Request for Research Funding for FY 2025-2026			
Project Number (Research Center Use Only): STR-26-04			
Requesting Office	CO Structures Design	**Priority**	4 of 5
Proposed Title	Shear Reinforcement Requirements for Ultra-High-Performance Concrete (UHPC) Piles		
Justification	Ultra-High Performance Concrete (UHPC) piles offer enhanced capacity due to the superior properties of UHPC material, compared to conventional concrete. However, the complexity of the current shear reinforcement detailing can make the fabrication costly and less competitive. Previously completed research by others indicates that shear reinforcement may not be required for UHPC members, although the FDOT-developed H-shaped UHPC pile has not specifically been tested. This research will investigate using steel fibers to reduce or replace traditional reinforcement, simplifying designs and enhancing efficiency. It advances Safety by improving structural integrity, Resiliency through durable designs, Robust Supply Chain by reducing material demand, Technology with advanced modeling, Workforce Development via updated guidelines, and Communities by enabling cost-effective, long-lasting infrastructure. This research combines experimental and analytical methods to study UHPC pile behavior under compression and impact. Experimental tests will include fabricating UHPC pile specimens with varying cross sections and confinement reinforcement, using digital image correlation (DIC) to track crack propagation. Finite element modeling (FEM) will simulate pile behavior and pile driving in different soil conditions.		
Impact	The research will simplify UHPC pile designs by reducing the need for shear reinforcement, lowering production costs, and enhancing construction efficiency, ultimately enabling more cost-effective and durable infrastructure. By streamlining these designs, the study supports wider adoption of UHPC piles, maximizing cost savings, durability, and resource efficiency.		
Affected Offices/ Districts	Central Office Structures Design Office		
Existing Work	Frank, T (2023). *Comparison of Steel Fibers and Transverse Steel Reinforcement for Shear Capacity in Reinforced Ultra High-Performance Concrete Beams*, International Interactive Symposium on Ultra-High Performance Concrete Aoude, H (2016). *Effect of transverse reinforcement detailing on the axial load response of UHPC columns*, International Interactive Symposium on Ultra-High-Performance Concrete		
Keywords Used In Existing Work Search **(Cannot leave blank)**	Ultra-High Performance Concrete, Steel Fibers, Confinement Reinforcement		
Related Contracts (Give contract numbers)	BED30-977-08, BED30-977-05, BED29-977-03, BED25-977-24, BED26-977-15		
Funding Request	$330,000	**Anticipated Duration**	3 years
Project Manager	Olga Iatsko	**Contracting Method**	direct contract with UNF
Equipment	N/A		
Urgency	4	This project was ranked 4th by district and central structures design offices.	
Implementability	1	The research findings are highly implementable, as they will provide practical design guidelines for reducing or eliminating confinement reinforcement in UHPC piles. These guidelines can be directly integrated into FDOT standards and construction practices, supported by experimental validation and numerical modeling. The simplified designs will	

		be easy for manufacturers to adopt, reducing production complexity and costs while maintaining structural performance.

Project Benefits (Succinct, complete explanation)

The project will provide significant benefits by optimizing UHPC pile designs, reducing reliance on confinement reinforcement, and simplifying detailing, which lowers production costs and improves manufacturing efficiency. These advancements will enhance structural safety and durability, ensuring piles can withstand extreme driving and operational conditions. Additionally, the streamlined production process will support a more robust and sustainable supply chain by reducing material waste and complexity. The research will also promote innovation through advanced modeling and experimental techniques, equipping the workforce with cutting-edge knowledge and practices.

Project Benefits **(Select all that apply and explain)**	**Quantifiable Benefits (units, dollars, etc…if applicable)**	**Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits**
o Materials Enhancement		Reinforcing may be reduced, thereby reducing materials consumed.
o Financial Impact		The research will have a positive financial impact by reducing production costs through simplified UHPC pile designs that require less confinement reinforcement. This will lower material and labor expenses, improve manufacturing efficiency, and enhance the competitiveness of UHPC piles, ultimately providing cost savings for infrastructure projects.
o Time Savings		The research will save time by simplifying UHPC pile designs, reducing detailing and construction complexity. This will streamline manufacturing, shorten construction timelines, and minimize delays caused by complex reinforcement requirements or testing procedures, leading to faster project completion.
o Lives Saved/Injuries Prevented		Reduction of the reinforcement detailing would reduce the human involvement at the fabrication stage and thereby minimize the chance of injury.
o Other (Explain)		

*Comments should explain and support urgency, financial benefit, and implementability scores