

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of May 31, 2019

Regular Board Members Present

W. Dotzler
C. Poole
T. Nicholson
R. Koester
R. Knoche
W. Weiss
P. Geilenfeldt III

L. Bjerke
B. Wilkinson
T. Kinney

Alternate Board Members Present

T. Wipf

Members with No Representation

D. Claman
A. Bradley
S. Struble
J. Thorius

Executive Secretary – V. Goetz

Visitors

Francis Today
Chris Brakke
Sarah Okerlund
Eric Cowles
David White
Khyle Clute
Katelyn Freeseaman
Brent Phares
Ashley Buss
Justin Dahlberg
Jerod Gross
Dan King
Peter Taylor
Greg Mulder
Randy Koester

Iowa Department of Transportation
Iowa Department of Transportation
Iowa Department of Transportation
Iowa Department of Transportation
Ingios Geotechnics, Inc.
Institute for Transportation
Institute for Transportation
Institute for Transportation
Institute for Transportation
Institute for Transportation
Institute for Transportation
Snyder & Associates
Iowa Concrete Paving Association
Iowa Concrete Paving Association
Iowa Concrete Paving Association
APWA

The meeting was held at the Iowa Department of Transportation Ames Complex, Building 5 Large Conference Room, on Friday, May 31, 2019. The meeting was called to order at 9:00 a.m. by Vice Chair Ron Knoche with an initial number of 11 voting members/alternates at the table.

1. Agenda review/modification

2. Membership Update

V. Goetz stated that Brad Skinner left Montgomery County, District four. Steve Strubble will move to the member spot and John Rassmussen from Pottawattamie County will be the new alternate.

3. Minutes Approval from the April 26, 2019 meeting

Motion to Approve by W. Dotzler; 2nd W. Weiss

Motion carried with 10 Aye, 0 Nay, 0 Abstaining

Member Joined the table

4. Final Report: ST-003, "In-Situ Modulus Measurement Using Automated Plate Load Testing for Statewide Mechanistic-Empirical Design Calibration", David White, Ingios Geotechnics, Inc., \$125,000

BACKGROUND

To develop the AASHTOWare Pavement ME Design™ input data needed for typical Iowa foundation layers, the Iowa Department of Transportation selected the Automated Plate Load Testing to conduct a state-wide field study. An experimental plan was developed in collaboration with the Iowa DOT pavement design and construction engineering teams. A total of 10 project sites were selected that covered common unbound foundation layer cross-sections used in Iowa highways. Projects consisted of different subbase types (granular subbase and modified subbase, per Iowa DOT standard specifications), different subbase materials (crushed limestone and recycled concrete aggregate), different subgrade types (select subgrade and embankment cut/fill subgrade). The goal at each site was to perform cyclic APLTs at 4 to 8 tests locations using a 12 in. diameter loading plate and perform static APLTs to determine modulus of subgrade reaction *k*-value at 1 to 2 test locations using a 30 in. diameter loading plate. Six of the ten projects were tested in fall of 2017 and the remaining four in spring of 2018, shortly after the spring-thaw. An additional site was selected for testing in fall 2018, but rain delays prevented project access. For each project site, an individual data report for each test location summarizing the composite resilient modulus, layered resilient modulus analysis results, the

“universal” model parameter values, modulus of subgrade reaction, penetration resistance profile from dynamic cone penetration test and a picture were documented. Summary statistics of average, standard deviation, and coefficient of variation of the different parameters are summarized separately for each project.

OBJECTIVES

To develop the AASHTOWare Pavement ME Design™ input data needed for Iowa foundation layers, the following testing program of in situ APLT testing was proposed for new pavements and reconstruction projects in six Iowa districts. The scope of work included:

- Reviewing pertinent project location information provided by the Iowa DOT to select two project sites from each Iowa district for up to 10-12 project locations that cover a wide range of soil conditions.
- Mobilizing APLT to each project site to conduct field testing.
- Conducting cyclic and static APLTs at each project location to generate a statistically robust dataset.
- Conducting dynamic cone penetrometer (DCP) test at each APLT location to obtain the layer thickness profile for back calculation analysis.
- Obtaining and conducting the necessary laboratory tests for soil characterization/classification.
- Developing a data report for each project site with a summary memo for Iowa DOT review.
- Developing a final report and presentation to Iowa DOT on key findings.
- Developing a technical brief.

BENEFITS

The results of implementing AASHTOWare Pavement ME Design™ capability coupled with in situ measured/verified M_r values is anticipated to reduce risk of not meeting pavement design performance criteria save money for optimizing selection of pavement foundation materials, provide efficiencies in design and construction, and increase quality, thus helping to insure long-term performance. The results and approach presented in this project report offers valuable information to practicing engineers and highway agencies on in situ ME calibration work for pavement foundation layers.

