AUGUST 2024

ABOUT THIS PROJECT

PROJECT NAME: Develop and Field Test Non-Proprietary Ultra-High Performance Concrete for New Bridge Decks

PROJECT NUMBER: TR-773

PROJECT FUNDING PROGRAM:
Iowa Highway Research Board

PROJECTED END DATE: February 2026

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RESEARCH IN PROGRESS

Developing Iowa's own ultra-high performance concrete for bridge decks

Ultra-high performance concrete (UHPC) enables bridges to potentially achieve superior strength and durability while minimizing maintenance needs and prolonging service life. But because UHPC costs significantly more than conventional concrete, its use in Iowa has been limited.

This project aims to develop a cost-effective UHPC using materials that are readily available in Iowa. Researchers will adjust the variables in the mixture design, including sand-to-cement ratio, type of supplementary cementitious materials, water-to-cementitious ratio, size of fine aggregates, and type and geometry of fibers, to identify the highest-performing UHPC mixtures. Casting, finishing, and curing methods will also be studied to ensure practical applications.

"The research results have the potential to save states and counties time and money, especially in bridge applications," explained James Hauber, chief structural engineer, Iowa DOT Bridges and Structures Bureau. "If a more affordable UHPC mixture can be developed that extends bridge service life and reduces maintenance costs, it would be of significant value."

The evaluation of the non-proprietary UHPC mixtures will involve testing and comparing them to the performance of two commercially available UHPC mixtures. The evaluation criteria are the extent of early-age shrinkage cracks, transportation of aggressive ions, freeze-thaw cycles, and abrasion resistance while maintaining proper workability, strength, and toughness characteristics. An analysis of cost and performance will identify the most cost-effective options.

The results will help agencies make more informed decisions about concrete bridge applications.

The research is expected to conclude in February 2026.

To learn more about this project and subscribe to updates, visit Idea #3838.

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