IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of January 29, 2010

Regular Board Members Present

A. Abu-Hawash
D. Ahart
J. Berger
V. Dumdei
J. Joiner
R. Knoche
B. Moore
M. Nahra
J. Waddingham
W. Weiss

Alternate Board Members Present

S. Nambisan for J. Alleman
S. Schnoebelen for K. Hornbuckle
W. Zitterich for J. Adam

Members With No Representation

J. Moellering
C. Schloz

Alternates Present as Guests

R. Younie

Secretary - M. Dunn

Visitors

Max Grogg	Federal Highway Administration
Edward Engle	Iowa Department of Transportation
Sandra Larson	Iowa Department of Transportation
Mary Starr	Iowa Department of Transportation
Chris Brakke	Iowa Department of Transportation
Ken Dunker	Iowa Department of Transportation
Brian Gelder	Iowa State University/InTrans
Shashi Nambisan	Iowa State University/InTrans
Brent Phares	Iowa State University/InTrans
Steven Reneker	Krikham Michael Consulting Engineers
Mohammed Elhakeem	University of Iowa
Chris Wilson	University of Iowa
Bart Berquist	University of Northern Iowa

The meeting was held at the Iowa Department of Transportation's Ames Complex, Materials East/West Conference Room, on Friday, January 29, 2010. The meeting was called to order at 9 a.m. by outgoing Chairperson Jim Berger with an initial number of 13 voting members/alternates at the table.

Agenda

No modifications to the Agenda were made.

Approval of the Minutes

Motion to approve minutes from the October 30, 2009 meeting by J. Joiner. 2nd by M. Nahra.
Motion carried with 13 aye, 0 nay, 0 abstaining.

DISCUSSION PROPOSAL (IHRB RFP 09-04) ***Timber Abutment Piling and Back Wall Rehab and Repair***, Brent Phares, Iowa State University/InTrans ($150,843)

C: The proposal was responsive to the issues we want examined. The budget looks good as well. This will address some of the larger issues we have regarding slab and beam bridges with timber abutments.

Motion to Approve by M. Nahra. 2nd by B. Moore.
Motion carried with 12 aye, 0 nay, 1 abstaining.

FINAL REPORT TR-595 "Autonomous Measurements of Bridge Pier and Abutment Scour Using Motion Sensing Radio Transmitters," Thanos Papanicolaou, The University of Iowa/IIHR ($57,000)

BACKGROUND
Scour around the foundations (piers and abutments) of a bridge due to river flow is a problem of national scope that has dramatic impacts on economics and safety of the traveling public. Bridge scour has resulted in more bridge failures than all other causes in recent history.

OBJECTIVES
The main objective of this study is to evaluate the capabilities of Radio Frequency Identification technology in collecting field data and remotely monitoring bridge scour.

BENEFITS
Advancements in sensor technology over the last half-decade contribute success towards the development of autonomous scour detection systems, which can help minimize exposure of maintenance personnel to dangerous conditions during floods and also contribute to the development of a warning system for bridge scour, preventing loss of life and property due to catastrophic failures. Thus, monitoring bridge scour can be a cost-effective approach for protecting the traveling public from potential bridges failure by alerting traffic engineers bridges must be closed during floods if scour depth reaches a critical level.

Q: How does the antenna pick up the signal?
A: It uses two principals - orientation and signal strength.

Q: How close does a transmitter need to be to the antenna?
A: With this system, three feet. However, this is a very limited system. The system we are going to build during Phase II of this project uses passive, low frequency systems that collect data up to sixty feet away.

Q: Will you attach an antenna to each pier?
A: Yes.
C: Conceivably, a lot of these transmitters could be scattered into ground fill, so as you filled it with water or water erosion began, you could measure the depth of the particle using the antenna.
A: Yes.
Q: Could thousands be measured at the same time? Do they come with manufacturer's coding or do you do that?
A: Each transmitter comes with a manufacturer's code, and before placement, you register each one using the antenna. As the antenna collects data, movement and depth can be determined through the plotting of each signal.
Q: Can readings show the difference between a transmitter under ten feet water and one in soil?
A: Yes. The distribution would be different. This is exactly what was shown in the laboratory experiments.

Motion to Approve by W. Zitterich. 2nd by Ahmad Abu-Hawash.
Motion carried with 13 aye, 0 nay, 0 abstaining.

