IOWA HIGHWAY RESEARCH BOARD (IHRB)
Minutes of October 31, 2014

Regular Board Members Present

A. Abu-Hawash
K. Jones
M. Kennerly
B. Younie
R. Knoche
D. Schnoebelen
W. Weiss
D. Miller
K. Mayberry
R. Fangmann

Alternate Board Members Present

P. Mouw
J. Thorius

Members with No Representation

T. Wipf
S. Okerlund

Secretary – V. Goetz

Visitors

Leighton Christiansen	Iowa Department of Transportation
Michael Kennerly	Iowa Department of Transportation
John Dostart	Iowa Department of Transportation
Francis Todey	Iowa Department of Transportation
Wayne Sunday	Iowa Department of Transportation
Mike Knopp	Iowa Department of Transportation
Dave Claman	Iowa Department of Transportation
Jeramy Ashlock	Iowa Department of Transportation
Donna Buckwald	Iowa Department of Transportation
Marian Muste	University of Iowa
Andy Wilson	FHWA
John Joiner	Ames
Brian Keierlieber	Buchanan County
Keith Knapp	LTAP
Brent Phares	InTrans

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, October 31, 2014. The meeting was called to order at 9:00 a.m. by Chairperson Kevin Mayberry with an initial number of 9 voting members/alternates at the table.

Minutes

1. **No Agenda Modifications**

2. **Motion to approve Minutes from the September 26, 2014 meeting**

Motion to Approve by 1st K. Jones 2nd R. Knoche
Motion carried with 9 Aye, 0 Nay, 0 Abstaining.

*****2 members joined the table. Total voting members = 11**

3. **FINAL REPORT,** *TR-647, "Methods for Removing Concete Decks from Bridge Girders",* Brent Phares, Iowa State University/InTrans, ($143,391)

BACKGROUND
Although bridges are typically designed to last for 75 years (AWS 2012), bridge decks deteriorate at a faster rate (Flowers et al. 2010). Full-depth replacement of bridge decks that can be performed without replacing the bridge substructures is one way of cost-effectively extending bridge service life.

OBJECTIVE
The overall goal of this research was to identify more efficient and reliable methods for concrete deck removal that preserve bridge superstructures and substructures.

DISCUSSION
Q. The recovery of water with the hydro demolition, how do we do this process?
A. On a project they removed a deck overlay they put blocks down to block the drain so it is all contained within the bridge.
Q. On the peeling the deck using the crab grab, is it easy or effective to use?
A. The contractors in Nebraska are using this as their standard of practice with no issues.
Q. Have you heard anything about the Nebraska study where they are taking the decks off of the concrete girders?
A. The final report should be done by the end of the year.
Q. What is the practicality for the DOT?
A. More use of the hydro demolition should be considered when it makes sense.

Motion to Approve by 1st R. Knoche. 2nd D. Schnoebelen
Motion carried with 11 Aye, 0 Nay, 0 Abstaining.

*****1members joined the table. Total voting members = 12**

4. **Implementation Discussion:**
   What are the next steps now that we have the results of this project?
   Ahmad stated that we could do trials and demonstrations and specify the use of hydro demolition on deck removal.

5. **FINAL REPORT,** *TR-642, "Pilot for a Hybrid Road-Flooding forecasting system on squaw Creek"* Ricardo Mantilla, The University of Iowa, ($173,178)

BACKGROUND

According to the National Weather Service, more than half of the fatalities attributed to flash floods are people swept away in vehicles when trying to cross an intersection that is flooded. Efforts are underway to improve prediction of the likelihood of roads to be inundated after heavy storms; however, the rapid rise of waters on small and medium size creeks requires accurate forecasting capabilities that are beyond the current state-of-the-art. This pilot project provides a test bed for a new generation of modeling technology geared towards improved forecasting capabilities.

OBJECTIVE

The long-term goal, and the umbrella for this pilot project, is to create a real-time road-flood forecasting system that is reliable enough to produce actionable predictions for state and local agencies responsible for maintaining road safety during extreme flooding events. The proposed flood forecasting system combines real-time stream level observations using bridge mounted sonic sensors (Fig. 1) developed by the Iowa flood center with the newly developed distributed hydrologic models CUENCAS-HM.

