

## IOWA HIGHWAY RESEARCH BOARD (IHRB)

*Minutes of January 29, 2021*

### Regular Board Members Present

J. DeVries	R. Knoche
R. Koester	W. Dotzler
A. Bradley	D. Claman
D. Sanders	C. Burke
W. Weiss	T. Roll
J. Fantz	M. Rydl
B. Wilkinson	
A. McGuire	
T. Kinney	

### Members with No Representation

### Executive Secretary – V. Goetz

The meeting was held online via Microsoft Teams on January 29, 2021 at 9:00 a.m. by Chair Dave Claman with an initial number of 15 voting members/alternates.

#### 1. **Agenda review/modification**

**Agenda modified to Update IHRB Membership and Vote for new Vice Chair for 2021**

**Motion to Approve by J. DeVries; R. Koester**

Motion carried with 15 Aye, 0 Nay, 0 Abstaining

Andrew McGuire nominated to serve as the Vice Chair/Chair for 2021/2022

**Motion to Approve by W. Weiss; M. Rydl**

Motion carried with 14 Aye, 0 Nay, 1 Abstaining

#### 2. **Minutes Approval form the September 25, 2020 meeting**

**Motion to Approve by R. Knoche; J. DeVries**

Motion carried with 15 Aye, 0 Nay, 0 Abstaining

#### 3. **Iowa LTAP – 2020 Overview and 2021 Planning, Keith Knapp, Iowa State University (15 min).**

##### **Discussion**

Q. When will you be able to do in Person training?

A. Fall would be the current prediction.

#### 4. **Final Report: TR-735, "[Holding Strategies for Low-Volume State Routes – Phase II](http://publications.iowa.gov/35239)", Chris Williams, Iowa State University, \$100,642 (15 Min).**

<http://publications.iowa.gov/35239>

##### **Discussion**

Q. When you are looking at additional roads, do you want them to be over PCC pavement?  
A. No, we are looking at where we can employ these newer technologies and get improved performance on Low Volume Roads.

**Implementation:** Continued monitoring and propose Phase III

**Motion to Approve by** R. Koester; 2<sup>nd</sup> T. Roll  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

5. **Final Report: TR-768, “[Design and Detailing Requirements for Columns under Collision](#)”**, Alice Alipour, Iowa State University, \$100,000 (15 min).

<http://publications.iowa.gov/35240>

#### **Discussion**

Q. The 48-inch diameter column for the frame pier would be considered crash resistant?  
A. Yes, the 48-inch diameter is crash resistant.  
Q. The recommended reinforcing changes, would that make the 3-diameter column pier crash resistant?  
A. Yes, the 3-diameter column pier could be used at the speed of 50 miles per hour.

**Motion to Approve by** R. Knoche; 2<sup>nd</sup> W. Dotzler  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

6. **Proposal, “[Superabsorbent Polymers in Concrete to Improve Durability](#)”**, Peter Taylor, Iowa State University, \$49,915.50, (\$49,915.50 SPR funded) (15 min).

#### **Background**

Internal curing is the practice of providing small, well-distributed reservoirs of water throughout a concrete section such that the w/cm of the mixture can be kept low, but the water can later be delivered to hydrating cement as the system dries out. Internal curing has been reported to be effective in reducing shrinkage cracking, improving potential durability of concrete mixtures, and most notably, reducing warping and associated cracking in pavements and slabs on grade. Currently, the use of light-weight fine aggregate (LWFA) is the most common practice in the United States to produce internally cured concrete. This method, however, necessitates pre-saturation of aggregate at concrete batch plants in accordance with a set timeline. This may increase costs related to stockpile management in addition to the costs and emissions associated with production and hauling the LWFA. Furthermore, the use of LWFA can reduce elastic modulus of concrete.

The use of superabsorbent polymers (SAP) as a means of internal curing can address such problems, while promoting hydration and reducing the risk of early age cracking. However, there has been relatively little work conducted in the US on these materials. Remaining questions include:

- How should SAP products be specified?
- How much is needed?
- Can SAPs be dry batched with additional water in the mixture without compromising performance?
- How are mixtures affected by their use?

