

# IOWA HIGHWAY RESEARCH BOARD (IHRB)

*Minutes of December 12, 2013*

## **Regular Board Members Present**

A. Abu-Hawash  
K. Jones  
M. Kennerly  
R. Younie  
S. Okerlund  
M. Kennerly  
R. Knoche

D. Schnoebelen  
R. Kieffer  
D. Miller  
P. Assman  
K. Mayberry  
E. Steffensmeier  
R. Fangmann

## **Alternate Board Members Present**

F. W. Klaiber for T. Wipf  
P. Mouw

L. Roehl

## **Members with No Representation**

W. Weiss

## **Secretary - M. Dunn**

## **Visitors**

Leighton Christiansen  
Linda Narigon  
Peggi Knight  
David White

Iowa Department of Transportation  
Iowa Department of Transportation  
Iowa Department of Transportation  
Iowa State University

The meeting was held at the Institute for Transportation Conference Room, on Thursday, December 12, 2013. The meeting was called to order at 1:00 p.m. by Chairperson Ahmad Abu-Hawash with an initial number of 12 voting members/alternates at the table.

## **Nominations for Chair/Vice Chair for 2014**

Kevin Mayberry nominated for Chair.

**Motion to Approve by** D. Miller; 2<sup>nd</sup> P. Assman  
Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

Terry Wipf nominated for Vice Chair.

**Motion to Approve by** R. Knoche; 2<sup>nd</sup> K. Mayberry  
Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

## **Minutes**

### **Motion to approve Minutes from the October 25, 2013 meeting**

**Motion to Approve by** R. Fangmann; 2<sup>nd</sup> E. Steffensmeier

Motion carried with 12 Aye, 0 Nay, 0 Abstaining.

## **Membership Changes for 2014**

Mike Kennerly is renewing his term to 2016. Doug Miller's Alternate will be Lee Bjerke from Winneshiek County. Ernie Steffensmeier is leaving the board and was presented certificate for his service to the board. Larry Roehl from Louisa County is the new member replacing Ernie and Jacob Thorius from Washington County is the new alternate.

**\*\*\*2 members joined the table. Total voting members 14**

## **Review Proposals from 2013 First Round Solicitation:**

**PROPOSAL, “(Continuation – Phase III): 3-Year Performance Monitoring of Boone County Expo Pavement Sections”, David j White, ISU/InTrans, (\$214,913)**

## **BACKGROUND**

Pavement foundation test sections at the Central Iowa Expo site (constructed in 2012 and paved in 2013) represents one of the most comprehensive studies of its kind in Iowa. Early research results demonstrate that the various pavement foundation systems provide significantly different support conditions (e.g., stiffness, drainage, durability, and uniformity). Further, the various material and treatments cover a wide range of material and construction costs. To more fully evaluate how to provide the best value pavement foundation system for Iowa roads, a performance monitoring program is needed. Past research have not specifically evaluated pavement foundation conditions with sufficient duration and testing frequency to properly characterize changes due to environmental conditions with time. This project site creates a unique opportunity to conduct in situ performance monitoring of the pavement system and foundation layers.

## **OBJECTIVES**

The primary goals of this project are to conduct performance monitoring of the test sections and assess environmental impacts on the test sections for a 3-year period. Specific objectives are to assess the following:

- a. Seasonal changes (within a year and over time) in foundation layer support conditions (strength and stiffness,
- b. Seasonal changes (within a year and over time) in subbase layer permeability,
- c. Seasonal temperature changes in foundation layers (document number of F/T cycles),

- d. Seasonal changes in the in-ground stresses under loading,
- e. Surface layer distresses over time (crack mapping and elevation changes),
- f. Moisture changes in subbase and subgrade layers seasonally and over time,
- g. Micro-mechanical changes in stabilized subgrade over time,
- h. Seasonal water table changes,
- i. Loss of support/erosion, and
- j. Weather information monitoring.

## **DISCUSSION**

Q. What is a Geo Cell?

A. A Geo Cell is sort of a 3-D geo-fabric. It was a technology developed by the Army in 1984. You fill Geo Cell with aggregate and it creates a stable platform to drive over.

Q. How are you keeping track of cumulative loads with vehicles on the test sections?

A. We are not at this time.

**Motion to Approve by R. Younie; 2<sup>nd</sup> P. Assman**

Motion carried with 13 Aye, 0 Nay, 1 Abstaining.

**FINAL REPORT, TR-632, “Low Cost Rural Road Surface alternatives”, Dave White, ISU/InTrans, (\$50,000)**

## **BACKGROUND**

Freezing-thawing action induces physical changes to granular surface roads that can negatively impact public users, reduce emergency responder access/time, and result in maintenance costs for secondary road departments. Stabilization can help reduce frost-susceptible conditions for unbound granular roads, but requires careful engineering design and controlled construction techniques. The comprehensive literature review conducted for this project categorized technical and some economic aspects of freeze-thaw mitigation for granular surfaced roadways.

## **OBJECTIVES**

A detailed literature survey was conducted on the topic of unbound granular road performance and construction with respect to freeze-thaw damage and resistance. Figure 1 shows typical Iowa gravel roadway conditions during the spring thaw period. Improvements to reduce rutting due to thaw weakening and preventing frost heave are desired. In this document and the accompanying report, engineering recommendations are provided for (1) collecting local information to better characterize the extent of the problem and (2) constructing test sections to evaluate freeze-thaw mitigation technologies at full-scale.

