

In This Issue

Program Update

- >[FFY 2009 investigators chosen](#)
- >[New proposal review process](#)
- >[All projects at a glance](#)

Research in Focus

- >[Posts for slopes](#)
- >[Sensor data now online](#)

Regional and National

- >[North Central Pavement study](#)
- >[MARC](#)
- >[Mid-Continent Conference](#)

Outreach

- >[WHRP works with tech teams](#)
- >[New emulsions task force](#)

Implementation

- >[Revised overlay procedures](#)

Welcome from Structures TOC chair

This is the eighth issue of WHRP E-News, wrapping up year two in our quarterly updates of the work of the Wisconsin Highway Research Program.

In the Structures Technical Oversight Committee we have had another busy quarter.

We've made progress on a number of studies, including 0092-08-14, *Fatigue Risks in the Connection of Sign Support Structures*. This study follows up on findings from a March 2004 WHRP report on a handful of support structures that had failed on Wisconsin highways early in their service – one within six months of installation.

Among the findings in the 2004 report were fabrication problems in trusses of these structures. By October of this year, Chris Foley and his team at Marquette University will finish a detailed investigation of the national and local experience with these welded and bolted connections and will propose a test protocol that will then be used in a new, Phase II study approved for FFY 2009. By fall of 2009, we hope to know exactly what we need to do with fabrication, design and construction to prevent such failures in the future.

In December, we wrapped up work on 0092-06-07, *Specification and Design of Fiber Reinforced Bridge Deck Forms for Use on Wide Flange T-Girders*. UW-Madison's Larry Bank helped us find high-technology stay-in-place forms for these bridge girders, and the report's design guidelines and performance specifications will save us time and money in bridge building.

These are exactly the kind of results we aim for in all our work at WHRP – economical, durable solutions for improving Wisconsin highways.

Scot Becker
State Bridge Engineer
Co-Chair, Structures TOC
scott.becker@dot.state.wi.us
(608) 266-5161



Scot Becker

Program Update

Steering Committee approves investigators for FFY 2009 research

On April 11, the Steering Committee approved the following TOC recommendations of investigators for the seven new projects selected for FFY 2009:

Flexible Pavements TOC

- Ray Bonaquist and Dave Christensen, Advanced Asphalt Technologists
Evaluation of Flow Number as a Discriminating HMA Mixture Property
- Jim Crovetti and David Newman, Marquette University
Performance Evaluation of Tack Coat Materials

Geotechnics TOC

- Van Komurka, Wagner Komurka Geotechnical Group, and Mark Meyers, UW-Platteville
Evaluation of Constructed, Cast-in-Place Piling
- James Schneider, UW-Madison
Evaluation of the Foundation Movement of Transportation Structures

Rigid Pavements TOC

- Bob Schmitt, UW-Platteville
Performance Evaluation of Open Graded Base Course with Doweled and Non-Doweled Transverse Joints

Structures TOC

- Baolin Wan and Chris Foley, Marquette University
Concrete Cracking in New Bridge Decks and Overlays
- Chris Foley and Baolin Wan, Marquette University
Fatigue Risks in the Connections of Sign Support Structures, Phase II

For information, contact WHRP Program Manager [Andrew Hanz](#).



Marquette University's Chris Foley (top) and Baolin Wan (bottom) will be working together on two 2009 WHRP studies.

New proposal review process

This spring the TOCs put to use the new proposal review process approved by the Steering Committee last December.

The new process requires TOC members to assign a numerical value to each research proposal in four areas:

- Technical Merits
- Cost Analysis
- Facilities
- Collaboration with Wisconsin Institutions

TOC chairs gather these evaluations, compile results, and then present results at the TOC proposal review meeting for discussion. After discussion, members may adjust their assessments, and the highest scored proposal for each project is selected for recommendation to the Steering Committee.

The procedure puts WHRP in compliance with WisDOT procurement policies. During this last selection process, WisDOT's Peg Lafky and TOC members discussed its strengths and weaknesses. WHRP has a Web-based survey of TOC members to gather additional input on the new method in order to refine procedures.

For information, contact [Andrew Hanz](#).

