

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of IHRB meeting held September 28, 2007

Regular Board Members Present

A. Abu-Hawash	J. Joiner
J. Alleman	J. Krist
J. Berger	M. Nahra
S. Dockstader	J. Rasmussen
T. Fonkert	R. Schletzbaum
S. Gannon	J. Singelstad
K. Hornbuckle	D. Waid

Alternate Board Members Present

W. Zitterich for J. Adam
R. Younie

Secretary

M. Dunn

Visitors

Scott Rinehart	Clay County, IA
Ed Engle	Iowa Department of Transportation
Sandra Larson	Iowa Department of Transportation
Mary Starr	Iowa Department of Transportation
Neal Hawkins	Iowa State University – CTRE
Omar Smadi	Iowa State University – CTRE
John Verkade	Iowa State University – Chemistry Department
Peter Taylor	Iowa State University – CP Tech Center
Paul Wiegand	Iowa State University – CP Tech Center
Christopher Wilson	The University of Iowa – IIHR
Sue Miller	MN, Freeborn County
Mike Sheehan	MN, Olmsted County

INTRODUCTION OF NEW BOARD MEMBER

New University of Iowa board member representative Keri Hornbuckle was introduced to the Board by Chairman James Alleman.

Agenda review/modification

Item 6 will be presented as Item 1 due to scheduling.

Approval of the minutes

Motion to approve the minutes from the August 24, 2007 meeting by M. Nahra, 2nd by Jim Berger.
Carried 14 yea, 0 nay, 0 abstaining.

One Board Member joined the table.

FINAL REPORT TR-534, “Design Procedures and Field Monitoring of Submerged Barbs for Streambank Protection,” Thanos Papanicolaou, The University of Iowa/IIHR (\$140,000)

BACKGROUND

The use of hydraulic structures to guide strong currents away from banks near bridges, and grooming flow through bridge waterways have gained increased support in recent years. In general terms, such structures create a region of comparatively low velocity, low turbulence, and low shear stress along a stream bank immediately upstream of a bridge, thereby creating a protected region for susceptible bridge foundations, as well as guarding weak banks.

OBJECTIVES

The main objective is to evaluate the hydraulic performance of riprap spurs and weirs in controlling bank erosion at the southern part of the Raccoon River upstream of the Hwy 169 Bridge, utilizing the commercially available Finite Element Surface Water Modeling System (FESWMS); also, to provide a tool to predict flow around bendway weirs and determine their optimum structure and stability under different flow conditions.

BENEFITS AND CONCLUSIONS

A well calibrated two-dimensional, depth-averaged hydrodynamic model is a suitable tool for simulating flows around bendway weirs and evaluating their performance in mitigating bank erosion. The sensitivity analysis increases the user’s knowledge on the effects of varying the individual input parameters and provides some insight into the model’s uncertainty. The use of the detailed field measurements verify the models output and ensures that the models’ built-in assumptions, which provide some inherent limitations, do not hinder the models overall capability to reproduce observed flow structure.

The study expands the intended application of two-dimensional hydrodynamic numerical models by demonstrating their capability in simulating averaged flow characteristics in highly turbulent regimes; also, barbs are considered a more biologically accepted streambank mitigation strategy because they create resting pools for fish and facilitate fluid biodiversity for aquatic species.

Q: Is this Iowa DOT property?

A: Not the whole bank. That would have been cost prohibitive. The purpose of the project was two-fold: 1) to minimize cost and 2) to re-direct the channel because of the migration to the bridge. We actually wanted to push the channel back to its original position and re-establish bank vegetation there. This research validates our (Iowa DOT) research. Land permits from the Iowa DNR are established and permanent right-of-way for 50' in either direction for this project is in place for our access.

Motion to Approve by R. Schletzbaum, 2nd by M. Nahra.
Carried 15 yea, 0 nay, 0 abstaining.

