

North Central Pavement Research Partnership Underlying Pavement Layer Stabilization Workshop

Proceedings

University of Wisconsin–Madison
October 8–9, 2008

Summary

Representatives of three state DOTs, two Canadian provinces, and two Midwest universities involved in transportation research met to discuss current research, problems, practices and technical innovations in the area of underlying pavement stabilization. The first day of the workshop included technical presentations and round-table follow-up discussions. The second day of the workshop was a business meeting of the North Central Pavement Research Partnership pooled fund. An appropriate next step in this subject area will be a discussion among pooled fund participants on pilot projects to further understand critical issues and improve stabilization practices.

The full agenda for the workshop is an appendix to these proceedings. Technical presentations from the meeting (including PowerPoint presentations and streaming video) and a follow-up literature search on soil stabilization are available on the workshop's [Web page](#).

Participants

Manitoba Infrastructure and Transportation
Said Kass

Michigan DOT
Andy Bennett
Mike Eacker
Mark Grazioli

Minnesota DOT
Steve Adamsky
Andy Eller
Maureen Jensen
Greg Larson
John Siekmeier

Ontario Ministry of Transportation
Chris Raymond (via Web cast)

Wisconsin DOT
Bob Arndorfer
Irene Battaglia
Laura Fenley
Peg Lafky

Michigan Technological University
Stan Vitton

University of Wisconsin–Madison
Hussain Bahia
Dante Fratta
Andrew Hanz

CTC & Associates
Pat Casey
Mark Linsenmayer
Kirsten Seeber

Acknowledgments

UW–Madison and WisDOT provided Webcasting technology and CTC's support time. North Central Pavement provided travel and accommodations for visitors from outside of Wisconsin.

Technical Presentations

Hyperlinks to full presentations are provided below.

[WisDOT's Policy for Use of Select Materials in Subgrades](#)

Bob Arndorfer, WisDOT

This presentation gave a brief history of WisDOT's select materials policy, which was developed in the mid 90s by a team established to address road construction cost overruns attributed to difficulties with the subgrade. The current design details and policy guidelines were then presented, along with an overview of five related research projects and an implementation study.

[Application of Laboratory Evaluation to Develop Stiffness Values and Layer Coefficients for Design](#)

Dante Fratta, UW-Madison

This presentation presented results of several research efforts: 1. A comparison of low-strain elastic modulus as derived from seismic tests with traditional laboratory resilient modulus. 2. Measuring elastic wave velocities in a small box. 3. Large-scale model experiments to determine the Gravel Equivalency of recycled pavement material and road surface gravel with and without fly ash. 4. Attempts to evaluate the use of geogrid in a flexible pavement system.

[Guidelines and Best Practices for Selecting the Proper Subgrade/Base Stabilization Alternative](#)

Stan Vitton, Michigan Technological University

This presentation covered the state of stabilization standards from AASHTO, the military, and other sources, covering different stabilization techniques (e.g., compaction, geotextiles, paper sludge), additives (e.g., portland cement, lime, fly ash), and related issues such as sustainability. The presentation also addressed the use of a modified light Clegg hammer to measure soil density.

[Construction Quality Control Practices for Evaluation of In-Situ Stiffness and Material Variability](#)

John Siekmeier, Mn/DOT

This presentation provided an overview of Intelligent Compaction research and techniques at Mn/DOT, including compaction testing, the move from measuring density to measuring modulus, new field testing techniques (e.g. light-weight deflectometers), intelligent compaction equipment (e.g., IC rollers that measure and document soil stiffness), and data management and geostatistics.

[Performance of Michigan's Stabilized Base Projects](#)

Andy Bennett, MDOT

This presentation described MDOT's Special Provision for Stabilized Open Graded Drainage Coarse and stabilized base projects constructed between 1990 and 1995 (two stabilized with cement, and 11 with asphalt, usually asphalt emulsion), including a 2006 field investigation into the current performance of these pavements and a cost comparison of open graded drainage coarse.

Technical Discussions

Discussion Topic: Ongoing/future research activities and agency needs to ensure implementable results

Facilitated by the Wisconsin Highway Research Program

All participants were asked what they learned from the day's presentations, to enable identification of common themes that would direct future emphases in the workshops and research efforts supported by the pooled fund. Responses are bulleted by participant.

