IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of April 26, 2019

Regular Board Members Present

W. Dotzler
C. Poole
R. Koester
R. Knoche
A. Bradley
W. Weiss
P. Geilenfeldt III
L. Bjerke
B. Wilkinson
J. Thorius
T. Kinney

Alternate Board Members Present

T. Wipf

Members with No Representation

D. Claman
T. Nicholson
S. Struble

Executive Secretary – V. Goetz

Visitors

Tammy Bailey	Iowa Department of Transportation
Brent Phares	Iowa State University
Travis Hosteng	Iowa State University

The meeting was held at the Iowa Department of Transportation Ames Complex, Building 5 Large Conference Room, on Friday, April 26, 2019. The meeting was called to order at 9:00 a.m. by Chair Allen Bradley with an initial number of 11 voting members/alternates at the table.

1. **Agenda review/modification**
   Discus AID Grant Project for Contracting Box Beams during new items

   Motion to Approve by R. Knoche; 2nd L Bjerke
   Motion carried with 11 Aye, 0 Nay, 0 Abstaining

2. **Minutes Approval from the February 2019 meeting**

Motion to Approve by W. Dotzler; 2nd J. Thorius
Motion carried with 11 Aye, 0 Nay, 0 Abstaining

3. **Membership Update**

V. Goetz stated that Brad Skinner is no longer with Montgomery County, and has left the board. A new member/alternate designation will be made by ICEA. Sarah Okerlund has left the City of Ankeny and taken a job with the DOT. Rudy Kester from the City of Waukee will replace Sarah. Rudy was previously the new alternate for Ron Knoche. APWA will be selecting who will be the new alternate for Ron.

V. Goetz presented Sarah a certificate for her years of service on the Iowa Highway Research Board.

Brad's certificate will be presented to him at a later date.

*****Member Joined the Table*****

4. **Final Report TR-680,** *"Laboratory and Field Evaluation of a Composite Glued-Laminated Girder to deck Connection"***,** Brent Phares, Iowa State University, $74,992, (15 min).

BACKGROUND

Although developments in design details, preservatives, and advanced engineered concepts have significantly improved timber bridge performance over the past several decades, timber is sometimes considered to be a poor bridge building material. However, when properly designed and protected from the elements, timber is a structurally capable, cost-effective, and aesthetically pleasing material suitable for many applications.

Today, with tightened budgets and increasing degradation of existing bridge inventories, city, county, and state offices are seeking structurally adequate and cost-effective bridge alternatives. In response, Buchanan County, Iowa, has been working with the National Center for Wood Transportation Structures (NCWTS) and a timber fabricator to develop a structurally efficient, long-lived, next-generation timber bridge.

OBJECTIVES

The objective of this project was to aid in the development of a next-generation timber bridge through the following:

- Laboratory and field testing of an innovative girder to deck connection detail designed to yield a composite structure
- Documenting construction of a next-generation timber bridge in Buchanan County

• Evaluating the bridge's field performance, including measuring changes in live load response over time and documenting the performance of a thin epoxy overlay wearing course on the bridge deck

BENEFITS

Of the two key innovations featured in this research—the use of epoxy for the deck-girder connection and a thin epoxy overlay wearing surface on the deck—the girder-deck connection performed adequately. The limiting factor for attaining true composite action with either the epoxied or bolted glulam connection details is not purely the deck to girder connection. Rather, gaps between adjacent deck panels must be reduced and/or eliminated to achieve a noticeable and accountable increase in composite action.

This connection detail has the potential to increase viable bridge options for use not only for Iowa's roadways, but nationally and internationally as well.

The thin epoxy wearing surface on the deck performed better as an impermeable joint filler than a wearing surface. In the future, the combination of an initial epoxy overlay to fill the joints and seal the gaps followed by a well-designed asphalt wearing surface may help prolong the life of the structure.

Successful implementation, monitoring, and performance reporting of a well-performing timber bridge may help improve the negative perception of timber as a bridge building material.

DISCUSSION

Q. Is that a sevety one-foot span? What is the construction cost?
A. Yes, it is a seventy one-foot span. I don't know the cost, but I could get that information for you.
Q. The transfer joints between the deck panel have that ledge connection. Even with the ledge connection you didn't think you got a good transfer of load?
A. You do longitudinally, from deck panel to deck panel, it is great. Transversely, the deck is a little thin and a little flexible. For the next bridge the supplier plans to epoxy that connection.

