Request for Research Funding for FY 2020-2021			
Requesting Office	CO Structures Office	**Priority**	3 of 6
Proposed Title	Quantifying the Effect of UHPC Fiber Dispersion and Orientation in Structural Members		
Justification	UHPC has been widely researched and implemented in the state of Florida for its superior structural and durability performance. Despite many successful structural level demonstrations, fiber dispersion and orientation remain a concern in the UHPC and general fiber reinforced concrete communities. Previous research demonstrated that the fiber orientation has a notable effect on the mechanical properties of UHPC at a material level, mostly focusing on tensile properties and the pull-out behavior of rebars embedded in UHPC. In addition, several studies were conducted in the past to correlate the casting sequence and flow properties of UHPC to fiber dispersion and orientation. However, most of this work focused on small scale UHPC specimens or plain UHPC sections of simple rectangular geometry without considering reinforcement and more complex geometry commonly used in bridges. UHPC design codes from other countries include reduction factors based on UHPC placement and fiber orientation for full-scale specimens. This research is a synthesis study to understand what those factors are based upon and what work has been completed on the topic.		
Impact	Quantifying the actual fiber dispersion and orientation status in real structural members and understanding their effect on structural performance are important to understand the reliability of UHPC members and quality control requirements. The presence of rebars and prestressing tendons may alter the dispersion and orientation of fibers, and these continuous reinforcements can also redistribute the stresses and alleviate the adverse effect of unfavorable fiber distribution.		
Affected Offices	FDOT Materials Office		
Existing Work	Walsh et. al., Fiber Orientation in Ultra-High-Performance Concrete Shear Keys of Adjacent-Box-Beam Bridges, ACI Materials Journal, 2018 Groeneveld et. al., Effect of Fiber Orientation on Dynamic Compressive Properties of an Ultra-High Performance Concrete, 2017 Maya, L.F., de la Varga, I., Graybeal, B.A., Fiber Reinforcement Influence on the Tensile Response of UHPFRC, Proceedings of the First International Interactive Symposium on UHPC, 2016 Wagner et. al., Evaluation of Fiber Distribution and Alignment in Structural UHPC Elements, Proceedings of the Second International Interactive Symposium on UHPC, 2019		
Keywords Used In Existing Work Search **(Cannot leave blank)**	UHPC fiber orientation		
Related Contracts (Give contract numbers)	BDV31-977-94		
Funding Request	$100,000	**Anticipated Duration**	1 year
Project Manager	Christina Freeman/Will Potter	**Contracting Method**	direct contract with university
Urgency	3	This project scored third in a rating of research ideas by FDOT's Central and District Structures Design Offices.	
Implementability	3	Depending on the results of the synthesis study, experimental work may be required to determine appropriate design methods for large scale UHPC members.	
Project Benefits (Succinct, complete explanation)			

A synthesis study is proposed to understand the scope and findings of research previously completed to measure the effects of fiber dispersion and orientation in large scale structural members. This will aid the structural design as well as determine whether special quality control measure is needed to ensure proper fiber dispersion.		
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		
o Materials Savings		
o Time Savings		
o Lives Saved/Injuries Prevented		
o Other (Explain)		This research will aid in the appropriate and conservative design of large scale members constructed of UHPC, to ensure safe mobility in the transportation system.

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