

# IOWA HIGHWAY RESEARCH BOARD (IHRB)

*Minutes of June 25, 2010*

## **Regular Board Members Present**

A. Abu-Hawash  
D. Ahart  
J. Berger  
V. Dumdei  
J. Joiner  
R. Knoche

C. Schloz  
J. Waddingham  
W. Weiss  
J. Moellering  
B. Moore

## **Alternate Board Members Present**

W. Zitterich for J. Adam  
M. Rouse for J. Alleman

## **Members With No Representation**

K. Hornbuckle  
M. Nahra

## **Alternates Present as Guests**

M. Kerper  
J.D. King

## **Secretary - M. Dunn**

## **Visitors**

Ken Dunker  
Edward Engle  
Ping Lu  
Mary Starr

Iowa Department of Transportation  
Iowa Department of Transportation  
Iowa Department of Transportation  
Iowa Department of Transportation

Charles Jahren  
Pavana Vennapusa  
Chris Williams

Iowa State University  
Iowa State University  
Iowa State University

Steve Klocke

Snyder & Associates

Howard Ho  
Daniel Mehl  
Salam Rahmatalla

The University of Iowa  
The University of Iowa  
The University of Iowa

Bart Bergquist

University of Northern Iowa

The meeting was held at the Iowa Department of Transportation Ames Complex, Materials East/West Conference Room, on Friday, June 25, 2010. The meeting was called to order at 9 a.m. by Chairperson Jay Waddingham with an initial number of 13 voting members/alternates at the table.

## **Agenda**

No changes were made to the Agenda.

**Motion to approve minutes from the May 21, 2010, meeting** by W. Weiss. 2<sup>nd</sup> by J. Berger.  
Motion carried with 13 aye, 0 nay, 0 abstaining.

## **FINAL REPORT TR-573, "Development of LRFD design Procedures for Bridge Piles in Iowa,"**

*Volume I – Electronic Database (PILOT-IA), Sri Sritharan, Iowa State University (\$250,000)*

### **BACKGROUND**

In response to AASHTO's permanent regionally calibrated LRFD resistance factors for the design of driven pile foundations, many states across the nation have made an effort to develop regionally calibrated LRFD resistance factors for the design and construction control of driven pile foundations. While these studies provide valuable information including the identification of available regional pile load test data, in all cases but one the reported LRFD resistance factor calibrations were accomplished through the use of national databases such as the DFLTD. Such procedures were adopted due to the absence of quality assurance provisions and required geotechnical and load test data for the regionally reported static pile load tests.

As a part of research project TR-573, "Development of LRFD Design Procedures for Bridge Piles in Iowa," which is directed at the development of LRFD procedures for bridge piles in the State of Iowa, the electronic database for Pile Load Tests in Iowa (PILOT-IA) was developed.

### **OBJECTIVES**

To examine current pile design and construction procedures used by the Iowa DOT and recommend changes and improvements consistent with available pile load test data, soils information, and bridge design practice recommended by load and resistance factor design (LRFD). In this process, recommended changes and improvements that will not significantly increase design and construction costs were a priority.

### **BENEFITS**

The TR-573 PILOT-IA project provides a means for all past, present, and future Iowa DOT bridge pile load test data to be stored in electronic form for subsequent reference and/or analysis. The data base can be easily expanded and will be housed at the Iowa DOT Research Bureau web site. The purpose of the user manual is to provide a comprehensive explanation of the many features incorporated into PILOT-IA, the details of how the quality of data was ensured, as well as information on how to add new SLT data and the minimum required extent of details for these new tests.

Q: So this project is just collecting data and will not develop design or field procedures?

A: This project will end up producing three reports and the database (Volume I); Volume II will be presented at the September meeting and the recommended resistant factors (for pile design) will be presented in Volume III. Baker, who works with us for AASHTO, is developing design factors. That report is in draft form now.

Q: New bridges use wave equation; will you replace that with a new calculation method?

A: Yes. In the proposal we included that, and will look at construction control in the design procedures. The county representative on the advisory committee told us that counties would prefer a simpler method, so two will be developed and either can be used.

**Motion to Approve** by A. Abu-Hawash. 2<sup>nd</sup> by J. Moellering.

Motion carried with 13 aye, 0 nay, 0 abstaining.