Motion to Approve by T. Kinney; 2nd R. Knoche
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

5. **FINAL REPORT TR-690,** *"Investigation into Shrinkage of High-Performance Concrete Used for Iowa Bridge Decks and Overlays-Phase II Shrinkage Control and Field Investigation*, Kejin Wang, Iowa State University, $299,993, (15 min).

BACKGROUND

A Phase I laboratory study conducted from 2011 to 2013 evaluated the shrinkage behavior of 11 High Performance Concrete mixes commonly used in Iowa bridge decks and overlays. The mixes were characterized based on their shrinkage behavior and mechanical properties as having either high, medium, or low cracking potential. Different shrinkage control technologies were suggested for these mixes.

Three concrete mixes with different shrinkage cracking potentials were selected from the Phase I study for further investigation in the Phase II study:

- Mix 6 (O-4WR), a mix with high shrinkage cracking potential, made with 100% Lafarge I/II cement, with a w/b ratio of 0.33
- Mix 8 (HPC-O-C20-S20), a mix with medium shrinkage cracking potential, made with quartzite as coarse aggregate, 80% Lafarge I/II cement, and 20% ground granulated blast furnace slag (GGBFS), with a w/b ratio of 0.40
- Mix 2 (HPC-O-C20), a mix with low shrinkage cracking potential, made with 80% Ash Grove IP cement and 20% Class C fly ash, with a w/b ratio of 0.40

OBJECTIVES

- Investigate different methods for controlling shrinkage cracking in Iowa HPC mixes and identify the most practical and effective applicable methods
- Investigate the field performance of selected Iowa HPC mixes and compare the performance of different mixes with varying shrinkage cracking potentials and the field performance of concrete mixes with and without shrinkage control methods
- Based on the results and observations from the laboratory and field investigations, provide recommendations for effectively controlling HPC shrinkage

BENEFITS

Adding 1.0/1.25 gal/yd3 of SRAs to Mix 6 demonstrated many positive effects on concrete shrinkage control and improved mechanical properties, except for the slight reduction in F-T durability. This shrinkage control method is recommended for shrinkage reduction and the prevention of premature concrete distress in Iowa bridge decks and overlays.

Reducing CM by 10% in Mix 8 decreased autogenous and free drying shrinkage significantly but did not significantly reduce ring shrinkage stress. This modification also noticeably reduced strength, elastic modulus, creep rate, and surface resistivity, which might impair serviceability. Therefore, it is recommended that this shrinkage control method be employed very cautiously.

Using Light Weight Fine Aggregate as an Internal Curing material in Mix 2 effectively reduced autogenous shrinkage but only slightly reduced free drying shrinkage and yielded little reduction in ring shrinkage stress. This modification also helped improve concrete strength, surface resistivity, and F-T durability slightly but reduced elastic modulus and creep rate. This shrinkage control

method can be considered for use in concrete mixes with moderate free drying shrinkage potential and/or mixes with a high autogenous shrinkage potential (i.e., concrete with a low w/b ratio).

Motion to Approve by R. Knoche; 2nd W. Dotzler
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

6. **FINAL REPORT TR-716** *"Construction of New Substructures Beneath Existing Bridges",* Bret Phares, Iowa State University, $49,808, (15 min),

BACKGROUND

To minimize traffic impact during accelerated bridge construction (ABC) projects, it is sometimes desirable to construct the new substructure underneath an existing bridge prior to its demolition and road closure. Installing a new substructure under an existing bridge creates challenges during construction, primarily due to the low overhead space and stability concerns for the existing foundation.

OBJECTIVES

The objectives of this project included three focus areas:

- Document through a literature search and survey, methods (including but not limited to multi-splicing and micropiles) for constructing new substructures beneath existing bridges
- Evaluate proven methods in terms of design considerations, constructability, and cost
- Document the project findings and develop method selection recommendations/guidelines

BENEFITS

Documenting proven techniques for constructing new substructures beneath existing bridges and comparing their design considerations, constructability, and costs will help engineers determine the most appropriate application of these techniques. This could help engineers make more consistent, efficient, and cost-effective decisions and reduce the risk in using the techniques on ABC projects.

Motion to Approve by R. Koester; 2nd P. Geilenfeldt III
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

7. PROPOSAL, *"Development of a Smartphone-Based Road Performance Data Collection Tool",* Halil Ceylan, Iowa State University, $296,901.

