**Minnesota Department of Transportation**



**MEMO**

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**DATE:** September 4, 2015

**TO:** TAP members

**FROM:** Tom Burnham, Project Manager

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**SUBJECT:** Minutes from 4th TAP meeting for TPF 5-269 (Transportation Pooled Fund) Project “Development of an Improved Design Procedure for Unbonded Concrete Overlays.”

The fourth Technical Advisory Panel meeting for the Transportation Pooled Fund Project 5-269 “Development of an Improved Design Procedure for Unbonded Concrete Overlays” was held on June 24, 2015. The meeting was conducted via a web meeting based out of the MnDOT Materials and Road Research Laboratory. The meeting was hosted by Tom Burnham (Project Manager, MnDOT) and the project team members Lev Khazanovich (U of Mn) and Julie Vandenbossche (U of Pitt).

Agenda

* Introductions (5 minutes) – Tom Burnham
* Project overview (5 minutes) – Tom Burnham
* Project Contractual Status – (5 minutes) – Lev Khazanovich
* Project Update/Task 2.1 Report (60 minutes) – Project team
* Discussion of Future Tasks/Partner Participation (75 minutes)
* Schedule next meeting

Meeting Summary

The meeting began with introductions by the participants.

Tom gave a brief summary of the objectives of the project.

Lev gave an update on the work completed and contractual status of the project. He reminded everyone that time and money was added to the contract in April 2015 to accommodate additional Task 2 lab testing carried out by Julie Vandenbossche at the University of Pittsburgh. The Task 8 (Final Report) completion date for the project is now scheduled for March 31, 2017.

Next, Lev reviewed the findings from Task 1. He then reported that most of the Task 2 laboratory testing had been completed. The remaining work in Task 2, involving the collection of field performance data from existing and new UBOL projects, as well as guidelines on drainage for UBOLs, will be completed by September 30, 2015. A contract amendment for a new completion date for Task 2 will be pursued. Chris Brakke mentioned that Iowa has some 10 ft long panel UBOL projects that could be measured for the study.

Julie then gave the group a comprehensive presentation on the findings from the Task 2 laboratory study. She began by thanking all of the students involved with the fabrication and testing of the beam specimens. This work took place from August 2014 to June 2015. Julie also thanked Eric Littel from the geotextile interlayer fabric manufacturer Propex for his donation of materials and assistance. Finally, she thanked all of the pooled fund DOT members who shipped her beam samples from various UBOL projects. These served as the base layer of many of the tested specimens.

Next, Julie described the logistics of the test specimen fabrication and testing. Four interlayer systems were tested, including nonwoven geotextile fabric, new dense graded asphalt, new open graded asphalt, and milled and unmilled existing dense graded asphalt. For the fabric interlayer specimens, two different weight fabrics were tested.

Maria Masten questioned why some of the asphalt interlayers were thicker than the typical MnDOT standard thickness of 1 inch. Julie suggested that these represent UBOL projects where the existing pavement is composite, and a thicker amount of an asphalt remains after milling. Overall, 21 existing 6”x6”x30” beams (from 5 DOT projects) were overlaid with new 6”x6”x30” concrete overlay beams. An additional 33 lower beams were cast and overlaid to complete the test matrix.

The first laboratory testing configuration was designed to characterize the stiffness of interlayer systems. A pulse load was applied on one side of each overlay beam’s center span sawed joint. Interlayer compression and load transfer efficiency were measured. As expected, the thinner 10 ounce geotextile fabric interlayer deflected less than the standard 15 ounce fabric. The overall deflection of fabric interlayers after 300,000 loadings remained fairly steady (“elastic”). HMA based interlayers exhibited cyclic creep and permanent deformation after the load cycles. The Minnesota PASSRC open graded HMA interlayer experienced the most permanent deformation. This type of behavior may lead to loss of support as a result of the PASSRC breaking down under repeated traffic loads. It was suggested that the elastic deflection response of fabric interlayers may provide more long-term uniform support to unbonded concrete overlays. John Donahue mentioned that the testing in this study did not address the effect of moisture breaking down HMA interlayers.

The second laboratory testing configuration was designed to characterize the friction along interlayer systems. These tests used a similar beam test setup as the first configuration. Specimens with fabric interlayers were made to test the effect on friction of using nails or glue for fastening the fabric to the lower beam. It was reported that the thinner 10 oz. fabric was stiffer, and therefore would provide more restraint and could lead to additional joints cracking. It was found that pinning or nailing the fabric to the lower beam provided little frictional restraint until the fabric engaged the fasteners. Therefore, spacing of the fasteners in the field will affect the resistance of the fabric interlayer. Minnesota PASSRC had largest decrease in stiffness and lowest ultimate friction resistance of HMA type interlayers. This may indicate that open graded mixes may be less stable, with an increased risk of loss of support to the overlay.

The third laboratory testing configuration was designed to characterize the ability of interlayer systems to prevent reflective cracking. During the development of the test setup, first attempts to form a crack in the lower beam by loading the overlay beam were unsuccessful. Therefore a 10 inch long gap in support of the lower beam was introduced. Cracks reflecting up from the bottom beam were then able to be formed.

The following conclusions were stated: 1) reflective cracking could not be generated from bottom up when the bottom portion of specimen was fully supported, 2) unless a void or discontinuity is present near joint or crack, the potential for reflective cracking is low, 3) true reflective cracking occurs rarely in the field, unless non-uniform support conditions exist, 4) additional energy is required to initiate cracks with fabric interlayers. The Michigan open graded HMA interlayer tended to provide increased resistance to the development of reflective cracking compared to other HMA interlayers.

The fourth and final laboratory test under Task 2 of this project was designed to characterize the vertical resistance provided by interlayer systems (Direct Tension Test). For tests with an HMA interlayer, 4 inch square specimens were cut from the reflective cracking beams tested in configuration 3. For fabric interlayer systems, 4 inch diameter cores were extracted. Adhesive was applied to the interface between the fabric and the lower beam. Testing showed the following: 1) only a small force is needed to unbonded fabrics, and therefore fabric interlayers provide little resistance to upward curling forces, 2) for HMA based interlayers, the location of the bond break varied depending on the mix type.

Lev then presented an overview of the structural models that will be considered during work in Task 3.

The meeting ended with general discussions, including:

1. Matt Zeller asked if the use of fiber-reinforced concrete will be considered during this study?
2. Someone also asked whether this study can answer the question of “how faulted can the existing concrete pavement be when using a fabric interlayer”?
3. Maria Masten suggested acknowledgement of the efforts of MnDOT’s Rob Golish and the McCrossan Company for retrieving the Minnesota beam samples that were shipped to Pittsburgh for testing in this study.

Tom concluded the meeting by suggesting that the next TAP meeting occur sometime in December 2015.