

# IOWA HIGHWAY RESEARCH BOARD (IHRB)

*Minutes of February 28, 2020*

## **Regular Board Members Present**

P. Geilenfeldt III  
J. Fantz  
B. Wilkinson  
S. Struble  
A. McGuire  
D. Claman  
W. Dotzler  
J. DeVries

T. Nicholson  
R. Koester  
R. Knoche  
A. Bradley  
D. Sanders

## **Members with No Representation**

T. Kinney  
W. Weiss

## **Executive Secretary – V. Goetz**

## **Visitors**

Tammy Bailey	Iowa Department of Transportation
Brian Worrel	Iowa Department of Transportation
Khyle Clute	Iowa Department of Transportation
Francis Todey	Iowa Department of Transportation
Sarah Okerlund	Iowa Department of Transportation
Niki Stinn	Iowa Department of Transportation
Daniel Harness	Iowa Department of Transportation
Justin Dahlberg	Iowa State University/InTrans
Katheryn Freeseaman	Iowa State University/InTrans
Inya Nlenanya	Iowa State University/InTrans
Ashley Buss	Iowa State University/InTrans
David Scacka	Iowa State University/InTrans
John Shaw	Iowa State University/InTrans
Brian Moore	National Association of County Engineers
David Carroll	Warren County
Greg Mulder	Iowa Concrete Paving Association
Chris Cromwell	Federal Highway Administration
John Thomas	Hungry Canyons Alliance
Taylor Roll	Hardin County Engineer
Mitch Rydl	Audubon County Engineer

The meeting was held at the Iowa Department of Transportation Ames Complex, East/West Materials Conference Room on February 28, 2020. The meeting was called to order at 9:00 a.m. by Chair Ron Knoche with an initial number of 12 voting members/alternates at the table.

**1. Agenda review/modification**

Agenda Item Number 8 the proposal amount is \$182,829.48

**2. IHRB Membership update**

For the Iowa DOT:

Chris Poole was replaced by Jeff De Vries, Construction and Materials Bureau; Dan Harness, Design Bureau, will remain as the Alternate Member.

For the Counties:

Joel Frantz, Fayette County Engineer, moved to County District 2 regular member and Dusty Rolando, Floyd/Chickasaw County Engineer will serve as the new Alternate.

Andrew McGuire, Keokuk County Engineer, moved to County District 5 regular member, and Brad Skinner, Appanoose County Engineer, is the new County District 5 Alternate Member.

Terry Wipf will serve as David Sanders' Alternate for Iowa State University.

Paul Hanley will serve as Allen Bradley's Alternate for University of Iowa.

Ron Knoche, Iowa City Public Works Director is the 2020 IHRB Chair.

Motion to nominate Dave Claman as Vice-Chair for 2020 by Dave Claman; 2<sup>nd</sup> Rudy Koester  
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

**3. Minutes Approval from the December 10, 2019 meeting**

Motion to Approve by B. Dotzler; 2nd A. McGuire

Motion carried with 12 Aye, 0 Nay, 0 Abstaining

**4. Final Report: TR-750 "Documenting the Design and Use of Different Types Of Grade Control At Culverts,"** John Thomas, Hungry Canyons Alliance, \$25,000, (15 Min)

**BACKGROUND**

While existing literature sufficiently discusses how to properly design a culvert after choosing what type of Grade control will be used, there are no preliminary design aids available to easily compare different types of grade control for culverts. Engineers often don't have the time, staff, or budget to research the most cost-effective method of grade control. This especially pertains to new engineers or those who deal with grade control at culverts infrequently due to the geomorphic landscape they typically practice in.

The Hungry Canyons Alliance (HCA) was formed locally to research and implement solutions to widespread stream channel incision and erosion in a 19-county area of the deep loess soils

region of western Iowa. Since 1992, the HCA has provided state and federal cost share to build grade control structures to protect county infrastructure. Over that time, the HCA has cost-shared on at least 175 culvert grade control structures.

