Minutes of TAP Meeting for TPF 5(269) Project "Development of an Improved Design Procedure for Unbonded Concrete Overlays," March 19, 2018.

Written by: Tom Burnham, MnDOT, 4-9-2018

The seventh Technical Advisory Panel (TAP) meeting for the Transportation Pooled Fund Project 5-269 "Development of an Improved Design Procedure for Unbonded Concrete Overlays" was held on March 19, 2018. 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 (University of Minnesota), and Julie Vandenbossche (University of Pittsburgh). There were 19 meeting participants.

Agenda

- Introductions (5 minutes) – Tom Burnham
- Project overview (5 minutes) – Tom Burnham
- Presentation and discussion on new design procedure (75 minutes) – Project team
- Project update on remaining tasks (20 minutes) – Project team
- Schedule next meeting

Meeting Summary

Tom Burnham began the meeting with a short review of the objectives of the project. He reminded the group that the contract started in June 2013, and will be completed by October of 2018. He gave an overview of the tasks remaining under the new contract with the University of Pittsburgh. He also noted that due to the need to close out the previous contract with the University of Minnesota, as well as establish a new contract with the University of Pittsburgh, at least 6 months of working time was lost in 2017.

Next, Lev presented an update on recent progress on the project. The Powerpoint used during his presentation can be found attached to these minutes. He began with a review of the work completed in previous tasks. This included the results of an investigation into a list of current and past design procedures for unbonded concrete overlays, as well as a description of the limited design factors upon which they were based. He next discussed the importance of the role that an interlayer plays on the performance of unbonded concrete overlays. In both laboratory experiments and a review of field performance, reflective cracking through an unbonded concrete overlay was found to be insignificant.

Further describing the results from this study's lab experiments designed to characterize interlayers, it was found that there can be permanent deformation within asphalt interlayers. This, as well as stripping of the asphalt under freeze-thaw and hydraulic forces, can lead to behavior mimicking transverse joint faulting. The lab testing also revealed that the "k-value" of geotextile fabric interlayers is much lower than asphalt interlayers, however it also provides much more elastic support to a concrete overlay.

Randy Riley asked about whether fabrics can develop permanent deformation, to which the response was yes, however it is minimal and quickly stabilizes. Lev next described the reason for choosing a Totski model to accommodate the behavior of the interlayer. John Donahue asked about the meaning of a "k-value" for fabric, to which Lev stated it was not a material property, but a computational factor used primarily for the analysis. Julie Vandenbossche explained that the k-values were developed using a combination of the theoretical model and FWD testing results from the field.

The performance modeling was described next. This study included three models: transverse cracking, transverse joint damage (corner/longitudinal cracking), and transverse joint faulting. The inclusion of the new faulting model accounts for the degradation of interlayers over time. The cracking model utilized the PavementME (MEPDG) framework, with some significant modifications. Level 3 MEPDG curves were used to characterize PCC strength gain. Traffic is accommodated through the use of MEPDG default axle spectrum, however **states may use their own spectrum if desired.** The primary input is AADTT for the first year, followed by a linear traffic growth rate. Next, the curling analysis was described. There are 70 weather stations available for the analysis in the current program. **Participating pooled fund states can request additional stations be added by the research team.** Finally, the incremental damage analysis model was discussed. It was noted that the analysis was carried out on a yearly, rather than monthly basis. John Donahue questioned the use of a frequency table presented by Lev. Lev stated that it is used to significantly simplify the analysis process.

For characterizing permanent built-in curl, two models were used, one for day time conditions, one for night time conditions. For the stress analysis, four types of cracks are considered: Top down transverse, bottom up transverse, top down longitudinal, bottom up longitudinal. The presentation on the development of the new design procedure was concluded by describing the reliability analysis. Lev stated that much of it was based on work done for MnDOT's MnPAVE Rigid procedure. Variation levels of 3% for thickness and 7.8% for strength were described. Tom Burnham stated that a link to MnPAVE Rigid would be provided:
http://www.dot.state.mn.us/materials/pvmtdesign/software.html

Next, Lev demonstrated the current version of the new design software. He noted that there are still several components that will be added to the program within the next few weeks. These include: the ability to design projects with smaller slab sizes (i.e. 6 ft. by 6 ft. slabs), and the inclusion of the faulting model. **Lev asked that participating pooled states inform him of recommended default values for each input field in the program.** Tom Burnham mentioned that it might be helpful if some of the fixed design values be displayed on the screen to aid the user. Mike Eacker asked about the assumed amount of cracked panels for a given reliability. Lev stated that it was currently 20% cracked panels for 50% reliability. Lev suggested that the % cracked panels could be added as an input.

Julie wrapped up the research team's presentation with a discussion on the development of the faulting model. She described the use of an erodibility index for asphalt interlayers. This was followed by the framework for the faulting model. The predictive model response utilizes a deflection basin approach. Calibration of the erosion index portion of the model included the use of actual FWD deflection basins.

Tom asked about the schedule for the remainder of the project. As described previously, the next version of the software will be available within the next few weeks (goal = April 9th). This will be followed shortly thereafter by delivery of the user guide. Finally the project selection criteria document and final project report will be completed by August.

The meeting concluded with the recommendation for one final TAP meeting to occur shortly after the draft final report becomes available.