**FINAL REPORT TR-529, "Ultra High Performance Concrete Bridge Wapello County,"** Terry Wipf, Iowa State University (\$154,358)

### **BACKGROUND**

Advanced materials (i.e. materials with more desirable qualities than those commonly used in practice) have the potential to improve durability, increase capacity, and provide solutions that minimize inconvenience to users. In 2002, Wapello County submitted a proposal (in cooperation with the Iowa DOT and the Iowa State University Bridge Engineering Center), to the Federal Highway Administration for the construction and

evaluation of the nation's first Ultra-High Performance Concrete Bridge. In 2003 the proposal was accepted and Wapello County received the requested funding.

## OBJECTIVES

The initial work included designing, documenting, and constructing the first UHPC bridge in the United States. The two primary objectives of this research were to develop a shear design procedure for possible code adoption and to provide a performance evaluation to ensure the viability of the first UHPC bridge in the United States. Two other secondary objectives included defining material properties and understanding flexural behavior of a UHPC bridge girder. In order to obtain information in these areas, several tests were carried out including material testing, large-scale laboratory flexure testing, large-scale laboratory shear testing, large-scale laboratory flexure-shear testing, small-scale laboratory shear testing, and field testing of a UHPC bridge.

## BENEFITS

Analytical models to understand the flexure and shear behavior of UHPC members were developed using interactive computer based procedures. Previous research is referenced explaining a simplified flexural design procedure and a simplified pure shear design procedure. This work describes a shear design procedure based on the Modified Compression Field Theory (MCFT) which can be used in the design of UHPC members. Conclusions regarding the viability of the UHPC bridge and recommendations were made for future research.

Q: Do we need to resolve the strand-pullout issue?

A: I believe we do. There is some research being done by the University of Ohio, and their initial results were in conflict with what we saw, however, they're doing straight pullout. We added an actual cross-section, so maybe some of those behavior differences are contributing to that.

C: A second bridge was constructed with this material in Wapello County, Iowa, with another planned.

Q: Are there any construction issues with these beams?

A: The properties of this material is best used in the deck to keep water out (of the deck).

**Motion to Approve** by B. Moore. 2<sup>nd</sup> by R. Knoche.

Motion carried with 13 aye, 0 nay, 0 abstaining.

**FINAL REPORT TR-600, "Improving Concrete Overlay Construction,"** Paul Wiegand, Iowa State University (James Cable presented results of field work) (\$250,000)

## BACKGROUND

As our highway system ages and available funding shrinks, agencies look for efficient methods to preserve and extend the service life of existing pavements. In addition, highway agencies are being asked to minimize the time of exposure to construction and inconvenience by the public. Despite completion of hundreds of concrete overlay projects, some highway agencies are reluctant to use them, believing that concrete overlays are expensive and difficult to build and should be used only in limited applications. Because of this belief, it is very important that efficient construction methods be developed to meet public need for mobility, safety, and access to property.

## OBJECTIVES

Four ongoing construction projects in Iowa were selected to study ways to improve concrete overlay construction. The projects, one each in Osceola, Poweshiek, Worth, and Johnson counties, were selected based on certain characteristics and availability.

Seven research objectives for improving concrete overlay construction were investigated across the four projects:

- Evaluate machine control systems.
- Evaluate longitudinal joint forming operations.
- Study the need for milling existing surfaces.
- Evaluate the use of innovative materials, such as geotextiles for bond breakers.
- Determine innovative ways to control traffic.
- Find ways to minimize construction time.
- Determine required opening strength for local traffic.

#### BENEFITS

Improved design and construction guidelines for PCC overlays.

**Motion to Approve** by R. Younie. 2<sup>nd</sup> by C. Schloz.

Motion carried with 13 aye, 0 nay, 0 abstaining.

**PROPOSAL *Geosynthetic Reinforced Soil for Low Volume Bridge Abutments***, David White, Iowa State University (\$81,500)

#### BACKGROUND

Geosynthetic reinforced soil (GRS) bridge abutment is a retaining wall system with layers of geosynthetic materials attached to the front face that extends between lifts of well-compacted backfill material. In GRS, through the interface friction the reinforcement restrains lateral deformation of the soil next to the reinforcement and therefore increases the strength and stiffness of the soil. The facing elements can be rigid or flexible. Using pre-cast or cast-in-place concrete walls is considered a rigid facing. Using wrapped geosynthetic sheets, concrete blocks, gabions, or timbers that are not rigidly attached to each other is considered a flexible facing.