### **OBJECTIVES**

This “state of the practice” report evaluates and summarizes current methods of grade control at culverts with photographic examples of each type of culvert grade control. It is intended to be used as a reference to Help engineers in the preliminary design stage select the most cost-effective and constructible type of culvert grade control based primarily on the amount of grade needing controlled. While some culvert projects are designed to include grade control to achieve hydraulic efficiency and capacity at the inlet or to dissipate energy at the outlet, here we give engineers an end-product to shoot for to reverse engineer a culvert that requires a significant drop in elevation. This publication does not replace other design considerations, methodologies, guidance, or Manuals.

### **RECOMMENDATION**

We recommend an attempt be made to create an easy-to-use spreadsheet-based decision-matrix tool, along with any associated graphs/charts/other tools, to help engineers select the most cost-effective and constructible type of culvert grade control that also provides the longest-term performance with the least amount of ongoing maintenance. We also recommend that this “state of the practice” be updated every five years to keep the information in it as current and useful as possible.

### **DISCUSSION**

Q. If we get someone else to do the design metrics, would you be willing to be the champion of the Technical Advisory Committee?

A. Yes

**Motion to Approve by D. Sanders; 2<sup>nd</sup> B. Wilkinson**

Motion carried with 12 Aye, 0 Nay, 0 Abstaining

- 5. Final Report: TR-755, “*Scientific Innovations in Microsurfacing and Slurry Seal Mixture Design,*” Ashley Buss, Iowa State University, \$50,000, (15 Min)**

### **BACKGROUND**

Pavement preservation treatments that utilize asphalt emulsions are growing in popularity due to the overwhelming need to preserve infrastructure and ensure treatment cost effectiveness, as well as due to the versatility of asphalt emulsion applications. However, emulsions are not well understood by many practitioners in the civil engineering community. Both microsurfacing and slurry seal treatments use quick-setting emulsions. These emulsion formulations and mixture designs are engineered to work together to maintain adequate consistency during mixing and then rapidly set and break once placed on the roadway surface. This rapid break allows for rapid curing of the new pavement surface, allowing the road to be opened to traffic in as little time as an hour after treatment application.

## **OBJECTIVES**

The objectives of this study were to determine the feasibility of using zeta potential to better understand asphalt emulsion stability, asphalt emulsion/fine aggregate interactions, and development of cohesion in slurry seal mixtures over time. Using measurements during the microsurfacing or mixtures over slurry seal mixture design may help practitioners make more informed decisions about mixture adjustments when adapting to varying field conditions.

## **RECOMMENDATION**

This was one of six Innovative Projects funded by the Iowa Highway Research Board in 2018. Future studies should verify if the differences in zeta potential demonstrated in this laboratory study reflect field observations. For example, laboratory and field differences in temperature and humidity could contribute to differences in strength gain. In addition, exposing samples to a wide range of environments could prove useful in determining important additional environmental factors that impact the development of cohesive strength. Finally, more research could be done with additional types of emulsions having different chemistries, such as tack coats and cold-in-place mixtures, to determine whether zeta potential can help predict setting times for these emulsions as well.

**Motion to Approve by B. Dotzler; 2<sup>nd</sup> S. Struble**  
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

- 6. Proposal IHRB-172: “Guide to Remediate Bridge Deck Cracking”, Mohamed Elbatanouny, Wiss, Janney, Elstner, \$175,000.**

## **BACKGROUND**

Cracking is a common issue in concrete bridge decks. Early-age cracking is most commonly caused by autogenous shrinkage, drying and/or differential drying shrinkage, and volumetric change due to thermal effects, including initial heat of hydration and diurnal temperature cycling, combined with high levels of restraint. The change in volume combined with restraints from structural connections, reinforcement, and aggregates within the concrete induce tensile stresses that exceed the tensile strength of the concrete, often at a young age. Other potential causes of early-age cracking are movements of formwork and frost damage (Cuelho & Stephens, 2013). Cracks can also be caused subsidence (settlement over reinforcing steel). Subsidence or settlement cracks occur when settlement of concrete occurs at some obstruction, like reinforcing steel. Reinforcing steel is typically supported by chairs or bolsters. When concrete is in a plastic state, natural settlement occurs as dense constituents (aggregate and cement) sink to the bottom. The supported reinforcing steel stops this natural settlement process and can cause tensile stress and cracking directly above the reinforcing steel. These types of cracks can significantly compromise the service life, because the cracks directly expose lengths of the reinforcing steel and allow aggressive agents to easily penetrate the concrete directly to the steel.