### **Objective**

The first recognized superabsorbent polymer was developed by the USDA agricultural research service in 1973 from chemically modified starch and poly(acrylonitrile). Known as “Super-Slurper”, this biosynthetic hybrid was acclaimed for its ability to absorb up to 1400 times its weight in water. Over the following decades fully synthetic SAPs were developed from various crosslinked polyacrylic and polyamides, with a primary use in agricultural, sanitary and convenience products. While synthetic SAPs have dominated the market due to cost and performance advantages, starch-based alternatives have recently been reintroduced to the marketplace through products like BioSAP (Archer-Daniels Midland Co.) or WATER LOCK (Grain Processing Corporation). The vast majority of commercial SAPs derive their performance from ionic groups in their chemical structure, and accordingly, performance will vary according to the pH and ionic character of the environment in which the SAP is use. A smaller subset of SAPs function based on polar non-ionic groups such as those found in crosslinked polyvinyl alcohol or polyethylene oxide, and as such have less absorbency but also less environmental sensitivity.

### **Benefits**

The fundamental aim will be to provide the tools to minimize cracking and increase longevity at minimum life cycle cost. The anticipated results of the proposed research include:

1. Determine the feasibility of using SAP in lieu of pre-wetted LWFA for internally cured concrete.
2. Develop practical guidance and specification language to be used when selecting an SAP and preparing and accepting mixtures containing SAP.
3. Provide performance and cost comparison data for internally cured concrete using SAP.

**Motion to Approve by** T. Roll; 2<sup>nd</sup> R. Koester

Motion carried with 15 Aye, 0 Nay, 0 Abstaining

7. **Proposal, “[Iowa Public Works Service Bureau](#)”,** Paul Wiegand, Iowa State university, \$490,000 (15 min).

### **Background**

In order to determine the feasibility of an urban service bureau in Iowa, the Iowa Highway Research Board initiated a study (TR-761) in 2018. The study was conducted by the SUDAS staff within the Institute for Transportation at Iowa State University. The primary focus of the study was to determine if there was interest in developing a statewide service bureau to serve public works official’s needs. Initial work involved a literature search to determine whether any similar organizations existed across the country, as well as setting up a questionnaire to be sent to all cities with a population above 250 people. It was determined no similar organizations exist.

The questionnaire addressed whether users were likely to use general applications containing contacts from other agencies, asset management, management tools, sample ordinances and policies, and communication with the Iowa DOT. Over 80% of the respondents indicated that they were highly or somewhat likely to use those applications. Based on those responses, the project team developed potential organizational structures and associated costs. The results indicated establishing the IPWSB within the SUDAS program was the least costly alternative due to existing funding for the current staff. Funding sources were evaluated, and it was determined the best source of revenue would be an off-the-top allocation of 1/8 of 1% from the street construction portion of Iowa’s Road Use Tax Fund. The final recommendation from TR-761 was to pursue establishing the IPWSB within the

SUDAS program with funding from Iowa's Road Use Tax Fund. In addition, TR-761 recommended a Phase 2 to provide funding for establishment of the IPWSB while the permanent funding was being pursued.

### **Objective**

The objectives of the Phase 2 project include providing for these general concepts:

- Assist public works departments across the state in streamlining essential services to their local communities.
- Improve efficient use of public resources, since new or expanded revenue sources are unlikely, in order to maintain each community's infrastructure, which is critical to the long-term sustainability of each community.
- Provide public works staff and civic leaders with specific data to allow them to make informed decisions and policies to improve the quality of life in Iowa communities.
- Maintain stable and sustainable communities through the in-depth understanding of the workings of Iowa public works departments.
- Improve infrastructure operational efficiencies by cultivating communication between agencies.

### **Benefits**

This study will provide the following benefits:

- Invaluable tools and resources for public works departments across the state, who provide essential services in their local communities.
- Efficient use of public resources to maintain each community's infrastructure, which is critical to the long-term sustainability of each community.
- Provide public works staff and civic leaders with specific data to allow them to make informed decisions and policies to improve the quality of life in Iowa communities.
- Stable and sustainable communities through the in-depth understanding of the workings of public works departments.
- Improved infrastructure operational efficiencies by cultivating communication between agencies.

### **Discussion**

Q. Has there been discussions with Legislatures, the Chair of the Transportation Committee or others to start the law change to make the one eighth of one cent for this funding?