#### OBJECTIVES

- Develop an instrumentation and monitoring plan to evaluate performance of newly constructed GRS bridge abutment systems
- Develop a design approach and construction guidelines for GRS bridge abutment systems with shallow spread footings on LVR bridges
- Document and evaluate the cost and construction aspects associated with construction of GRS bridge abutment systems from detailed field observations on project sites
- Produce a research report and technology transfer materials that provide recommendations for use and potential limitations of GRS bridge abutment systems

#### BENEFITS

Development of a cost-effective alternative for LVR bridge abutments will prove beneficial to bridge owners. Counties could adopt developed guidelines and recommended design. The GRS bridge abutment systems could potentially improve performance of the superstructure and substructure components of LVR bridges compared to conventional systems.

**Motion to Approve** by W. Weiss. 2<sup>nd</sup> by A. Abu-Hawash.

Motion carried with 13 aye, 0 nay, 0 abstaining.

**FINAL REPORT TR-596, "Insights into the Design and Characteristics of the Sedimentation Process at Multi-Barrel Culverts in Iowa,"** Marian Muste, The University of Iowa (\$72,752)

**BACKGROUND**

This study is an integral part of a broader study focused on the design and implementation of self-cleaning culverts, i.e., configurations that prevent the formation of sediment deposits after culvert construction or cleaning. Sediment deposition at culverts is influenced by many factors, including the size and characteristics of material of which the channel is composed, the hydraulic characteristics generated under different hydrology events, the culvert geometry design, channel transition design, and the vegetation around the channel.

**OBJECTIVES**

The main objective of this research is to understand the mechanics of flow and sedimentation processes at multi-box culverts to support the design and implementation of self-cleaning systems that flush out sediment deposits using the power of drainage flows. The research entailed field observations, laboratory experiments, and numerical simulations.

**BENEFITS**

The insights garnered by the present study represent essential knowledge that will be further used to formulate guidelines to retrofit existing culverts and to improve the design specifications in order to ensure that culverts do not require intervention after construction or cleaning.

Q: Is there new information here for a potential solution to sedimentation?

A: Yes, with sedimentation there are solutions. There is no consideration for sedimentation currently in design of culverts. With the self-cleaning design, the stream influences the solution in regard to streamlining the stream into the culvert. We've done this in the lab and are ready to apply solutions in the field. The designs and geometry definitely have an effect. I tried to mimic nature's deposition factors, which are random, in the lab. Rip-Rap will not develop vegetation.

**Motion to Approve** by W. Weiss. 2<sup>nd</sup> by V. Dumdei.

Motion carried with 13 aye, 0 nay, 0 abstaining.

**\*One Member Left the Table\***

**PROPOSAL TR-619 Additional Funding for Field Testing, "Development of Self-Cleaning Box Culvert Design,"** Marian Muste, The University of Iowa (\$9,697)

A proposal for Phase II for self-cleaning culverts was funded at the January 2010 IHRB meeting. At that time, funding was not included for field testing in the scope of TR-619. Because that funding was not included but field testing was requested by the Board, we decided at that time to come back after field sites were selected for fund approval to implement that specific objective.

Since then, we met with some of our DOT district representatives and several county engineers in the Iowa City area and talked about what criteria was needed for site selection. We came up with a list of must-have attributes and prefer-to-have (but not required) ones.

From that list we chose 9-10 culvert sites that have been reviewed by Dr. Muste during the Phase II work, and identified a triple-barrel culvert site appropriate for constructing a test case for this self-cleaning design. This request for funds is essentially for monitoring of the test site; we will coordinate with the district to clean the culvert and construct the modification. This request for \$9,697 is for testing and monitoring of that site.

We're not quite to the point of doing a test case on a twin-barrel culvert at this time, so we have some time to locate a site (either close to or away from Iowa City).

C: In Phase I, what type of culvert was the research based on?

A: A three-box culvert.

