of and guidelines for interlayers
  - Project selection criteria
Development of an Improved Design Procedure for Unbonded Concrete Overlays

Scope of work

- Literature review and summary of existing UCOCP design procedures, and survey of performance of experimental and in-service UCOCP projects.

- Develop separator layer (interlayer) design parameters and performance model(s) for various materials based on field performance and limited laboratory testing (if needed).
Development of an Improved Design Procedure for Unbonded Concrete Overlays

- Scope of work (con’t.)
  - Develop new, or improve existing UCOCP pavement response and performance prediction models that incorporate
    - Slab thickness (3” to 12”?)
    - Panel size
    - Joint load transfer mechanisms
    - Axle load configuration
    - Condition of the existing pavement
    - Climate (nation-wide) (Utilize existing models)
    - Performance of a separator layer over time
Development of an Improved Design Procedure for Unbonded Concrete Overlays

Scope of work (con’t.)

- Develop a unified national mechanistic-empirical design procedure for unbonded concrete overlays of existing concrete and composite pavements.
- Procedure should consist of a self-contained spreadsheet or software program
  - Formulated for adoption into DARWin-ME in the future.
- Must accommodate a variety of climate conditions, axle load configurations, underlying pavement conditions, and time dependent performance of the separator layer.
Development of an Improved Design Procedure for Unbonded Concrete Overlays

- Scope of work (con’t.)
  - Develop user manual
  - Provide project selection criteria
    - Existing guidelines
    - Improved guidelines based on feasible designs.
Development of an Improved Design Procedure for Unbonded Concrete Overlays

Benefits of project design

- Freedom to use existing models or develop new ones as needed
- Potential to create or evaluate innovative designs
  - Thin or Ultra-thin UCOCP
  - Interlayer types:
    - New or milled HMA (dense or porous)
    - Fabric
  - CRCP overlay over JPCP (may require additional funds?)