Principal Investigator	Institution	1. Technical Merits		2. Cost Analysis		3. Facilities		4. Collaboration w/ WI Institutions		Totals	
		Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation	Average	Standard Deviation

One version of the new proposal evaluation summary form used by TOC members includes a scoring grid like this one.

Project status at a glance

As of March 21, 2008, there were 35 active WHRP projects. Two projects were completed during the last quarter.

■ Percent Complete as of 12/31/07
 ■ Percent Complete as of 3/21/08



Research in Focus

Simple posts keep slopes in place

0092-05-09, *Investigation of Vertical Members to Resist Surficial Slope Instabilities*

Following a heavy rain or snowmelt, maintenance crews often need to repair slopes along highways where erosion has scarred embankments. These surficial slope failures occur when seepage, saturation of soil, and even traffic loading, works with the geometry of slopes to carve out ravines or holes in the turf. The end result is often soil sliding onto highways, clogging drains, even damaging guardrails and utility poles.

To fix the failures crews typically push the soil back into place and lay sod or other landscaping to stabilize the soil. But effective methods of stabilization that prevent failures haven't been verified scientifically; in fact, little research has been done on stabilization methods.

Through a recently completed project of the Wisconsin Highway Research Program, Professor Hani Titi and a team of researchers at UW-Milwaukee identified three promising approaches to slope stabilization and studied them closely. Research into the methods and an evaluation of a slope in Waukesha County showed that all three methods - soil nailing, anchor systems, and short driven posts - protect slopes from failure and are more cost-effective than conventional repair.

The method shown to provide the most protection at the lowest cost is placement of wood or plastic posts, particularly when closely spaced. These vertical members will need to be studied over the long term, but they will likely become a fixture of Wisconsin highway slopes.

For details, see the WHRP study's [project page](#) or contact [Bob Arndorfer](#), chair of the Geotechnics Technical Oversight Committee, at (608) 246-7940.



Marquette pavement instrumentation project Web site

0092-06-01, Perpetual Pavement Instrumentation for the Marquette Interchange Project – Phases I and II

In the spring and summer of 2006, Jim Crovetti of Marquette University led a group of researchers in placing gauges and sensors in a section of perpetual asphalt pavement in the Marquette Interchange reconstruction in Milwaukee.

Readings are transmitted wirelessly from a data station along the roadway to equipment at the university, where data is collated and posted on a Web site – www.mchange-strain.com. Sensors collect data on:

- Vertical soil pressure
- Strain at the bottom of asphalt layers
- Internal pavement strain
- Weight in motion
- Wheel wander
- Soil moisture
- Vertical pavement temperature gradients
- Solar radiation
- Temperature and wind speed

To view data, users simply review images of traffic on a selected date at various times of the day. By clicking on an image, the user can view graphs and values in data for that particular moment.

Crovetti is incorporating comments from the TOC on his Phase II final report, which will be posted by the end of this month. For information, go to the hyperlink above, review the [project page](#) or contact [Andrew Hanz](#).



Gauges like this strain sensor (top) have been embedded in the perpetual pavement at the Marquette Interchange (bottom).

Regional and National Collaboration

North Central Pavement pooled fund approaches second phase

The North Central Pavement Research and Implementation Coordination Partnership – once known as the Frozen Four for its original membership – is soliciting new members from a variety of northern U.S. states and Canadian provinces.

Feedback in recent meetings has guided members to emphasize holding workshops on research topics of shared interest and on helping important research get implemented. The updated [Web site](#) features a variety of reports and workshop presentations, including updated versions of reports on WisDOT activities toward the implementation of the MEPDG; subgrade resilient modulus testing activities in Illinois, Michigan, Minnesota and Wisconsin; as well as up-to-date listings of research by the partners in the areas of flexible and rigid pavements, soils and foundations, and design and management.

Browse the Web site, review reports or databases, and if you have questions, feel free to contact WHRP's Technical Director, [Hussain Bahia](#).



The North Central Pavement Research and Implementation Coordination Partnership has sharpened its focus to hold more workshops and guide research into implementation.

Modified Asphalt Research Center – MARC

A major activity of the [Modified Asphalt Research Center](#) at UW-Madison is its collaborative participation in the FHWA-funded [Asphalt Research Consortium](#). Aligned with the WHRP Flexible Pavements TOC's long-term plan to "improve the design, construction and performance of long-lived, quality HMA pavements in Wisconsin," MARC research focuses on new testing and analysis techniques for high performance modified asphalts. Among the UW research team's key findings to date have been important discoveries on asphalt binder resistance to rutting and fatigue damage.