Mark Dunn: One of the objectives of Phase II was to see if the design could be modified for a two-box culvert, however, we need to do the analysis yet so there's time to select a field test site.

C: We just don't want to lose that (two-box culvert design).

A: No, there is time. We are testing the two-box culvert in the lab, doing exactly the same as we did for three-box culvert.

**Motion to Approve** by W. Weiss. 2<sup>nd</sup> by V. Dumdei.

Motion carried with 12 aye, 0 nay, 0 abstaining.

**Mark: The next three RFPs remain from FY09-10.**

**PROPOSAL IHRB-09-03, *Maintenance and Design of Steel Abutment Piles in Iowa Bridges***, Wiss, Janney, Elstner Associates, Inc. (WJE) (\$123,426)

The Board has recommended WJE after its first review.

**Motion to Approve** by A. Abu-Hawash. 2<sup>nd</sup> by R. Knoche.

Motion carried with 12 aye, 0 nay, 0 abstaining.

**PROPOSAL IHRB 09-06, *Quality Control/Quality Assurance Testing for Joint Density and Segregation of Asphalt Mixtures***, Chris Williams, Iowa State University (\$150,742)

This is an RFP approved by the Board at the last meeting. It was reviewed by our materials office with no issues reported. It is a joint proposal between Iowa State University (ISU) and The University of Iowa (U of I), with Chris Williams at ISU taking the lead on this particular project.

**Motion to Approve** by J. Berger. 2<sup>nd</sup> by V. Dumdei.

Motion carried with 12 aye, 0 nay, 0 abstaining.

**PROPOSAL IHRB 09-07, *Development of Quality Standards for Inclusion of High Recycled Asphalt Pavement Content in Asphalt Mixtures***, Hosin "David" Lee, The University of Iowa (\$150,000)

This is also a joint project; however, this one will be led by Dr. Lee from U of I.

Jim Berger, Iowa DOT Materials Office: We did have some comments. Mark is going to take care of a small revision to add testing at all temperatures.

Mark: Yes, those were fairly minor and we can work with the advisory committee to make modifications.

**Motion to Approve** by V. Dumdei. 2<sup>nd</sup> by J. Berger.

Motion carried with 12 aye, 0 nay, 0 abstaining.

## **FY2011 RFP DISCUSSION**

IHRB RFP-10-01, *Improving Accuracy of the Deflection and Camber Predictions for Prestressed Concrete Bridge Girders*

No comments on funding level or scope.

IHRB RFP-10-02, *Optimization of Snow Drifting Mitigation and Control Methods for Iowa Conditions*

No comments on funding level or scope.

IHRB RFP-10-03 *Risk Mitigation Strategies for Operations and Maintenance Activities*

No comments on funding level or scope.

IHRB RFP-10-04, (No proposed funding amount yet. TBD) *Alkali Content of Fly Ash – Measuring and Testing Strategies for Evaluating Compliance*

Mark: I'll work with the Iowa DOT Materials Office to reach an amount and report back to the Board.

## **NEW BUSINESS**

The Travel Meeting scheduled for July 30, 2010, will be held at The University of Iowa's Lucille A. Carver Mississippi Riverside Environmental Research Station (LACMRERS) in Muscatine, Iowa. The Agenda will be limited, allowing exploration of the station's research and touring of the facilities. Doug Schnoebelen, LACMRERS director, is preparing an Agenda that will be emailed to attendees sometime next month.

If you plan to attend, please let us know as soon as possible so Doug has a head count. Also, we suggest you book your hotel as soon as possible, because there are other events happening on that day in the immediate area.

C: Are there still plans to go out on the river?

Mark: As far as we know that is something they are planning on. I'm not sure if river levels are going to be an issue over there or not. I haven't heard anything contrary at this point. I'll let you know if anything changes. A van will be leaving from Iowa DOT Ames complex the afternoon before if you're interested in carpooling.

## **ADJOURN**

Motion to Approve by C. Schloz. 2<sup>nd</sup> by R. Knoche.

Motion carried with 12 aye, 0 nay, 0 abstaining.

**The next meeting of the Iowa Highway Research Board will be held on Friday, May 21, 2010, in the East/West Materials Conference Room at the Iowa DOT.**

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**Mark J. Dunn, IHRB Secretary**