BACKGROUND

Over the last few years, many studies have been conducted to explore the feasibility of using smartphones to evaluate road performance. Table 1 summarizes some areas of road performance evaluation where the application of the smartphones is being actively researched or has been identified for future research over the last 10 years. Note that Table 1 is developed for this proposal by updating the most recent survey of the literature conducted by Alavi and Buttlar. As seen in this table, most previous studies have utilized GPS and accelerometer sensors inside smartphones. The majority of these studies have also investigated the use of the Android mobile operating system for developing smartphone applications to control the built-in sensors inside a smartphone for data collection and for processing the collected data into actionable information (e.g., IRI). Road performance types mainly investigated for potential applications are road surface anomaly detection, pothole detection, and IRI. The application for detecting cracking was investigated but is very limited.

OBJECTIVES

The objectives of this research are listed as follows:

- The first objective of this research would be to develop a smartphone-based (mobile application) pavement roughness measurement system for collecting roughness data at an appropriate frequency required for pavement management and maintenance planning.
- The second objective is to identify and evaluate the potential capacities of a smartphone-based tool for detecting and measuring other road surface distress types including cracking, rutting, faulting, and so on.
- The third objective is to develop a standardized nonproprietary data collection tool that can be used to collect roughness data required for pavement management and would also have the capabilities of providing the location and optional sensor data necessary for AVL systems.
- The fourth objective would be to test and calibrate the standardized nonproprietary collection tool for the various selected brands and types of popular Android smartphones in comparison to Class 1 profilometer specified by ASTM E 950 (e.g., high speed inertial profilometer unit, if available) with known high accuracy of IRI and GPS values to allow for field implementation being used in different types of vehicles.

BENEFITS

The outcomes resulting from this project will be of great benefit to Iowa county engineers to better manage their paved road systems. The work would result in a user-friendly and cost-effective smart road performance data collection tool enabling frequent performance data collection and leading to a significant reduction in the cost of acquiring pavement performance data and a better understanding overall pavement network performance level. Consequently, the outcomes resulting from this project will help facilitate decision-making in managing county paved-road assets, improve overall pavement network performance levels, and enhance the safety and mobility of the

Iowa county paved road system through enhanced abilities to make timely maintenance, repairing, and rehabilitation decisions.

Motion to Approve by T. Kinney; 2nd B. Wilkinson
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

8. RFP

a. **IHRB-187**, "Development of Approaches to Quantify Superloads and their Impacts on Iowa Road Infrastructure System".

V. Goetz stated that this project will go out for RFP July 15, if there are no changes or concerns by the Board.

The Board will table IHRB-187 project for further review until the May IHRB meeting.

9. New Business

a. **TRB's 12th International Conference on Low Volume Roads, September 15-18, 2019, Kalispell, MT**

V. Goetz stated that this International Conference will be held in Kalispell, MT. Iowa is participating in a Pooled Fund that will fund 2 DOT persons to attend the conference. The request is for Iowa Research Board to fund $10,000 to send four LPA representatives to this Conference.

Motion to Approve by T. Kinney; 2nd P Geilenfeldt III
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

b. **STIC Incentive Funds and AID Grant for FY19: Project Solicitation Out May 1st and due June 15th.**

V. Goetz stated, each federal fiscal year we get $100,000 dollars to be put towards implementation of innovations or technologies. FHWA rolled out the new Every Day Counts round 5 innovations last fall and Iowa has selected five of them. An e-mail was sent out earlier this week of the five selected technologies along with some ideas that could be possible projects that would help us submit them. Also, Iowa is eligible to apply for up to One Million Dollars for the State agency and up to One Million Dollars for the Sub percipient LPA for Advance Innovation Deployment Grant (AID). Iowa has applied for several of these in the past, and have currently been awarded 3 AID grants.

c. AID Award Update: Implementation of Innovative Contracting Method to Accelerate Replacement of County Bridges

Iowa DOT was awarded $1 Million dollars AID Grant in September of 2018 to pilot using Added Options Bidding to bundle the materials and supply the superstructure and UHPC joint material. The project team has been working towards a letting for April 2019, with a base bid of including 8 bridges in 8 different counties. We have an apparent bidder, and Office of Contracts is working on the contract. B. Moore will be working with Winneshiek, Buchanan, Fayette, Lyon, Monona, Madison, Dallas, and Davis Counties to move forward with bridge project development. Iowa DOT District 2 will be overseeing the project, with B. Moore assisting between the DOT contract and the county projects. County projects are targeting late summer and fall lettings. All bridges are to be built by the end of construction season in 2020.

10. Adjourn

The next meeting of the Iowa Highway Research Board will be held Friday, May 31, 2019 at 9:00 a.m. In the East/West Materials Conference Room at the Iowa DOT.

Vanessa Goetz, IHRB Executive Secretary