A. We have not started that process, waiting for approval for this project.

Q. The funding would start with the IHRB then the Law change would fund this project in the future?

A. Yes

**Motion to Approve by** W. Weiss; 2<sup>nd</sup> R. Knoche

Motion carried with 14 Aye, 0 Nay, 1 Abstaining

8. Proposal, "[Next Generation Life-Cycle Cost Analysis Tool for Bridges in Iowa – Phase II](#)", Alice Alipour, Iowa State University, \$150,000 (15 Min)

### **Background**

The main objectives of the *Next Generation Life Cycle Cost Analysis Tool for Bridges in Iowa -Phase I* project was (1) to collect and synthesize background information on LCCA and bridge asset management practices, and (2) to develop a preliminary LCCA tool for the bridges in Iowa. Bridge data was sourced from experts in the field, Iowa's Structure Inventory and Inspection Management

System (SIIMS) database, and the National Bridge Inventory database to demonstrate the ability to supply the data necessary for a holistic LCCA approach. This approach included risk analysis in asset management, which has been required by the Moving Ahead for Progress in the 21st Century Act (MAP-21) since its enactment in 2012. Monte Carlo simulations and Markov-Chain models were developed to deliver a set of Iowa-specific deterioration models. Survival analysis was then used to evaluate the average ages for the different condition ratings based on the available data. The methodology successfully developed in Phase I takes into consideration the deterioration rates specific to Iowa bridge decks at two-year time intervals and aims to predict the agency and user costs associated with preserving, rehabilitating, and repairing the bridge decks. This offers a unique advantage over Iowa's current system, which selects projects based on the lowest bid or estimated initial cost. In addition, the developed tool is extendable to cover various bridge elements if needed. As part of the Phase I of this research project, the following tasks were completed with a focus on bridge decks: (1) formulation of representative deterioration models based on historical data, (2) development of a library of maintenance strategies used for deck components, their associated costs, and improvements achieved in the condition rating (or state), (3) identification of the cost of various maintenance and repair activities during a bridge's service life, and (4) development of an interactive tool to assess the life-cycle costs of bridge decks for Iowa.

### **Objective**

Building on the advancements made under the Phase I of this research project and after extensive discussions with the members of the project's Technical Advisory Committee (TAC), Phase II of this research project aims to tackle the following research objectives:

- **Task 1:** Enable the developed LCCA tool to consider various sources of uncertainty in cost-life expectancy calculations
- **Task 2:** Conduct a survey of the Iowa Department of Transportation's (DOT's) six districts to obtain firsthand information about the frequency and cost of various bridge deck maintenance activities, such as cleaning, epoxy injection, overlays, deck patching, and joint repair
- **Task 3:** Improve the current LCCA tool by integrating the original information obtained from the survey regarding the activities/costs associated with the maintenance bridge decks
- **Task 4:** Develop a user cost module for the tool as an optional choice to go beyond the direct cost calculations
- **Task 5:** Identify, test, and implement the necessary user interface options in the developed LCCA tool
- **Task 6:** Prepare and submit the final report, along with the second version of the LCCA tool, which will be accompanied by a user's manual and solved examples

### **Benefits**

The outcome of this project is expected to improve the existing procedure to assess the life-cycle cost of the bridges in Iowa. The planned activities will lead to an enhanced LCCA tool that will help the Iowa DOT, county engineers, and planners to define different alternatives for the repair and replacement of bridges, assess the life-cycle costs associated with each alternative, examine different input parameters to account for uncertainties and unknown factors, and reach a decision as to what is the best course of action. The results of this project will also provide a foundation for further development of decision-making tools for the bridges in Iowa. The project will further allow for assessing the reliability and relevancy of the available data sources to conduct LCCA and make recommendations on the type of data that need to be stored by state and county engineers to enhance the reliability of LCCA, leading to the improved safety and functionality of the bridges in service.