PROPOSAL ***An Adaptive Field Detection Method for Bridge Scour Monitoring Using Motion-Sensing Radio Transponders (RFIDs),*** Thanos Papanicolaou, The University of Iowa/IIHR ($170,866)

BACKGROUND
This project will build on previous research funded by the Iowa DOT Office of Bridges & Structures which developed software to read the location of RFIDs. This project will also contribute to data collected during Phase I of the study, project TR-595, "Autonomous Measurements of Bridge Pier and Abutment Scour using Motion-Sensing Radio Transmitters."

In this study, the expansion, reconfiguration, and transfer of Radio Frequency IDentification (RFID) technology from the laboratory to the field in order to collect rare field scour data and remotely monitor bridge scour during floods is proposed.

OBJECTIVES
A comprehensive field detection method for developing advanced capability for reliable monitoring, inspection and life estimation of bridge infrastructure will be developed. The goal is to utilize Motion-Sensing Radio Transponders (RFIDS) on fully adaptive bridge monitoring and residual life prediction to minimize the problems inherent in physical inspections of bridges. The following will be developed:

- A novel integrated condition-based maintenance framework integrating transformative research in RFID sensors and sensing architecture for in-situ scour monitoring;
- State-of-the-art computationally efficient multi-scale modeling for scour assessment; and
- A damage prognostics framework for estimating remaining useful life of critically scoured bridge structures.

BENEFITS
This project will provide real-time datasets that can be used in making decisions on bridge down time, repair cost, and functionality. These datasets could aid to the fundamental understanding of clear water scour and live bed scour. Finally, the research will pave the way for inexpensive, bridge automated monitoring and provide the Iowa DOT with an open framework to expedite the development of similar systems for other critical infrastructure such as dams, and levees or other near-shore structures.

C: For remote monitoring, you want antennae in a position where you can detect a signal from anywhere, anytime. It would obviously need to be protected from vandalism, etc.
A: For autonomous monitoring, you would put it under the guard rail; there is risk as with all other instrumentation. We'd like to develop a kit so antennae are protected.

Q: Is the chain system only good for one scour event or can it be re-used?
A: It is for continuous events.

Q: Rather than a lot of data being presented, wouldn't it be better if some type of warning could simply be given when certain conditions were present?
A: Yes, that is a possibility; a buzzer or some type of warning system could be used.
C: This offers some advantages if information can be remotely transferred. If systems could be pre-placed, shorter detours could be managed when necessary and bridges would only be closed when necessary.

Motion to Approve by W. Zitterich. 2nd by Ahmad Abu-Hawash.
Motion carried with 12 aye, 0 nay, 1 abstaining.

PROPOSAL ***Development of Self-Cleaning Box Culvert Design*** **- PHASE II,** Marian Muste, The University of Iowa/IIHR ($97,832)

BACKGROUND
Existing manuals do not provide adequate information on sediment control at box culverts, or for multi-barrel culverts generally. This project continues work initiated during TR-545, "Development of Self-Cleaning Box Culverts," to ensure that box culverts do not become silted in. This project focuses on aspects needed for field implementation of self-cleaning designs developed through TR-545.

OBJECTIVES
Phase II objectives include:

a) Conduct laboratory tests for developing self-cleaning designs for 2-box culverts
b) Identify two- and three-barrel culverts in Iowa counties displaying a dynamic sedimentation behavior for subsequent implementation of self-cleaning designs recommended by TR-545
c) Initiate monitoring programs at select culverts to establish reference conditions for assessing efficacy of the self-cleaning designs
d) Conduct laboratory performance tests for culverts retrofitted with upstream and downstream cleaning fillets
e) Conduct laboratory performance tests of self-cleaning culverts for assessment of performance at overtopping and estimate the effect of culvert modifications on the head losses through culverts.

BENEFITS
A report providing design layouts and guidance for self-cleansing methods for use for new culverts and retrofitting existing culverts known to have a sedimentation problem will be produced. The report will be comprehensive and well-illustrated for easy, direct reference on how to select the best self-cleansing method suited for a culvert site. Results will be presented during two Iowa conferences.

Q: What do you expect the solution to be for two-box culverts?
A: Up to now, our focus has been on three-box culverts, so until the research is done it's difficult to estimate.