DISCUSSION

Q. Is the center developing digital location sensors and models in Iowa City?
A. Yes, they are deployed throughout the State.
Q. The cross sections are all developed through all the drainage areas?
A. Yes, the cross sections are in development for all of Iowa. They are developing cross sections for all the streets in Iowa that drain more than one square mile.
Q. Is the City of Ames benefiting from having this whole network on the Squaw Creek?
A. The City of Ames uses their own hydrology modeling and using our predictions for verification.

Motion to Approve by 1st A. Abu-Hawash. 2nd A. B. Younie
Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

6. **Implementation Discussion:**
   Since this project was more of a proof concept the question would be what would be the next step. Do a pilot project and look at a problem site in Lucas County that overtops about every two years and try to utilize the model that Ricardo has with bridge watch so we can give people a forecasted alert so they know that the potential is that the bridge will over top.

7. **RFP PROPOSAL,** *"Guidance on Traffic Sign Effectiveness, installations, and removal",* Keith Knapp, Iowa State University/InTrans, ($75,000)

BACKGROUND

The project described in the RFP focuses on the development of a document that assists in the installation, maintenance, and removal of regulatory and warning traffic signs. The primary reference document for the basics of traffic sign installation (e.g., height, lateral placement, color, etc.) of traffic signs are in the. There are, however, a number of parts in the MUTCD that are not applicable to local roadways (e.g., large guide signs). Fortunately, this information has been abridged and supplemented here in Iowa within the *Iowa Traffic Control Devices and Pavement Markings: A Manual for Cities and Counties* (TR-441). This document is regularly requested and used by local agencies in Iowa to make traffic signing decisions, but it is currently out of date. In addition, the Iowa DOT has posted its *Traffic and Safety Manual* with additional guidance.

There are very few required traffic signs in the MUTCD. Many more signs require the consideration of various decision-making factors for their installation and/or removal. The MUTCD does, in a number of cases, also list a number of factors that might be considered when deciding to install or remove a traffic sign . These factors are often noted in the "option" or "support" statements of the MUTCD. The input or processes needed for the engineering judgment or studies that are sometimes used to decide whether a traffic sign is installed and/or removed, however, generally comes from a multitude of other auxiliary documents. Three documents that might be used to assist with these activities might include the *Handbook of Simplified Practice for Traffic Studies* (TR-455), the Institute for Transportation Engineers *Manual of Transportation Engineering Studies*, and the Iowa DOT *Traffic and Safety Manual*. The research and literature that focuses on the potential impacts of traffic signs, however, is much more significant.

OBJECTIVE

The primary objective of this project will be to review and summarize existing research materials related to the operational and safety impacts of warning and regulatory traffic signs. An interpretation of the value and robustness of the approach used in the studies and their results will also be included. In addition, summary guidance on the installation and removal of the same traffic signs will be provided, including a description of related Iowa tort law and liability. Lastly, it is proposed that a review of the *Iowa Traffic Control Devices and Pavement Markings: A Manual for Cities and Counties* (TR-441) report be completed and any changes that it may need be summarized as part of this project.

DISCUSSION

Q. How do people get selected to be on the Technical Advisory Committee?
A. It's on a voluntary bases, but the Research section can suggest candidates.

Motion to Approve by 1st D. Miller.2nd R. Knoche.
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

8. RFP PROPOSAL, "*Feasibility of Gravel Road and shoulder Recycling IHRB 14-04", Jeramy Ashlock, ($174,870)*

BACKGROUND

Gravel material properties such as gradation, plasticity index, fines content, and maximum grain size are important factors that influence gravel loss and roughness deterioration of gravel roads (van Zyl et al., 2007). Skorseth and Selim (2000) also explained that good-quality gravel

road surface course materials are different from granular base materials and granular fill materials, because the base materials contain very small percentages of fines which form a crust that helps keep the materials bonded together but is difficult to maintain. Other materials used for fills usually have high sand contents to provide good drainage, but remain loose and unstable when used on gravel roads. Therefore, gravel roads will perform poorly if they are not maintained with a proper gradation and plasticity index.

However, gravel roads can also become contaminated by excessive fines contents (as occurred during recent Western Iowa floods) which decreases their performance and increases problems such as potholes, frost boils due to freeze-thawcycles, and rutting. Several technologies such as chemical and mechanical stabilization are available to treat these problems (White and Vennapusa, 2013). However, the problem of excessive fines presents additional challenges. This project aims to develop recycling methods by which such excessive fines can be removed to restore the performance of gravel roads by recovering their original gradations and plasticity indexes while reducing the use of virgin aggregate.