## **OBJECTIVE**

The primary objective of this study is to develop a comprehensive guide to remediate cracks in bridge decks by completing a synthesis of existing practices (including industry practices,

standards, and specifications) and creating decision matrices for crack remediation options. The guide is intended to address different types of cracking scenarios and provide both high-level discussion of appropriate and feasible repairs and best practices as well as detailed guidance on procedures and available materials. Users will be able to reference the guide for:

- Aides and decision matrices for selecting crack repair systems that identify appropriate repair methods and materials based on the existing deck condition and crack characteristics;
- Guidance for choosing between potential repair systems based on practical considerations, including ease of installation, expected service life benefit to be experienced by the deck, and benefit-cost ratio; suggested crack inspection procedures for acquiring the condition information used by the decision-making aides to select appropriate crack repairs and verifying effective installation; and
- Guidelines on repair procedures and best practices for each crack repair method considered.

**Motion to Approve by S. Struble; 2<sup>nd</sup> R. Koester**  
Motion carried with 12 Aye, 0 Nay, 0 Abstaining

\*\*\*Member joined table\*\*\*

**7. Proposal IHRB-93: “Iowa’s Pavement Preservation Guide”, Ashley Buss, Iowa State University, \$120,000.**

**BACKGROUND**

The Phase 1 study developed life-extension estimates based on pavement performance data and conducted a survey of county engineers to better understand pavement preservation needs for Iowa roadways. The first choice was improved avenues for funding which demonstrates a need for ensuring cost-effective decisions are being made on a network- and project-level. Next, the areas of need are selection criteria and guidance for techniques as well as materials selection and specification guidance. The guidance developed through this research will provide decision tools for practitioners to choose treatment alternatives and efficiently analyze costs. The pavement preservation guide will also provide important preservation treatment summary information with notes about materials, specifications, and construction considerations.

This project also leverages work done by IHRB Project TR-651, Iowa Pavement Asset Management Decision-Making Framework. Management Decision-Making Framework. This study developed decision trees for pavement treatments, considered return-on-investment (ROI) analysis, and analyzed non-economic factors for treatment considerations.

A South Carolina DOT study recommended implementing methods that help pavement managers easily identify pavement sections that are good candidates for pavement preservation, GIS tools to visualize locations of preservation candidates, integrate pavement management tools to support cost-benefit analysis and invest in training for agency personnel.

Many states have developed pavement preservation guidance documents to help practitioners optimize their budgets and enhance long-term performance of the roadway. The Federal Highway Administration (FHWA), Strategic Highway Research Program (SHRP2), and National

Cooperative for Highway Research Program (NCHRP) have also developed national-level guidance for pavement preservation project selection, optimal timing, and implementing pavement preservation programs. Long term pavement performance (LTPP) studies provide estimated preservation treatment life extension and states with active preservation programs have published reports showing preservation treatments are cost-effective and keeping roads in better condition longer. The research team will use these resources to document recommendations for Iowa’s Pavement Preservation Guide.

**OBJECTIVE**

The primary objective of this project is to create a stand-alone document titled, “Iowa’s Pavement Preservation Guide”. The guide will summarize proven pavement preservation techniques for HMA and PCC pavements in Iowa. This project will build on past Iowa pavement preservation research, past Iowa research in asset management, and summarize best practices from sources across the country. The literature review will focus on pavement preservation guidance manuals developed by states with active preservation programs. Decision tables will be tailored to Iowa roads and guide practitioners toward the best treatment alternatives. The guide will concisely summarize the distresses each pavement preservation treatment targets, treatment advantages and disadvantages, treatment costs (and note any bid items excluded from the estimate), typical life extension, and special considerations or curing times. A comprehensive literature review and project report will be developed to document the recommendations in the guide.