A worldwide literature review was conducted using many sources, and the results were assessed in a systematic approach using a rating system developed as part of this project. The results of the literature review are organized by engineering categories. Approximately 300 technical articles were reviewed and then down-selected to about 150 sources for full assessment and inclusion in the bibliography.

## **DISCUSSION**

**Motion to Approve by R. Fangmann; 2<sup>nd</sup> K. Jones**  
Motion carried with 14Aye, 0 Nay, 0 Abstaining.

**PROPOSAL, “Autonomous Sensing Skin for Detection and Localization of Fatigue Cracks”,**  
Simon Laflamme, ISU/InTrans, (\$92,150)

### **BACKGROUND**

Monitoring of fatigue cracks on transportation infrastructure is a difficult task. Fatigue cracks are small, and may form over a very large surface. To be able to detect them, one typically needs a precise strain gage, located over the surface where the crack will form. Given the small dimension of strain gages (< 0.75 in), it is probabilistically not possible to detect a new fatigue crack on the entire system. Strain gages are also prone to rupture and have a high rate of failure in field applications. Other technologies exist that showed some promise at crack detection and localization. Piezoelectric transducers (PZTs) can detect crack located between two nodes by sending and measuring mechanical waves. However, PZTs rely on high frequency measurements, and are very sensitivity to the quality of the bonding interface between the sensor and the monitored surface. In a harsh environment, it is unrealistic to use PZTs over a long period of time. Fiber optics has also shown great potential by being able to detect cracks at discrete locations over the entire length of the sensor. Nevertheless, reading from fiber optics requires expensive equipment, and the sensor may also be sensitive to the bounding agent, depending on the type of fiber used. Accelerometers may be used to detect new cracks by identifying a change in the vibration signature, but research has shown that this is very difficult to achieve, since the vibration signature is only modestly affected by fatigue cracks, and environmental effect will likely dominate any changes in the signature. Table 1 summarizes current limitations of existing off-the-shelf solutions for SHM of fatigue cracks.

### **OBJECTIVES**

The overarching objective of the proposal is to develop an autonomous sensing system for detecting and localization of fatigue cracks. This will be achieved via the completion of the following specific research objectives:

1. Validation of an SEC for detection of fatigue cracks.
2. Development of an autonomous wireless data acquisition system.
3. Validation of the proposed solution in a laboratory setup.
4. Validation of the proposed solution on a bridge.
5. Data collection from field application.

### **DISCUSSION**

Q. Does the patch just detect in the area where it is located?

A. The patch detects strain of cracks under its area.

Q. What are the limits in the size of this device?

A. You can make it any size; the bigger you get the less sensitivity you will have.

Q. How do you physically adhere this patch to the surface?

A. We adhere the patch with epoxy.

**Motion to Approve by P. Assman; 2<sup>nd</sup> R. Knoche.**  
Motion carried with 13 Aye, 0 Nay, 1 Abstaining.

## **Second Round RFP Review and Discussion FY 13-14**

- **RFP-IHRB-13-06 Compiling Legal Opinions Affecting Road Issues**  
Mark will review the anticipated cost prior to solicitation. No other changes were made.
- **RFP-IHRB-13-07 Design and Performance Verification of a Bridge Column/Footing /Pile System for Accelerated Bridge Construction (ABC)**  
No changes were made.
- **RFP-IHRB-13-08 Evaluation of Otta Seal Surfacing for Low-Volume Roads in Iowa**  
Patrick Mouw will be the technical contact. No other changes were made.
- **RFP-IHRB-13-09 Assessment of PCC Concrete Setting Time and Joint Sawing**  
No changes were made.
- **RFP-IHRB-13-10 Impacts of Internally Cured Concrete Paving on Contraction Joint Spacing**  
This RFP will be split into two parts. The initial stage of this project will be an economic analysis and literature search regarding the use of ICC in pavement. No other changes were made.
- **RFP-IHRB-13-11 Iowa Granular Road Design and Maintenance Handbook**  
A training component will be added. Actual training will not be developed through this project; however the deliverables should be applicable to the development of training. No other changes were made.

**\*\*\*\* It is anticipated that there will be enough funding remaining to proceed with the following RFPs, however they will be held back until the previous project proposals are approved to verify funding availability.**

- **RFP-IHRB-13-12 Upgrading Bridge Rails on Low Volume Roads in Iowa**  
No changes were made.
- **RFP-IHRB-13-13 Performance based Evaluation of Cost Effective Aggregate Options for Granular Roadways**  
No changes were made.

## **NEW BUSINESS**

There will not be a January 31<sup>st</sup> IHRB Meeting. A march 28, 2014 meeting will be added to the schedule to move the project identification and ranking up in the calendar to better coordinate the IHRB program with other research programs.

## **ADJOURN**

**The next meeting of the Iowa Highway Research Board will be held Friday, February 28, 2014, in the East/West Materials Conference Room at the Iowa DOT. The meeting will begin promptly at 9 a.m.**

A handwritten signature in black ink that reads "Mark J. Dunn". The signature is written in a cursive style with a large initial "M" and a long, sweeping underline.

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**Mark J. Dunn, IHRB Secretary**