- Seismic modulus developments — awareness of new technology;
Info about the use of geogrids (particle size, when they might not be effective);
The use of paper sludge for stabilization (Wisconsin, Minnesota) in lieu of geotextiles;
Compaction uniformity built into specifications as pay incentives for contractors
- When to use select materials for subgrade;
Baton-handler – increasing test frequency due to new type of test;
Intelligent compaction – LWD use
- Wisconsin's approach to full-length subgrade modification;
Details on intelligent compaction
- Ways to communicate complex information: 3D plot of density moisture/modulus (additional applications);
GIS/IC overlay is a powerful visual tool.
- Value of face-to-face info sharing on practical topics;
Resilient modulus presentation: stress/strain on moisture; not just compaction, but stiffness/strength;
Preliminary guide to stabilization (Stan Vitton's presentation): practical lessons from experience;
IC Quickmap
- Field verification of lab measurements of stiffness;
Variety of stabilization methods – use of recycled materials
- Accelerometer use in lab or field research;
Military use of stabilization – need to review (NCHRP training manual out of Kansas University on stabilization techniques is currently underway)
- Stabilization is less practical with freeze/thaw cycles;
It shows promise in delaying distresses, with more dense-graded bases;
LWD costs \$7-12K, but could go down with U.S. production
- IC/LWD use;
Base stabilization – impacts on life of pavements (more open gradation);
Benefits of free-form exchange between experts
- Dante Fratta's presentation: seismic signal's relation to resilient modulus;
Use of geostatistics
- Geogrid limitations;
Pavement performance (Andy Bennett's presentation)
- Bucket test/seismic
- Retaining the lessons of good work done years ago;
Andy's Bennett's presentation: Fluctuations in pricing instead of doing advance pavement selection. Get alternate bids – how to best do this via performance specs in the face of industry

claims?

60-year concrete design needs to take base design more into account.

- Stabilization methods;
Life-cycle analysis (need to do more);
Correlation of seismic measurements to resilient modulus;
Bucket test/seismic modulus
- Quality control (stabilization)
- Seismic measurements correlating to resilient modulus;
Differential performance of unbound/bound drainage layers;
Advantages/use of LWD for quality assurance
- Lack of cost differential with stabilization

Discussion Topic: Future research priorities in the area of underlying pavement layer stabilization

Participants were asked what they would choose to study in this area given funds to do so.

- Life cycle costing: compare research efforts versus actual construction costs. Is there a true benefit to these types of research efforts? Why not just add the money spent on research to construction (e.g., adding an extra layer of pavement instead of optimizing the design mix)?
- (Responding to previous) Extra pavement thickness doesn't fix your joints. Need more cost-effective methods of hauling in subbase materials (info coming from NCHRP) and ability to construct and build into design and know what you'll get. Quantifying the effect of stabilization on design, taking into account material variability of recycled products.
- Need more knowledge of stabilization to evaluate claims of vendors, especially in chemical stabilization area. Need pre-engineering/lab testing on products to prevent failures in the field. Looking for comprehensive guide (NCHRP/Kansas University project may provide this): test, performance expectation, references. (Mark Grazioli: Michigan has a process for approval of new techniques/materials.) "New product standard" (with DOT references).
- Ontario uses full depth recycling or FDR with expanded asphalt stabilization. May need performance review of these treatments. Research into sustainability of standard pavement specification. Sustainability of stabilization options (recycling/reuse component gives a reason to promote stabilization techniques).
- Need more input parameters for stabilization (for MEPDG). Also sustainability.
- The value of stabilization and what parameters to use to modify design methods.
- Need systematic international scan on actual performance of pavements around the world. Response: this may already exist, on noise and other design parameters/composite pavements... covers at least concrete. See European design catalogs. Should we implement the very different design techniques used in different parts of the world (e.g., very thick bases with lots of stabilization and very thin pavement layers)?
- Related issue: dust generation from different types of roads.

Business Meeting

Minnesota DOT does not plan to continue its participation in the pooled fund; its representatives were not present at the business meeting.

Discussion Topic: The upcoming year's work plan

Business meeting participants discussed the upcoming year by task.

