



ACCELERATED BRIDGE CONSTRUCTION  
UNIVERSITY TRANSPORTATION CENTER

| <b>UTC Project Information</b>  |   |
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| Project Title   | Non-Proprietary Ultra-High Performance Concrete Mix Design For ABC Applications   |
| University  | ISU   |
| Principal Investigator  | Behrouz Shafei  |
| PI Contact Information  | shafei@iastate.edu  |
| Funding Source(s) and Amounts Provided (by each agency or organization) | ABC-UTC Funds: \$60,000<br>Match Funds: \$30,000 from ISU   |
| Total Project Cost  | \$90,000  |
| Agency ID or Contract Number  | 69A3551747121   |
| Start and End Dates   | January 2018–February 2020  |
| Brief Description of Research Project                                   | <p>Despite superior strength and durability, the use of ultra-high performance concrete (UHPC) in conventional concrete applications has been limited mainly due to cost considerations. While the former efforts have made advances in the development of non-proprietary UHPC mixtures, the cost of the final product has still remained too high for an immediate implementation. A study completed by FHWA (2013) outlined promising advances made in the development of non-proprietary UHPC mixes with a material cost ranging from \$355 to \$500 per cubic yard, excluding the cost of fibers. Addition of steel fibers was reported to increase the total cost by up to \$470 per cubic yard. In a very recent study completed at Iowa State University, it was found that the total material cost can be reduced to \$450 per cubic yard if non-proprietary mixes with local materials are developed. The cost analysis showed that almost half of the total cost is to purchase steel fibers. As steel fibers are the main contributor to the unit cost of UHPC and they are also prone to chloride-induced corrosion, this project explores alternative fibers with optimal dosages for UHPC. The main objective of this project is to develop and characterize economic, non-proprietary UHPC mixes made with materials locally available. This will be achieved through a holistic set of laboratory experiments that will be primarily focused on the choice of fibers, which are known as the costliest ingredient of UHPC mixes.</p> |

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| <p>Describe Implementation of Research Outcomes (or why not implemented)<br/>Place Any Photos Here</p>  | <p>Match funds from Iowa DOT</p>   |
| <p>Impacts/Benefits of Implementation (actual, not anticipated)</p>                                     | <p>February 2020 PBS News Hour's Breakthrough series interview with ISU PIs on non-proprietary UHPC research (<a href="https://www.pbs.org/newshour/show/this-super-strong-concrete-could-repair-aging-bridges-heres-whats-standing-in-the-way">https://www.pbs.org/newshour/show/this-super-strong-concrete-could-repair-aging-bridges-heres-whats-standing-in-the-way</a>)</p> |
| <p>Web Links</p> <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project website</li> </ul> | <p><a href="https://abc-utc.fiu.edu/research-projects/isu-research-projects/non-proprietary-ultra-high-performance-concrete-mix-design-for-abc-applications/">https://abc-utc.fiu.edu/research-projects/isu-research-projects/non-proprietary-ultra-high-performance-concrete-mix-design-for-abc-applications/</a></p>   |