

IOWA HIGHWAY RESEARCH BOARD (IHRB)

Minutes of June 26, 2020

Regular Board Members Present

A. Bradley	R. Koester
A. McGuire	D. Sanders
B. Wilkinson	T. Roll
J. DeVries	T. Kinney
J. Fantz	W. Weiss
T. Nicholson	B. Dotzler
R. Knoche	

Members with Representation

A. Abu-Hawash

Members with No Representation

S. Struble

Executive Secretary – V. Goetz

The meeting was held online via Microsoft Teams on June 26, 2020 at 9:00 a.m. by Chair Ron Knoche with an initial number of 13 voting members/alternates.

1. Agenda review/modification

2. Minutes Approval form the April 24, 2020 meeting

Motion to Approve by D. Sanders; 2nd T. Kinney

Motion carried with 13 Aye, 0 Nay, 0 Abstaining

*****Member Joined*****

3. Proposal: TR-712, “Evaluate, Modify, and Adapt he ConcreteWorks Software for Iowa’s Use (Phase II A&B)”, Kejin Wang, Iowa State University, \$292,234, (15 Min).

BACKGROUND

As mentioned previously, during the recent IHRB Project (TR 712 - Phase I), researchers found that concrete mixes containing slag, especially at a high replacement level, displayed a higher adiabatic temperature rise (ATR) than the concrete containing the same amount of fly ash. Based on existing publications, a main reason for this is that the pre-treatments used for modern slags alternate slag fineness, particle size distribution, and calcium sulfate content, and such slags affect the hydration of

cement differently from the slags used in earlier years. The issue related to the changes in slag characteristics has not been addressed in the current ConcreteWorks (CW) software. In addition, there are two adjacent peaks commonly seen in the heat generation curve of the cement containing slag, but only a single peak is in the heat generation curve of OPC and OPC-fly ash cement. Currently, the prediction models used in the CW software do not consider the occurrence of these two hydration peaks but only one peak, thus leading to an inaccurate estimation of the temperature of concrete containing slag.

Lately, the research team conducted a preliminary thermal analysis for the Iowa I74 mass concrete project using CW, where slag was used in the concrete mix, and the results showed that the maximum and differential temperatures predicted using CW were all over 10°F higher than those measured. To improve the reliability of the prediction, CW shall be further modified to be suitable for Iowa mass concrete mixes containing slags. Based on the TR712 research team's knowledge, some research is currently in progress in the State of Florida studying the effects of different slag compositions and fineness on cement hydration. However, the on-going study in Florida does not consider the effects of slag dosages (or replacement levels) neither the ATR prediction models for mass concrete containing slag. In addition, the slags and concrete mixes used in Florida are very different from those used in Iowa. As slags are commonly used in Iowa mass concrete mixes, conducting an additional study to further improve thermal prediction of Iowa mass concrete containing slags is necessary.

OBJECTIVES

This proposed work on TR 712 - Phase IIA aims at having a better understanding on the hydration of slag as well as its effects on the temperature development in the mass concrete used in Iowa. The goal of the study is to improve the thermal prediction of CW for Iowa mass concrete containing slag.

The specific objectives of this study are:

- (1) To investigate the characteristics of the slags commonly used in Iowa and their effects on the ATR in Iowa mass concrete structures
- (2) To establish hydration model of binary and ternary cementitious materials containing slag
- (3) To develop an appropriate ATR prediction model that will be incorporated into CW
- (4) To validate the ATR prediction model and improve the thermal prediction of CW for Iowa mass concrete containing slag.

BENEFITS

It is expected that the new slag hydration model and slag concrete ATR model obtained from the Phase IIA study will lead to a better understanding of the effects of slag type and replacement level on the cement hydration and to more accurate predictions of the thermal behavior of concrete mixes containing slag. Using the updated CW software, Iowa state, county, and city engineers can obtain a better prediction of the thermal behavior of mass concrete and make a choice for the use of slag in future mass concrete projects.

The seal slab component obtained from the Phase IIB study will be a new addition to the current CW software. Iowa state and county engineers will be the first-time users to predict the thermal behavior of a seal slab and its effect on the thermal behavior of the mass concrete footing above.

Based on the reliable predictions, measures can be taken for a proper temperature control, thus reducing thermal cracking potential. The models and predictions in the updated CW will be developed based on and validated by the experimental results obtained from Iowa concrete materials, and therefore the Iowa concrete industry will benefit the most.

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

Motion carried with 14 Aye, 0 Nay, 0 Abstaining

4. RFP: IHRB – 181, “Alternative Funding Approaches for Iowa Roads”.

Motion to Approve by W. Dotzler; 2nd R. Koester

Motion carried with 14 Aye, 0 Nay, 0 Abstaining

5. RFP: IHRB – 275, “Bridges Designed for Minimum Maintenance”.

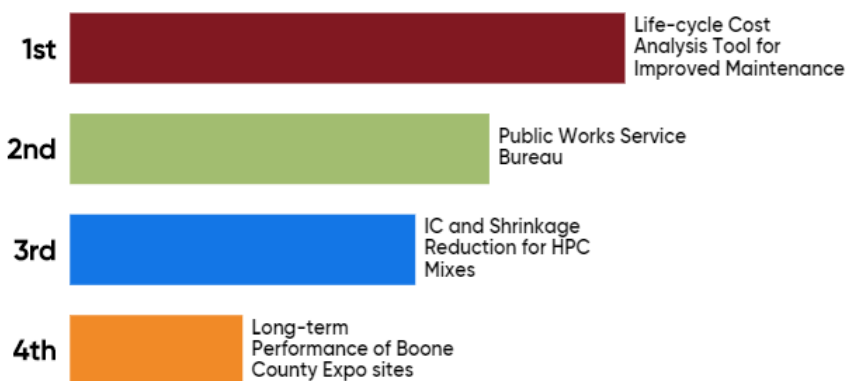
Motion to Approve by T. Kinney; 2nd J. DeVries

Motion carried with 14 Aye, 0 Nay, 0 Abstaining

6. Continuation Phase Project Ranking:

Number	Title
364	Using Natural Fibers for Internal Curing and Shrinkage Reduction of HPC Bridge Decks & Overlays
389	Automated Plate Load Test Evaluation of Long-term Performance of Pavement Foundation Systems
412	Iowa Public Works Service Bureau, Phase 2
432	Extension of the Life-Cycle Cost Analysis Tool for Improved Maintenance and Management of Bridges

Results:



Motion to Approve by A. Abu-Hawash; 2nd B. Wilkinson

Motion carried with 14 Aye, 0 Nay, 0 Abstaining

7. New Business

- a. New Idea Submittal Platform Live July 1. www.ideas.iowadot.gov
Everyone is welcome to explore the site and encouraged to participate! DOT employees already have access to the site. External partners will need to create an account.
- b. New IHRB Alternate member for County Dist 3 is William Rabenberg, Clay County Engineer

8. Meeting Adjourn

The next regular meeting of the Iowa Highway Research Board is scheduled for July 31, 2020 Online via Microsoft Teams Meeting. Please contact Vanessa.Goetz@iowadot.us by 4 p.m. Thursday July 30, 2020 if you would like to attend the meeting online.



Vanessa Goetz, IHRB Executive Secretary