- In the area of rutting, the team has made strides in uncovering the role that binders play in the unstable flow of asphalt mixtures. Its advances in binder characterization and understanding of mixture "flow number" are important steps in identifying modifiers that will provide superior resistance to rutting.
- In the area of fatigue, the research team developed a new and easily performed binder test to effectively predict pavement fatigue, the Binder Yield Energy Test. The BYET follows a simple constant-strain loading test to measure binder load capacity before yielding. Along with mathematical formulas that describe how fatigue damage evolves, the research results will help estimate the fatigue damage related to such factors as traffic volume and pavement structure.

For more information on these or other MARC research projects, contact [Hussain Bahia](#).



Madison hosts Mid-Continent Conference in August

UW-Madison will host the annual Mid-Continent Transportation Research Symposium August 14 and 15 at the Madison Concourse Hotel. The conference, hosted in Iowa and Wisconsin in alternating years, provides a forum for sharing the results and application of regional transportation research.

Last year's conference at Iowa State University featured 28 sessions and 109 papers, and this year's version will offer a similar smorgasbord of presentations on the state-of-the-art transportation technology and practice, the latest research activity, and future research directions in safety, bridges and structures, pavements, planning, ITS, weather, environment, traffic, and maritime.

The program also serves as a course in UW-Madison's Department of Engineering Professional Development program, and attendance yields credits in various professional development certificate programs.

To learn more about the conference and to register, go to the [Mid Continent](#) Web site. For information on professional development credits through the symposium, check [Mid Con Professional](#). For information on WHRP presentations at the conference, contact [Andrew Hanz](#).



Outreach

WHRP works closely with WisDOT Tech Teams

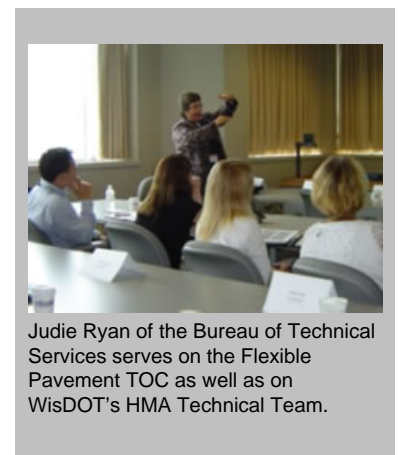
If TOCs help direct researchers toward solutions WisDOT needs in pavement and bridge construction and maintenance, it's the WisDOT Technical Teams that turn these solutions into specifications and procedures for the department and its contractors. The Tech Teams turn a TOC's "what" into a "how."

TOC members frequently moonlight with a corresponding Tech Team, members like the Flexible Pavement TOC's Judie Ryan of the Bureau of Technical Services, who also serves on the HMA Technical Team.

Ryan sees the double-duty as a natural alignment of interests. "On the Tech Team, we don't hesitate to ask a principal investigator from WHRP to sit in on a conference call," says Ryan. "We rely quite a bit on presentations from TOC meetings."

The relationship between the groups often puts research results on the fast track to implementation. Ryan points to projects like WHRP analysis of Superpave lift thickness, results of which were used in the 2003 specifications, though the project final report wasn't published until March 2005, and to WHRP work on PG binders that was used several years ahead of the final report publication.

It's this kind of integration of industry, academic, and department interests that optimizes the benefit WisDOT gains from its work with WHRP and the TOCs. For information on TOC activities, see the [WHRP](#) Web site or contact [Andrew Hanz](#).



New FHWA task force on asphalt emulsions aims to reduce construction energy needs

Soaring energy prices and environmental concerns have put green paving at the forefront of highway construction research. Various warm asphalt mixtures, emulsions, and asphalt additives can bring down energy needs and accommodate increased use of recycled pavement.