**Motion to Approve by** R. Knoche; 2<sup>nd</sup> R. Koester  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

9. RFP Review, "IHRB-3216 - [Iowa Granular Road Structural Design Tool](#)" to be posted March 15, 2021

**Motion to Approve by** W. Weiss; 2<sup>nd</sup> A. McGuire  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

10. IHRB Next Phase Project Ranking

**Motion to Approve by** W. Dotzler; 2<sup>nd</sup> W. Weiss  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

**Final Ranking:**

1. [Gradation Optimization for Improved Performance of Granular Surfaced Roadways \(#3070\)](#)
2. [A Decision-Matrix Tool for Culvert Grade Control Selection \(#3044\)](#)
3. [Development of Effective ABC Methods for Bridge Abutment Design and Construction \(#3058\)](#)
4. [Assessment of Epoxy Overlays in Iowa \(#3048\)](#)
5. [Implementing AG industry technology for tiling granular roads in Iowa \(#3062\)](#)
6. [Development of Effective ABC Methods for Pile-Footing-Column Systems \(#3055\)](#)
7. [Design of self-cleaning solutions for mitigating sedimentation at twin and single-box culverts \(#3071\)](#)
8. [Beam End Repair for Prestressed Concrete Beams - Field Implementation \(#3059\)](#)
9. [Automated Plate Load Test Evaluation of Long-term Performance of Pavement Foundation Systems \(#3206\)](#)
10. [Field Performance of Fiber-Reinforced Concrete Overlays \(#3067\)](#)

**Motion for ABC Project to move ahead prior to others for matching funds:**

**Motion to Approve by** W. Weiss; 2<sup>nd</sup> W. Dotzler  
Motion carried with 15 Aye, 0 Nay, 0 Abstaining

#	Idea	State	Reviewed	Rating	Ranking
3070	<a href="#">Gradation Optimization for Improved Performance of Granular Surfaced Roadways</a>	IHRB Ranking	14	3.2	3.2
3044	<a href="#">A Decision-Matrix Tool for Culvert Grade Control Selection</a>	IHRB Ranking	14	3.1	3.1
3058	<a href="#">Development of Effective ABC Methods for Bridge Abutment Design and Construction</a>	IHRB Ranking	14	3.1	3.1
3048	<a href="#">Assessment of Epoxy Overlays in Iowa</a>	IHRB Ranking	14	3.0	3.0
3062	<a href="#">Implementing AG industry technology for tiling granular roads in Iowa</a>	IHRB Ranking	14	3.0	3.0
3055	<a href="#">Development of Effective ABC Methods for Pile-Footing-Column Systems</a>	IHRB Ranking	13	2.9	2.9
3071	<a href="#">Design of self-cleaning solutions for mitigating sedimentation at twin and single-box culverts</a>	IHRB Ranking	14	2.8	2.8
3059	<a href="#">Beam End Repair for Prestressed Concrete Beams - Field Implementation</a>	IHRB Ranking	14	2.7	2.7
3206	<a href="#">Automated Plate Load Test Evaluation of Long-term Performance of Pavement Foundation Systems</a>	IHRB Ranking	14	2.6	2.6
3067	<a href="#">Field Performance of Fiber-Reinforced Concrete Overlays</a>	IHRB Ranking	14	2.5	2.5

## 11. New Business

-New Topics Ranking Final Result from December IHRB Review Committee Online

- 3050 [Pilot Use of Recycled tires as Geo-Cells](#) will move to Project Development. Vanessa Goetz – Champion
- 3051 [Effective Use of Waste Tire Derived Geomaterials for Improving Quality of Iowa Roadway Foundation](#) – **CANCELLED**. Idea combined with #3050
- 3054 [Base Stabilization of Iowa Gravel Roads using recycled Plastics](#) will move to Project Development. Brian Moore – Champion
- 3068 [Exploration of Using Biomass Ashes as Sustainable, Alternate Pozzolanic Materials to Replace Fly Ash](#) – **CANCELLED**. Idea will be considered under [Fly ash And Alternate Materials #3184](#)

-Iowa DOT Research has a new Ideation platform for innovation and research management. If you are not an employee of the Iowa DOT, please create an account and explore our new site!

<https://ideas.iowadot.gov/>

## 12. Meeting Adjourn

**Motion to Approve** by J. DeVries; 2<sup>nd</sup> R. Knoche

Motion carried with 15 Aye, 0 Nay, 0 Abstaining

The next regular meeting of the Iowa Highway Research Board is scheduled for Friday, February 26, 2021 at 9:00 am Online via Microsoft Teams Meeting. Please contact [Vanessa.Goetz@iowadot.us](mailto:Vanessa.Goetz@iowadot.us) by 4 p.m. Thursday February 25, 2021 if you would like to attend the meeting online.

Vanessa Goetz, IHRB Executive Secretary