PROPOSALS

Continuation Proposal HR-140(F), “Collection and Analysis of Streamflow Data,” Greg Nalley, U.S. Geological Survey (\$227,585)

BACKGROUND

Research project HR-140 was established July 1, 1968, by consolidating three separate research projects then under contract between the U.S Geological Survey (USGS) and the Iowa State Highway Commission. For the USGS, Iowa Water Science Center, HR-140 funds three separate programs: 1) continuous-record streamflow-gaging stations in Iowa, 2) partial-record gaging stations in Iowa, and 3) flood profiles of Iowa streams.

Currently, the streamflow gaging portion of project HR-140 fully or partially funds the operation and maintenance of approximately 114 gaging stations on rivers and streams in Iowa. This network of stations

includes fully funding 89 crest stage gages and partially funding 25 continuous-record gages. Site visits to each gage occurs on a six week interval for routine measurements of flow and gage inspection. During flood events, measurements of flow are made to better define the discharge rating curve.

The flood-profile portion of project HR-140 is the preparation of water-surface profiles of major floods on principal streams in Iowa. A total of 31 reports have been prepared as part of project HR-140 since the first flood-profile report was published in 1963. Cost sharing is 55% IHRB and 45% USGS.

OBJECTIVES

The objectives of this proposed research are to:

- 1) Operate, maintain and publish streamflow data for 25 continuous-record gaging stations in Iowa
- 2) Operate, maintain, and publish high-flow data for 89 partial-record (crest-stage) gaging stations in Iowa
- 3) Collect and publish water-surface profiles and storm and flood information for significant flood events

The 2006 Water Year Data is available on CD and on the web at: <http://ia.water.usgs.gov>.

Motion to Approve by A. Abu-Hawash, 2nd by M. Nahra.
Carried 15 yea, 0 nay, 0 abstaining.

Proposal – *Low Cost Strategies to Reduce Speed and Crashes on Curves*, Shauna Hallmark, ISU/CTRE (\$80,000)

BACKGROUND

Curve related crashes result from a number of causes, including driver workload, driver expectancy, and speeding. Approximately 56% of run-off-road fatal crashes on curves are speed related. Studies have suggested that geometric improvements can reduce crashes, however, costs for geometric improvements are prohibitive, especially for counties with a large number of rural two-lane roads to maintain. Geometric improvements also require programming and can take some time to implement.

SCOPE

DCWS are one method that has been tried in limited applications to reduce vehicle speeds and subsequently crashes. A DCWS consists of a speed measuring device, which may include loop detectors or radar, and a variable message sign which provides warnings to speeding drivers to slow down. This project is funded in part by the FHWA (\$300,000); researchers are seeking match funds totaling \$760,000. IHRB funds sought: \$80,000.

OBJECTIVES

- Identify low-cost safety treatments used to address speed and safety on rural horizontal curves
- Identify at least 4-8 pilot study locations for installation of dynamic speed feedback signs in Iowa
- Identify 4-6 pilot study locations for installation of other low cost treatments
- Summarize the results in a format that can be easily communicated and utilized

Q: How many speed signs are there?

A: Twenty-four total; 4-6 or 4-8 of those will be in Iowa.

Q: Are rumble strips part of this research?

A: We will investigate the use of strips in this project; rumble stripes are part of an independent CTRE project funded by IHRB. We will utilize that information and collaborate in implementation of stripes.

Motion to Approve by J. Berger, 2nd by T. Fonkert.
Carried 15 yea, 0 nay, 0 abstaining.

FINAL REPORT TR-498, “Field Testing of Railroad Flat Car Bridges,” F.W. Klaiber, Iowa State University (\$192,598)

BACKGROUND

Project History includes Phases I & II: Phase I - TR-421, “Use of Railroad Flat Cars for Low Volume Road Bridges” which included a feasibility study conducted in 1999 and included testing of an existing RRFC bridge in Tama County, and TR-444, “Demonstration Project Using Railroad Flatcar Bridges for Low-Volume Road Bridges” that included the design, construction and testing of two RRFC bridges in Buchanan and Winnebago Counties in 2003; grillage analyses and results from field tests were also used to develop a design methodology.

