



Ultra-High-Performance Concrete (UHPC) Use in Florida Structural Applications

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Project Manager

Harvey "Dale" DeFord
FDOT Office of Materials

Principal Investigator

Kyle Riding
University of Florida

Current Situation

Ultra-high-performance concrete (UHPC) is an innovative class of concrete with high strength and durability. UHPC is commonly used for roadway repairs, overlays, joining precast concrete panels, and is increasingly being considered for other types of structures. This material has the potential to provide a very long service life for reinforced concrete structures, providing reinforcement alternatives in extremely aggressive environments, such as what we see along the Florida coast.

Early on, proprietary UHPC blends dominated but, increasingly, the industry is interested in using non-proprietary UHPC blends for larger-scale applications. This presents added challenges with mix development, quality assurance, and quality control. However, the upside of this circumstance is greatly reduced costs for materials and shipping. Proper dispersion and orientation of the reinforcement fibers in UHPC are key to its strength. Most methods of checking this are time-consuming and destructive. An inexpensive, simple, and nondestructive method is needed to validate this at critical locations.



Fibers are added after mortar is mixed to give the concrete more strength, ductility, and tensile capacity.

Research Objectives

The objective of this project was to establish mixing, placing, curing, and durability requirements and test methods necessary to produce durable, non-proprietary UHPC made using locally-sourced raw materials for different classes of structural use and exposure conditions.

Project Activities

After a literature review, the University of Florida research team used a combined experimental and numerical approach. The team used four concrete mixture designs with differing fiber contents and three different curing methods. They investigated the range of material properties possible and their impact on strength, durability, and test methods.

Additionally, the team investigated multiple non-destructive techniques to determine which method should be used to measure fiber densities and orientation in UHPC.

Project Conclusions and Benefits

This research provided FDOT-recommended specifications for non-proprietary UHPC materials and construction. The team also drafted specification language for several test methods, including a nondestructive way to evaluate steel fibers in UHPC.

These test methods should provide practitioners the knowledge to properly test their own non-proprietary UHPC mixes using locally-sourced materials.

For more information, please see [fdot.gov/research](https://www.fdot.gov/research).