DISCUSSION

Q. Is VIC this like intelligent compaction?

A. Yes, but this is better. This is part of a new generation of construction systems that validate design data.

Motion to Approve by W. Dotzler; 2nd T. Nicholson

Motion carried with 11 Aye, 0 Nay, 0 Abstaining

5. **Final Report: TR-698**, “Optimized Joint Spacing for Concrete Overlays with and without Structural Fiber Reinforcement”, Peter Taylor, Iowa State University, \$200,638

BACKGROUND

In thin concrete overlays (4-inch to 6-inch), field observations have sometimes shown that not all contraction joints activate initially and, in some cases, do not activate until many years after construction. Contraction joints that do not activate may be considered an inefficient design that leads to unnecessary maintenance efforts, unnecessary costs, and negative impacts on concrete overlay performance. Optimum joint spacing design for concrete overlays may need to be determined based on factors different from those that are currently considered.

OBJECTIVES

The objective of this study was to determine the optimum joint spacing for thin concrete overlays (4-inch to 6-inch) based on traffic loading, concrete overlay thickness, support system, presence of fibers, and concrete overlay types.

BENEFITS

The results of this study are beneficial to the Iowa Department of Transportation (DOT) and local agencies. The results appear to show a correlation between joint activation and the ratio of slab length to radius of relative stiffness (L/ℓ). Designing joint spacing to achieve L/ℓ between 4 and 7 may provide the desired balance between maximum, timely joint activation, and good overlay performance. The findings of this study are being shared with cities, counties, the Iowa DOT, and consultants through various programs including concrete pavement lunch forums, Iowa Concrete Paving Association (ICPA) workshops, and other seminars. Publications are being distributed via the National Concrete Pavement Technology (CP Tech) Center website and other newsletters.

DISCUSSION

Q. Shorter joints control cracking has been the history, does that remain true?

A. Yes, but there is a crossover or sweet spot that appears to be the best of both situations.

Motion to Approve by R. Koester; 2nd T. Nicholson

Motion carried with 11 Aye, 0 Nay, 0 Abstaining

6. **Final Report: TR-709**, “Effectiveness of Pavement Preservation”, Ashley Buss, Iowa State University, \$120,000.

BACKGROUND

The Iowa Department of Transportation (DOT) has invested in collecting pavement performance information and storing it in their own pavement management information system. Combined with construction records, this database can be utilized to extract performance data on a project-by-project basis for various preservation methods.

Pavement preservation techniques can be integrated into a pavement management strategy so that treatments are applied over more miles at less cost.

OBJECTIVE

The objective of this research was to improve the understanding of pavement preservation effectiveness in Iowa using both qualitative and quantitative metrics.

BENEFITS

This study works toward establishing data-driven pavement preservation guidance. The research compiles construction and performance data in one place to objectively analyze the cost-effectiveness of preservation strategies based on observed performance. The methodologies to determine index service life extensions and index value benefits are discussed extensively in the final project report.

While the quantity of projects with data remains relatively small, the framework for adding additional project data for each preservation method is soundly in place. In time, additional project data will be available to add to this study's analysis.

The immediate benefit of this research is that it provides a tool for agencies to assess their localized pavement performance, allowing for more effective treatment selection in terms of both performance and economics.

DISCUSSION

Q. What are the next steps for implementation?

A. Review survey results and levels of interest. Funding and guidance were high priorities to pursue. Hoping to tie those priorities into other projects currently being worked on to provide answers.

Q. Would presentations help how the priorities are being dealt with?

A. We are hoping to build a practitioner's guide.

Motion to Approve by T. Kinney; 2nd W. Dotzler

Motion carried with 11 Aye, 0 Nay, 0 Abstaining

- 7. Final Report: TR-710, "Partially Grouted Revetment for Low-Volume Road Bridges", Brent Phares, Iowa State University, \$93,500.**

BACKGROUND

The Iowa secondary road system has a large number of scour susceptible bridges or bridges with unknown foundation conditions. These structures are commonly required to have a plan of action (POA) developed and implemented, which will close the structure during flood events, or have countermeasures installed that will allow the bridge to remain open during the event. In the case of unknown foundations, countermeasures must be installed.

Not surprisingly, installing the needed countermeasures can be a very costly endeavor. This is especially concerning given the fact that county budgets are already tight. Thus, there is a need to investigate various countermeasure options that are both affordable and effective.

Among the many different countermeasures available is a potentially viable technique known as a partially grouted revetment (also referred to as partially grouted riprap). Partially grouted revetments have been successfully used in Europe, and more recently in Minnesota. Partially grouted revetments are used in Europe to prevent scour and/or erosion of riverbeds and to also prevent scour at bridge piers and abutments.

Partially grouted revetment construction involves the placement of rock, stone, and/or recycled concrete on a filter layer that is compatible with the subsoil. The voids of the matrix are then partially filled with a Portland cement-based grout material.