Task 1: Develop/update Web site

New direction: move away from the development of the research database/spreadsheets. Maintain Web site and populate with results of teleconferences/workshops.

Task 2: Coordinate teleconferences

Use teleconferences to follow up on reports that have been released or mentioned at previous meetings. Keep discussing things quarterly. Obtain and discuss ideas for new workshops.

Task 3: Coordinate workshops

The cost is \$8-10K per workshop, primarily devoted to travel and lodging. No expenses are incurred for facilities.

Task 4: Investigate potential processes/topics for pilot projects

Use some money to fund small projects that get the concerns of the group—probably as derived from a workshop—addressed via an implementation project. For example, the group could take one of the ideas from the discussion about what research initiatives to fund.

Because of the addition of Task 4, the solicitation to join the pooled fund went from \$5K per year to \$20K per year. As an idea from last year's workshop, we could have someone gather resilient modulus measurement techniques (there are even multiple AASHTO procedures), define the best practice, and validate a standard. The point of these implementation efforts would be to patch other research that has been done, for instance, regarding the life cycle costs for stabilization methods: instead of just doing this for Michigan (as per yesterday's presentation), look at the experiences of all four states/provinces.

Discussion Topic: Future pooled fund events; feedback

Business meeting participants discussed additional ideas for future events and feedback on the technical presentations.

- In December the group will revisit the list of potential workshop topics developed last spring.
- The technical presentations offered a nice variety, covering both research and practical experience.
- Said Kass shared Manitoba's experience with another association: The Canada/Northern Ireland Commission, consisting of Manitoba University and DOT and Northern Ireland DOT and University, University of Saskatchewan, University of British Columbia, with some countries in Europe who want to join. This group held a conference in Belfast with numerous 10-min presentations saying what they're doing and what the results are, covering 20-25 subjects, then a team-building day. The group had a subsequent meeting in Winnipeg.
- A suggestion for future workshops: encouraging parallelism and responsiveness in presentations, so that all can see what all member states/provinces are doing in the particular area, and what their problems and goals are. The group could be more formal about this: soliciting input from regions/designers. The presentations could also include research syntheses to present a clear picture of the range of research in the area.

Appendix. Workshop Agenda

Day One: Technical Sessions Underlying Pavement Layer Stabilization

October 8, 2008
8:30 a.m. – 5:00 p.m.

- 8:30 – 8:45** **Welcome and Introductions** – *Hussain Bahia, WHRP and Pat Casey, CTC & Associates*
- 8:45 – 9:15** **WisDOT’s Policy for Use of Select Materials in Subgrades** – *Bob Arndorfer, WisDOT*
- 9:15 – 10:30** **Topic 1: Application of Laboratory Evaluation to Develop Stiffness Values and Layer Coefficients for Design** – *Dante Fratta, UW-Madison*
- 10:45 – 12:00** **Topic 2: Guidelines and Best Practices for Selecting the Proper Subgrade/Base Stabilization Alternative** – *Stan Vitton, Michigan Tech University*
- 1:00 – 2:15** **Topic 3: Construction Quality Control Practices for Evaluation of In-Situ Stiffness and Material Variability** – *John Siekmeier, Mn/DOT*
- 2:30 – 3:45** **Topic 4: Performance of Michigan’s Stabilized Base Projects** – *Andy Bennett, MDOT*
- 3:45 – 5:00** **Ongoing/Future Research Activities and Agency Needs to Ensure Implementable Results** – *Discussion facilitated by WHRP*

Day Two: Business Meeting

October 9, 2008
8:30 a.m. – 12:00 p.m.

- 8:30 – 8:45** **Introductions** – *WHRP*
- 8:45 – 9:15** **Overview of WisDOT’s Research Program and Plans for the Future** – *Peg Lafky, WisDOT*
- 9:15 – 10:00** **Updates on new Research Projects and Opportunities for Collaboration** – *All State/Province partners*
- 10:00 – 10:30** **Feedback on Stabilization Workshop and Desired Outcomes** – *WHRP*
- 11:00 – 11:45** **Phase II of the Pooled Fund** – *All*
- **Solicitation Update**
 - **Future Direction**
 - **Next Meeting and Objectives**
- 11:45 – 12:00** **Financial Update/Outstanding Issues** – *Andrew Hanz*