SCOPE & OBJECTIVES

Based on the conclusions of IHRB Project TR-444, additional research on the use of RRFC bridges was undertaken. Phase III of the project investigated:

- Different design and rating procedures
- Additional single span configurations plus multiple span configurations
- Different mechanisms for connecting adjacent RRFCs and the resulting lateral load distribution factors
- Sheet pile abutments
- Behavior of RRFCs that had been strengthened so that they could be used on existing abutments.

A total of eight RRFC bridges were tested (five single span, two two-span, and one three-span). Based on the results, a simplified design and rating procedure has been developed for the economical replacement bridge alternative. Volume 1 presents the results from the testing of four single span RRFC bridges; Volume 2 shows results from testing the strengthened single span bridge and three multiple span bridges.

CONCLUSIONS

To ensure compliance with AASHTO acceptance criteria, the amount of dead load should be limited; longitudinal flatcar connections tested effectively transferred the live load transversely; RRFC clear spans should be restricted to less than 66-ft unless members are strengthened; single-span and multiple-span RRFC bridges are effective replacement bridges for use on low volume roads; controlling section for some multiple span bridges (like the two in Buchanan County) is the shallow section of the interior girder and based on the limited research in this project, sheet pile abutments are a viable alternative for low volume roads

Motion to Approve by M. Nahra, 2nd by S. Gannon.
Carried 15 yea, 0 nay, 0 abstaining.

DISCUSSION & SELECTION OF PROPOSALS FROM FIRST ROUND 2007 RFPs

IHRB 07-02 – *Pavement Markings and Safety*, Omar Smadi, ISU/CTRE (\$96,000)

C: There is state (of Iowa) interest in this project; as far as painting lines based on reflectivity, we’d like to know how low that reflectivity can go before affecting safety and accident rates. The problem is we don’t want to paint the roads before there is a need, but when does it get too dim that it becomes a safety factor? Where do we paint or not paint when considering both monetary and safety issues?

C: Is a false sense of security created by brighter lines? People drive faster and might make mistakes at night. It has been said that people like them, but no study proving that they deliver on increased safety has been done. On the issue of reflectivity, there isn’t a study we know of showing brighter lines deliver on raising safety.

C: We’re trying to make a data-driven decisions if putting more funds into painting pavement markings.

Motion to Approve by J. Joiner, 2nd by W. Zitterich.
Carried 15 yea, 0 nay, 0 abstaining.

IHRB 07-06 – *Development of an Improved Agricultural-Based Deicing Product*, John Verkade, ISU (\$100,000)

Q: Is this the type of deicer used on the Minnesota bridge (that collapsed)?

A: No. That appears to have been potassium acetate causing zinc corrosion on steel. I don't think it's been proven yet.

Q: Is this focusing on PC pavements or asphalt, too?

A: Both.

C: Are these products effective on both PC & AC pavement?

A: There is a concern that a compound in ag products would decompose asphalt; that is something we will examine.

C: What is the number of products to be examined?

A: About half a dozen; judicious selection predicts the combination of ag products with traditional materials for effectiveness. Not all are inexpensive.

C: Six products aren't many; one issue we've had is that when we're asked to consider an ag product and we try it, if it doesn't work well they change percentages in the product and try finding variations. Then, they ask us to check it again; percentages are changed a little bit so you end up sorting out variations, which is a good thing, but there are a lot of variations you get by changing percents and ratios. Will you be looking at this?

A: We plan to look at combinations; for example, once we have three current products that work well and six candidate ag products that might be inexpensive enough to work, you have 18 possibilities and yes, it will be necessary to look at the combinations. There are other compounds that could also be examined.

C: But there is a lot more than 18 when you consider other compounds.

A: Using chemistry we can predict with some certainty what products will give us trouble, not so much trouble or none at all. We have a team who is going to be able to give good educated predictions; it won't just be a matter of random guessing.

Q: If you're trying something effective it also has to be produced in sufficient quantities at the right price. If you find a product that can work down to zero degrees for instance, will it be readily available?

A: Cost and production analysis are necessary and will limit the number of candidates we examine.

C: We are trying to put together an advisory panel to consult with this Board. They will help us make some of those engineering and financial-economical type decisions.