Motion to Approve by P. Geilenfeldt III; 2<sup>nd</sup> J. Fantz  
 Motion carried with 13 Aye, 0 Nay, 0 Abstaining

- 8. **Proposal: IHRB-346: “Load and Resistance Factor Rating of Iowa DOT Standard Bridges Designed LRFD”,** Steve W. Moffitt, HGM Associates, \$182,829.48, (15 min)

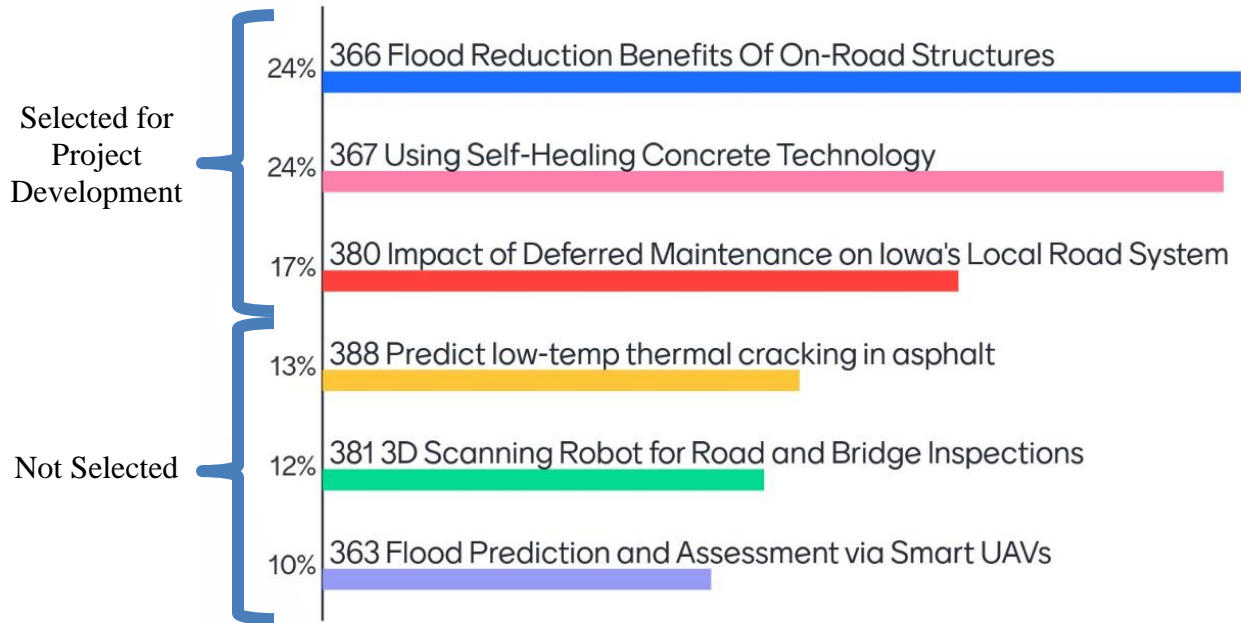
**BACKGROUND**

This project involves computing bridge load ratings for the J, H and RS standard designs and presenting them in a format consistent with previous IHRB rating reports which will be posted on the IDOT website for bridge owners and program managers to use in documenting their bridge inventories. The standard bridges that will be rated under this agreement include:

<b>Standard</b>
J24-06
J30-06
J40-06/14
J44-06/14
H24-06
H30-06
H30SI-12
H40-06/14
H44-07/14
RS40-10/14

Motion to Approve by S. Struble; 2<sup>nd</sup> D. Claman  
 Motion carried with 13 Aye, 0 Nay, 0 Abstaining