OBJECTIVES

The overall objectives of this project are as follows:

- Document the use of scour countermeasures including grouted revetments and assess general performance of each through anecdotal evidence
- Document performance and cost-effectiveness of existing, in-use countermeasures in the field
- Install partially grouted revetment pilot/demonstration projects
- Document and monitor the performance of partially grouted revetment pilot installations
- Develop guidance or best practices for scour countermeasures

This interim report presents background information on countermeasure types and their frequency of use, including a field review of existing countermeasures to determine quality of performance. These efforts were followed by several pilot installation sites on county infrastructure in Iowa using partially grouted revetments.

DISCUSSION

Q. Does grouting change rip-rap specs?

A. No, Rip-rap is as normal, add grout on top.

IMPLEMENTATION

Next steps to aid in implementation include developing specs for projects as well as develop contractor training for placement of the grouted revetment.

Motion to Approve by B. Wilkinson; 2nd L. Bjerke

Motion carried with 11 Aye, 0 Nay, 0 Abstaining

8. **Matching Funds Proposal:** *“Evaluation of Performance of A709 Grade QST 65 Steel”*, Justin Dahlberg, Iowa State University, \$131,140, (15 min)

BACKGROUND

ASTM A913 steel has been referenced in the AISC Steel Construction Manual for many years and has been used in vertical construction with enough success to see its use continue. The grade was developed in Europe in the late 1970s and 1980s and became more readily used in the early 1990s. United States based Nucor-Yamato Steel became the first domestic producer of this grade in 2016. At the end of 2018, Nucor-Yamato received approval to include ASTM A913 into the ASTM A709-18 Standard Specification for Structural Steel for Bridges. Under the A709 specification and for reference to bridge steels, A913 Grade 65 is listed as A709 Grade QST 65.

With any new material, there are frequently questions about how a structure designed with the material will meet current design assumptions and provisions. In many ways, testing of new materials is simply needed to convince people of the material efficacy and performance. The objective of this project is to further evaluate and characterize A709 Grade QST 65 for use in bridge projects with a forward-looking view to identifying materials, concepts, ideas, etc. that are more cost-effective than current options.

OBJECTIVES

The primary goal for this project is to evaluate the efficacy of A709 grade QST 65 steel for use in bridge projects. The objectives of the project are as follows:

- Identify the current state of use of A709 grade QST 65 steel in bridge projects worldwide
- Identify the ductility and strength characteristics of A709 grade QST 65 steel through full-scale laboratory testing
- Identify the fatigue characteristics of A709 grade QST 65 steel through cyclic fatigue testing
- Observe and compare bridge construction similarities and differences to conventional construction using a new bridge planned for construction over Sand Creek in Buchanan County, IA in summer 2019 as a real-life, case study
- Compare relative costs of using A709 grade QST 65 steel over conventional steel
- Measure the live-load response at various points in time of the soon to be constructed Sand Creek bridge which is being constructed using A709 grade QST 65

BENEFITS

Cost savings on bridge construction projects can be realized if A709 Grade QST 65 Steel is used in lieu of more commonly used 50 ksi steel. A pound for pound greater cost of 3% is offset by the likely reduction in member sizes required and differing erection requirements. Using the yet-to-be constructed Sand Creek Bridge in Buchanan County, IA as an example, a cost comparison will

directly show the differences between this new steel grade and more commonly used 50 ksi steel. Even more, secondary benefits such as a reduced structure depth can lead to additional savings.

Motion to Approve by W. Weiss; 2nd T. Kinney
Motion carried with 11 Aye, 0 Nay, 0 Abstaining

9. RFP: “Development of Approaches to Quantify Superloads and their Impacts on Iowa Road Infrastructure System”

Motion to Approve by W. Weiss; 2nd T. Kinney
Motion carried with 11 Aye, 0 Nay, 0 Abstaining

10. New Business

V. Goetz stated that the IHRB approved four County Engineers to go to the Low Volume Road Conference in September in Kalispell, MT. W. Weiss requested to increase the funding for one additional County Engineer to attend.

The Research Bureau is sponsoring LPA’s to attend the Mid-West Conference Research Compositum in August with a reduced rate of fifty dollars for a LPA agency.

Motion to Approve by W. Weiss; 2nd T. Nicholson
Motion carried with 11 Aye, 0 Nay, 0 Abstaining

11. Adjourn

Motion to Approve by L. Bjerke; 2nd P. Geilenfeldt III
Motion carried with 11 Aye, 0 Nay, 0 Abstaining

The next meeting of the Iowa Highway Research Board will be held Friday, July 26, 2019 at 9:00 a.m. In the East/West Materials Conference Room at the Iowa DOT.

****The June IHRB meeting was cancelled****



Vanessa Goetz, IHRB Executive Secretary