Specifications for gradation and plasticity index of surface course and shoulder materials of gravel roads vary between state DOTs, and their importance is recognized in design and maintenance manuals. However, comprehensive evaluations of the performance and durability among various gradations of gravel surface course materials used in Iowa are lacking. From a literature review, it was determined that most of the DOT specifications and recommendations in design manuals were not performance-related. Researchers have recently been focusing on developing performance-related specifications for gravel roads. For example, Figure 1 shows a material selection chart for gravel road surface course materials that was developed based on testing and monitoring of 110 gravel road sections for more than three years in Southern Africa (South Africa DOT 1990). More studies of this nature are needed to improve the performance and durability of gravel roads while making use of recycled aggregates for increased sustainability.

OBJECTIVE

The research team will conduct literature review, surveys, and several series of laboratory tests to evaluate the feasibility of changing the gradations of existing materials while recycling the existing aggregate to improve the performance and durability of surface courses and shoulders of gravel roads. Specific attention will be paid to the effects of fines content and plasticity index on strength, freeze/thaw durability, and aggregate loss for the different surface course gradations. Chemical and mechanical stabilization methods will also be assessed in the lab tests, to examine their effectiveness in economically enhancing the long-term performance.

Based on the laboratory testing results, the research team will identify the most cost-effective combinations of optimum gradation and stabilization methods. Several types of construction equipment that can potentially be used to process existing granular roadway materials to remove fines and restore the initial gradation or produce the optimum gradation 3 will be identified. Construction procedures for demonstration road sections will then be developed in consultation with the project Technical Advisory Committee (TAC).

Field tests including Dynamic Cone Penetrometer (DCP), Falling Weight Deflectometer (FWD), Light Weight Deflectometer (LWD), and Multichannel Analysis of Surface Waves (MASW) tests will be conducted to monitor the field performance and durability of the various demonstration and control sections. Based on the measured test section performance and life-cycle cost

analyses, the most cost-effective solutions for recycling surface courses and shoulders of gravel roads will be identified.

DISCUSSION

Q. Jeramy, are you planning on doing multiple areas of the State to look at different aggregates that are available?

A. We will do this out of Pottawatomi County because the problem is pacific to silky fines which we are going to find along the two rivers.

Motion to Approve by 1st W. Weiss.2nd B. Fangmann.

Motion carried with 12 Aye, 0 Nay, 0 Abstaining

9.Continuing PROPOSAL, "*Iowa Loval Technical Assistance Program (HR296), Keith Knapp, Iowa State University/InTrans, ($150,000).*

BACKGROUND

The Iowa LTAP began in 1983 as the Rural Technical Assistance Program (RTAP). It was one of 10 original RTAPs funded by the Federal Highway Administration (FHWA) in 10 states. These programs were typically called technology transfer centers, or T2 centers. The goal of the Iowa RTAP was to share new research and information with local transportation agencies and help them in their daily transportation operations. The Iowa RTAP outreach efforts—including a quarterly technology newsletter, transportation lending library, training workshops, and individualized technical assistance—helped prove the benefits of such a program and RTAP was eventually funded in all 50 states, Puerto Rico, and seven tribal regions. In 1991, the national RTAP was renamed the Local Technical Assistance Program (LTAP) and also incorporated the Tribal Technical Assistance Program (TTAP). This change included the addition of an urban element to the program.

The Iowa LTAP is managed through the Institute for Transportation (InTrans) at Iowa State University under an annual contract administered by the Iowa Department of Transportation (Iowa DOT). Funding for the Iowa LTAP and its related activities primarily comes from the FHWA and the IHRB. Additional funding to support Iowa LTAP staff and their activities is also acquired through individual state and federal project contracts, Iowa State University Extension, non-profit organizations, and the Iowa Governor's Traffic Safety Bureau. Other sources of funding are also continuously explored.

OBJECTIVE

The primary objective of Iowa LTAP is to provide quality training events and technical transportation-related information that is useful to local transportation agencies. These activities need to be completed, within current LTAP funding, in a manner that is effective and efficient. Desirably, these activities are also provided when they are most needed by local transportation agencies and in a format that is useful and useable. New knowledge and tools, developed through IHRB research or other entities (e.g., the Institute for Transportation (InTrans)), are incorporated, as appropriate, into either existing or new LTAP activities.

