Request for Research Funding for FY 2020-2021			
Requesting Office	CO Structures Office	**Priority**	2 of 6
Proposed Title	Wound FRP Shear Reinforcement for Concrete Structures		
Justification	FDOT is implementing the use of FRP reinforcement when warranted for improved corrosion resistance. FRP has been developed in a way that mimics steel reinforcing. But that may not be the best way to utilize the FRP material and requires a strength reduction at reinforcing bar bends because the FRP is bent after fabrication, similar to steel reinforcing. Using FRP reinforcing in the more efficient way that is tailored to the material will reduce the costs of bridges which need to be reinforced with FRP. Manufacturing methods such as filament winding rather than post-pultrusion bending can provide greater strength, stiffness with tighter bend radii or complex geometry.		
Impact	If this research is not pursued, FRP reinforcing will be less efficient and bridges reinforced with it more expensive.		
Affected Offices	State Materials, State Structures Design		
Existing Work	Spadea, S., Orr, J., Nanni, A., Yang, Y. (2017), Wound FRP Shear Reinforcement for Concrete Structures, Journal of Composites for Construction, DOI: 10.1061/(ASCE)CC.1943-5614.0000807 Yang, Y., Orr, J., Spadea, S. (2018), Shear Behavior of Variable-Depth Concrete Beams with Wound Fiber–Reinforced Polymer Shear Reinforcement, Journal of Composites for Construction, DOI: 10.1061/(ASCE)CC.1943-5614.0000899 Lee, C., Ko, M., Lee, Y. (2014), Bend strength of complete closed type carbon fiber-reinforced polymer stirrups with rectangular section, Journal of Composites for Construction, https://doi.org/10.1061/(ASCE)CC.1943-5614.0000428		
Keywords Used In Existing Work Search **(Cannot leave blank)**	Wound FRP, Adhoc Stirrups		
Related Contracts (Give contract numbers)	BDV30-977-110 (GFRP-RC Traffic Barriers), BDV30-977-27 (Prestressed Pile Spirals), BDV30-977-22 (HSSS-PC Beams & GFRP Shear and Confinement)		
Funding Request	$325,000	**Anticipated Duration**	3 years
Project Manager	Steven Nolan/Will Potter	**Contracting Method**	RFP
Urgency	2	This project scored second in a rating of research ideas by FDOT's Central and District Structures Design Offices.	
Implementability	4	Implementation of this research would require existing specifications for FRP reinforcing to be revised including Section 415, 932-3, and Materials Manual (Chapter 12). Manufacturing of wound FRP would have to be expanded for widespread implementation although several manufacturers already have this capability.	

Project Benefits (Succinct, complete explanation)

This research would look into the confinement and alternative shear reinforcement for wound (continuous) FRP stirrups, in the ends of piles, prestressed beams, thin posts and beam elements, and traffic barriers. In previous research projects, FRP bars have been designed based on our experience with steel bars. However, that may not be the most efficient use of FRP materials. This research would examine the use of wound stirrups. In addition, rectangular and circular stirrups will be compared and available strength at bent corners will be examined. In-state manufacturers have the capacity to produce stirrups with this technology, fostering future business development and expansion.

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		This research would examine the use of a more efficient FRP reinforcement.
o Materials Savings		More efficient reinforcing would result in construction cost savings.
o Time Savings		
o Lives Saved/Injuries Prevented		
o Other (Explain)		

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