WHRP Technical Director Hussain Bahia led the effort to create a new task force, Performance Properties of Asphalt Emulsions, as part of FHWA's Pavement Preservation Expert Task Group. At a February conference in Mexico, Bahia urged industry groups to meet with the PPETG and the Asphalt Research Consortium on lower-energy asphalt options. A meeting in April and a teleconference in May led the new group to create subcommittees that can focus efforts to meet a variety of group goals, including:

- Refine existing Pavement Preservation Roadmap problem statements
- Recommend integration of related research activities
- Advance performance-based methods and specifications
- Advance materials understanding of "right time, right place, right application"
- Promote materials-related certification standards
- Coordinate with SuperPave ETGs, TRB, NCHRP, AASHTO/ASTM, and industry groups
- Actively encourage adoption of uniform national standards for pavement preservation technologies that utilize emulsions

To review pavement preservation activities, go to <http://www.pavementpreservation.org/>; for emulsions, see <http://www.aema.org/index.html>. For more information about research on green paving, contact [Hussain Bahia](#), and to connect with the Emulsion Task Force, contact Bahia or task force chair [Roger Hayner](#).



Asphalt emulsions are one approach to low-energy, green paving that a new task force will investigate.

Implementation Report

Revising asphalt overlay design procedures

0092-07-12, *Implementation Project for Developing Rational Overlay Design Procedures for Flexible Pavements*

One of the most cost-effective methods for extending a pavement's service life is to overlay it with asphalt. WisDOT's design procedures for overlaying asphalt pavement are based on 1972 AASHTO standards, putting Wisconsin behind neighboring states in its approach to overlays. Until the MEPDG can be used for overlays in Wisconsin, a possibility still a few years away, WisDOT wants a better method for designing overlays.

A WHRP report in fall of 2005 identified three methods used by neighboring agencies that would upgrade WisDOT procedure. The investigator from that research – Marquette University's Jim Crovetti – has led an implementation effort of the 2005 research.

In June of this year the implementation project will have produced:

- Revisions to Procedure 14-10-30 of the Facilities Development Manual;
- New overlay design software;
- Several workshops around the state on the new procedures;
- Follow-up surveys, reports, and recommendations.

For information, see the [Overlay Implementation](#) Web page or contact [Andrew Hanz](#).



New procedures in the Facilities Development Manual, new software, and workshops around the state will make HMA overlays like this one even more effective in Wisconsin.

About WHRP

www.whrp.org

The Wisconsin Highway Research Program was established in 1998 by the Wisconsin Department of Transportation to conduct research on highway materials and construction methods. WHRP is administered by the UW-Madison Department of Civil and Environmental Engineering. A Steering Committee chaired by the WisDOT Research Administrator provides policy direction to the WHRP Technical Director, Program Manager and five Technical Oversight Committees chaired by WisDOT engineers. The TOCs focus their work on Flexible Pavements, Rigid Pavements, Geotechnics, Structures and Data Integration. The Steering Committee and TOCs are composed of representatives from WisDOT, FHWA, academia and industry.

STEERING COMMITTEE

Nikki Hatch, Chair

WisDOT Bureau of Business Services

Don Miller

WisDOT Bureau of Project Development

Beth Cannestra

WisDOT Bureau of Structures

Dan McGuire

WisDOT Bureau of Technical Services

Alan Rommel

WisDOT NE Region

Wes Shemwell

FHWA-Wisconsin

Teresa Adams

National Center for Freight & Infrastructure Research & Education

Bob Schmitt

UW-Platteville

Matt Grove

Wisconsin Transportation Builders Association

Mike Paddock

American Council of Engineering Companies of Wisconsin

Kevin McMullen

Wisconsin Concrete Pavement Association

Scot Schwandt

Wisconsin Asphalt Pavement Association

Jack Arseneau

Wisconsin Earthmovers Association

TOC CHAIRS

Jim Parry, Rigid Pavement

WisDOT Bureau of Technical Services

Len Makowski, Flexible Pavement

WisDOT SE Region

Bob Arndorfer, Geotechnics

WisDOT Bureau of Technical Services

Scot Becker, Structures

WisDOT Bureau of Structures

Travis McDaniel, Structures

WisDOT Bureau of Structures

Jim McDonnell, Data Integration

WisDOT Bureau of Business Services

PROGRAM DEVELOPMENT

Hussain Bahia, Technical Director

UW-Madison

Andrew Hanz, Program Manager

UW-Madison

Carl Johnson, Program Assistant

UW-Madison