

# 2022 Mid-Continent Transportation Research Symposium

Ames, Iowa

September 14–15, 2022

[intrans.iastate.edu/events/midcon2022/](https://intrans.iastate.edu/events/midcon2022/)

---

## Advances in the Development and Application of Non-Proprietary Ultra-High Performance Concrete

Behrouz Shafei, Iowa State University

### Abstract

Ultra-high performance concrete (UHPC) has received significant attention for bridge applications, especially where superior strength and durability characteristics are critical. Although the high strength and durability of UHPC permit the production of thinner/lighter structural elements with a longer service life and less maintenance needs, the use of commercial UHPC in many bridge projects can be cost prohibitive. This has motivated a series of research investigations to develop cost-effective UHPC mixtures through optimizing the cement content, replacing a portion of cement with supplementary cementitious materials, and relying on less expensive granular materials. Considering the promising results for non-proprietary UHPC mixtures and the growing need to utilize cost-effective UHPC for bridge structures, this presentation covers the development of non-proprietary UHPC mixtures made with the ingredients available from local resources and regional suppliers in Iowa. The performance of the developed non-proprietary UHPC mixtures will then be discussed at both fresh and hardened stages. This presentation will conclude with a set of applications, in which non-proprietary UHPC has been considered for the construction of new and the repair of existing bridge structures. The outcome is expected to pave the way to benefit from the unique characteristics of UHPC with the ultimate goal of improving the structural safety and performance of bridges in Iowa and beyond.