C: If you're considering commercial products I'm not sure of the legality of analyzing those; there may be some restrictions on that.

A: Typically when you ask them about those commercial products they'll only tell you why it works in general terms. They won't share chemical properties, although they almost always have some salt in them.

C: As public servants we have responsibility for knowing what's in a product regardless of where it came from or how we got it. If we're going to use something for a public purpose we need to know what the components are. This is a public safety issue.

A: Our vision is to take a raw material and find something appropriate that works, rather than starting with proprietary materials.

C: We know what salt does on the road. We have a standard practice of use and know what performance will take place. Through this process of looking at raw materials, would you look at that in relationship to the properties of sand and salt as well?

A: All of the tests will be compared to sodium chloride as a baseline.

C: The ethanol waste stream doesn't seem to have properties that would melt ice. Before we advance the study, we almost need to know what will be examined.

A: One possibility is glycerol; it's very cheap and although it's a slippery substance, there may be ways of modifying it to make it a good deicer. Because glycerol is only one constituent waste product of ethanol, perhaps it can be modified. It also isn't corrosive. This is something we could examine. This is just one idea.

C: Do we ask them to go back and refine the proposal or should they form a technical advisory committee before returning to present this proposal?

A: When we're talking about spending \$100,000 we should see a refined proposal and have some idea what we're going to be looking at up front.

C: I see advantages of open-endedness, but if they start with an ag by-product and it turns out to be a good deicer that would be great. The technical advisory panel would be a positive factor to guide this study.

Q: How much leg work do we expect the researchers to do before approval of their proposal?

C: A few phone calls to find out what their base streams are and their chemical compositions and they should know if the product has potential; we're talking about six products and \$100,000 study. I don't want to look six ways at one product. We want to give them guidance as to what we're looking for.

Q: Is there an inherent limit to the kinds of things you'd examine given your knowledge of what the waste streams are?

A: Yes, it is limited, because every producer of bio-renewable products is looking for a way to add value to their waste streams. That's true of grain processing and glycerol from the bio-diesel industry. We're up against a tough area here, finding cheap, available product that can compete with sodium chloride. But the nature of research is that unexpected things can happen. We can refine the proposal, but we're not sure how many possibilities are marketable.

Motion to request a refinement of the proposal to establish what materials would provide the best opportunities for research and for another presentation at the October 26, 2007 meeting by Mark Nahra, 2nd by S. Gannon.
Carried 15 yea, 0 nay, 0 abstaining.

Introduction to Minnesota LRRB and TERRA

Sue Miller, Freeborn County, MN Engineer and Local Road Research Board (LRRB) member and Mike Sheehan, Olmsted County Engineer, Research Implementation Committee Board and Transportation Engineering and Road Research Alliance (TERRA) member, were introduced. They spoke briefly on MnDOT's professional partnerships, those being formed and similarities between the transportation organizations in MN and IA and how goals and project innovations could be shared.

There is an initial membership fee of \$10,000 to join TERRA. For more information: www.lrrb.org or www.terraroadalliance.org.

C: Iowa and Minnesota are the only states with research boards; however, some states, like Alabama, are forming a volunteer board through county engineer participation.

Q: What is the mechanism to coordinate with TERRA? Would there be a liaison for the Board or the county engineers? Could our Secondary Roads Research Coordinator (Ed Engle) act in this capacity? If the Iowa DOT would allow him to travel we could contribute some money to that as well.

C: It would be a great idea to visit Minnesota for the Travel Meeting, 2008. The agricultural loads study would prove very interesting. There's also a porous concrete facility being constructed that would be finished by then.

NEW BUSINESS

None - no other new business was discussed.

Motion to Adjourn

Motion to Adjourn by S. Dockstader. 2nd by R. Schletzbaum.

Carried 15 yea, 0 nay, 0 abstaining.

The next scheduled meeting of the Iowa Highway Research Board will be held on **Friday, October 26, 2007 at 9:00 a.m. at the Iowa DOT Materials East/West Conference Room, Ames, Iowa.**

Mark J. Dunn, IHRB Secretary