Q: This study will provide more information about design for two-box culverts and overflow for the three-box culverts? And locations to build test sites will be chosen?
A: Yes.
Q: How soon will test sites be built?
A: At the beginning of this project we'll identify trouble spots and observe them. Currently, the only statistics we have is a map, the result of 16-20 responses from our previous survey.
Q: Once sites are selected, would we go ahead and do field trials?
A: I will visit counties and inquire about the history of cleaning culverts, because that's an indication of needed intervention. If we know cleaning history we can identify the hot spots.
C: On the Primary system, we probably know which sites have issues. Iowa DOT Office of Bridges and Structures can identify those. The cost of doing the actual construction is not included in this proposal. I didn't realize that. We have approval from Iowa DOT management to fund sites on the Primary System. If a county wanted construction of a site, then the county would pay for it.
A: We want known data prepared in a meaningful way when we select sites.
C: Maintenance supervisors should be able to identify sites with buildup.
C: This is the preparation for construction.
C: I was hoping to have some built during this phase.
A: If the Board wants me to look at a particular site, I will study the performance of that site for comparison.
Q: Within your proposal you have lab and field study. Within the field study, do you have time estimated for shaping Primary and/or county sites if those are available (to be built by either the county or the state)?
A: Yes.

Q: Also, after sites are selected, data gathered and sedimentation monitoring occurrences (after shaping) identified, will you be able to utilize your ideas for improving cleaning out sedimentation?
A: Yes. That was part of our discussion last October. However, we need very careful selection of the site.
C: Right now we're considering offering a couple Primary sites with monies coming out of Contingency Funds.
C: It would be simple for the counties to implement one of these structures; especially if it's a rip-rap or earth structure with rip-rap. I don't see it as a problem and I think counties would eagerly participate in construction.

DISCUSSION: An in-depth discussion followed this question-and-answer period. The Board agreed to approve the proposal on condition that at least one Field Study is done during this phase, under the current requested budget, as close to Johnson County as possible.

Motion to Approve With Revision by M. Nahra. 2nd by D. Schnoebelen.
Motion carried with 12 aye, 0 nay, 1 abstaining.

NEW BUSINESS
Mark: There have been some changes to the Board membership including the following: Jeff May, Knoxville, Iowa, is the new Alternate for Member John Joiner. Jeff Krist is no longer on the Board and Ronald Knoche, Iowa City, Iowa, is now a Member City Representative; Ron's Alternate is Tracy Warner, Ames Municipal Engineer. Clark Schloz, Maquoketa, Iowa, is now the regular Member for District Six and Cedar County Engineer Robert Fangmann is his Alternate.

IHRB Selection of Chair (County) and Vice-Chair (University) for 2010
Mark: Because no meeting was held in December, a Chair and Vice-Chair need to be elected. The rotation calls for a county Chair and university Vice-Chair. We also want to acknowledge and thank Jim Berger for sitting in today as acting Chair so new officials can be elected and prepare for the next meeting.

Nomination to appoint Jay Waddingham acting Chairperson by M. Nahra. 2nd by W. Weiss.
Moved nominations cease and cast a unanimous ballot for Jay Waddingham by M. Nahra. 2nd by W. Weiss
Voting: Motion carried with 12 aye, 0 nay, 1 abstaining.
***** Jay Waddingham appointed acting Chairperson for dates from January 1, 2010 through December 31, 2010.

Nomination to appoint Doug Schnoebelen acting Vice-Chair by S. Nambisan (for J. Alleman).
2nd by V. Dumdei.
Moved nominations cease and cast a unanimous ballot for D. Schnoebelen by S. Nambisan. 2nd by V. Dumdei
Voting: Motion carried with 12 aye, 0 nay, 1 abstaining.
***** Doug Schnoebelen appointed acting Vice-chair for dates from January 1, 2010 through December 31, 2010.

ADJOURN
Motion to Adjourn
Motion by M. Nahra. 2nd by S. Nambisan.
Motion carried with 13 aye, 0 nay, 0 abstaining.

The next meeting of the Iowa Highway Research Board will be held on Friday, February 26, 2010, in the East/West Materials Conference Room at the Iowa DOT.

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Mark J. Dunn, IHRB Secretary