The strategic planning and decision-making needed to make Iowa LTAP a premier technology transfer resource is guided by the following principles:

• Define and respond to customer needs;

• Provide quality customer service through various methods;
• Evaluate effort and track performance to improve service and communicate impacts;
• Apply fiscal responsibility through the selection of economically feasible and sustainable activities/tasks;
• Strive for predictable program funding and continue with highly capable staff;
• Expand and strengthen state and national organizational partnerships that may enhance services

DISCUSSION

Motion to Approve by 1st W. Weiss. 2nd R. Fangmann.
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

10. PROPOSAL, *Effect of Wind Induced Unsteady Vortex Shedding, Diurnal Temperature Changes, and Transit Conditions On Truss Structures Supporting Large Highway Signs" Asghar Bhatti, The University of Iowa, ($206,333).*

BACKGROUND
Recently, cracks at welding toes were reported for the truss structures employed in some states including Iowa. Large stresses caused by high wind loads could cause brittle fracture. Also cyclic stresses due to diurnal variation in temperature or due to oscillations in the wind force induced by vortex shedding behind the DMS cabinet may lead to fatigue damage. Other factors that can contribute to the development of cracks are fatigue induced by wind loads associated with the passage of trucks underneath the DMS cabinets.

OBJECTIVE
The objectives of this study are to investigate wind and thermal effects in the bridge type overhead DMS truss structures and improve the current design specifications. In order to accomplish this objective, it is necessary to study structural behavior and detailed strain-stress of the truss structures caused by unsteady wind loads associated with vortex shedding behind the DMS cabinet and thermal load on the truss supporting the DMS cabinet due to diurnal temperature variations. The last objective is to investigate possible fatigue failure due to vibrations during transportation from fabricator to the site where the truss and DMS cabinet will be deployed. The research plan describes how each objective will be accomplished.

Motion to Approve by 1st A. Abu-Hawash .2nd K. Jones.
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

11. **PROPOSAL,** *"Laboratory and Field Evaluation of an Alternative UHPC Mix and associated UHPC Bridge,* Brent Phares, Iowa State University, ($85,792).

BACKGROUND
Over the last decade a new generation of concrete known as Ultra High Performance Concrete (UHPC) has emerged on the market. This general class of concrete has compressive, tensile, permeability, and other properties that far exceed those of conventional or High Performance Concrete (HPC). The major drawback to this material is that its cost is considerably higher too. The prospect of using this material has, in fact, prompted the Federal Highway Administration

(FHWA) to invest in strategic research related to the use of UHPC. To the credit of Iowa DOT and County Engineers in Iowa, Iowa has remained at the forefront of this research too. In fact, the first two vehicular bridges constructed with UHPC in the United States were constructed in Iowa through multi-organizational partnerships. Up to this point there has been only one major producer of UHPC – LaFarge. The LaFarge product is a highly engineered concrete mix design sold under the trademarked name Ductal. Likely at least in part due to limited competition, the price of Ductal appears to have changed very little since it was first introduced. As a result, the most recent research activities have focused on identifying ways that small volumes of UHPC can be used in very strategic manners (e.g., joint closure pours in bridges, etc.). With this philosophy, the highly desirable properties can be exploited without resulting in significantly higher bridge construction costs.

OBJECTIVE

The objectives of the project proposed here are to aid evaluation of (1) a new cost-effective UHPC mix design and (2) evaluate the performance of a UHPC bridge design by:

- Assisting the Buchanan County Engineer in reviewing the plans for the yet-to-be-constructed K-UHPC bridge
- Characterizing the new UHPC material
- Assessing the bond/development length for the K-UHPC material
- Documenting the durability and performance of a yet-to-be-constructed K-UHPC bridge over a two year period.

DISCUSSION

Q. How different is this material, do you have any feedback from South Korea?
A. Korea is hesitant to release any characteristics. They have the same fibers and it looks the same but I am not really sure at this time.
Q. Do you envision eventually to not have to have a specialty contractor?
A. This is one of the things I have been looking for assistance on the post tensioning. This will give me an ideal opportunity to turn into an open house and bring other people in that are actually doing the post tensioning.

Motion to Approve by 1st K. Jones .2nd D. Schnoebelen.
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

12. **NEW BUISNESS**

13. ADJOURN

The next meeting of the Iowa Highway Research Board will be held Thursday, December 11, 2014, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 1p.m.

Vanessa Goetz, IHRB Secretary