**9. New Topic Voting – Final Ranking** Motion to Approve by S. Struble; 2<sup>nd</sup> R. Koester

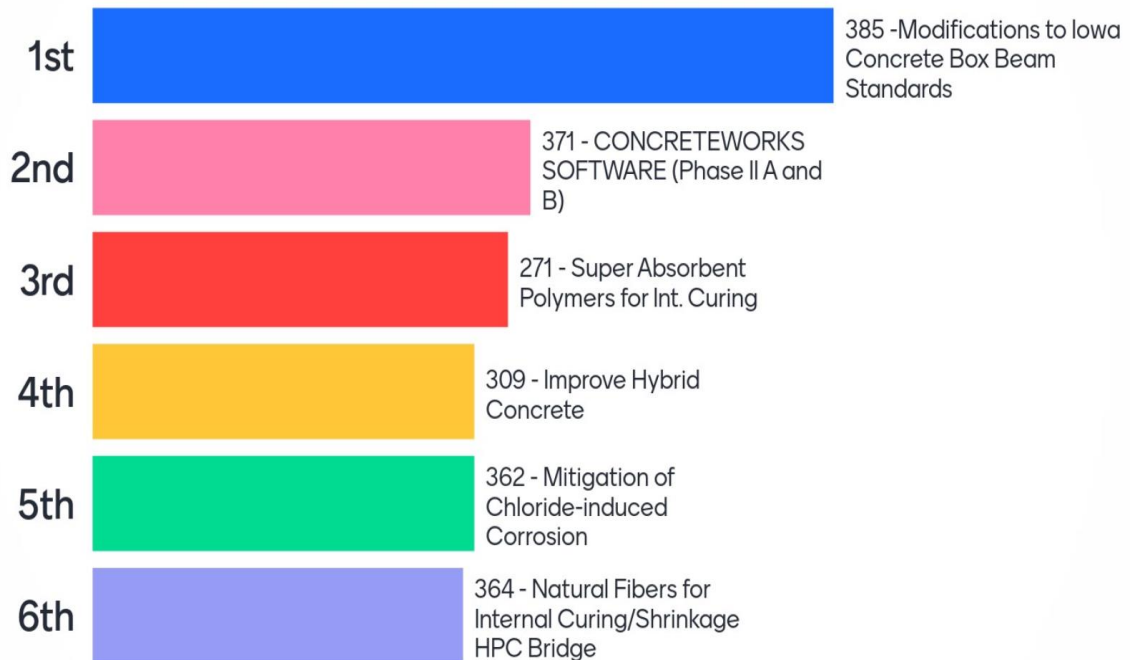


Motion to Approve by R. Koester; 2<sup>nd</sup> D. Claman  
 Motion carried with 13 Aye, 0 Nay, 0 Abstaining

**10. Continuation Project Ranking**

Submission No	Previous Project #	New Phase Project Title
271	TR-746	Use of Super Absorbent Polymers for Internal Curing of Concrete Bridge Decks and Pavements
309	TR-708B	Develop Evaluation Test Methods and Improve Durability and Crack Resistance of Hybrid Concrete
362	TR-754	Mitigation of Chloride-induced Corrosion Through Chemisorption
364	TR-690	Using Natural Fibers for Internal Curing and Shrinkage Reduction of HPC Bridge Decks & Overlays
371	TR-712	Evaluate, Modify and Adapt the Concreteworks Software (Phase II A and B)
385	TR-663	Modifications to Iowa Concrete Box Beam Standards

Results:



**Motion to Approve by S. Struble; 2<sup>nd</sup> T. Nicholson**  
Motion carried with 13 Aye, 0 Nay, 0 Abstaining

### 11. New Business

### 12. Meeting Adjourn

\*\*\*\*The March 2020 IHRB Meeting was cancelled\*\*\*\*

The next regular meeting of the Iowa Highway Research Board is scheduled for April 24, 2020 in the East/West Materials Conference Room at the Iowa DOT.

Vanessa Goetz, IHRB Executive Secretary