Request for Research Funding for FY 2019-2020			
Requesting Office	CO Structures Design	**Priority**	2 of 5
Proposed Title	Double Composite Steel Box Girders with UHPC		
Justification	Steel girder bridges are commonly designed to take advantage of composite action with the concrete top slab to improve the load carrying capacity and performance of the girder. This idea can be extended to double composite behavior by including a concrete bottom slab in the negative moment region of the girder. The double composite box was previously investigated in 2009 with some of the research results causing apprehension toward the concept; however, the double composite concept likely merits further research with the more recent advancement of ultra-high performance concrete (UHPC). Also, there lessons learned from the study in 2009 will be utilized to potentially advance the concept further with conventional concrete.		
Impact	Savings in double composite bridge design arise since steel is replaced by less costly concrete to carry compressive loads. The consequence of not completing the research would be a loss in potential savings.		
Affected Offices	The FDOT Construction Office would be affected by implementation of this research if it is successful and CEI are required to inspect the new structure type. CO Construction Structures personnel were included in the discussion of this research.		
Existing Work	Experimental Evaluation of a New Double Composite System for Steel Bridges, Mountain-Plains Consortium, Active Design of Double Composite Bridges using High Strength Steel, Procedia Engineering, Volume 14, Issue 0, 2011, pp 1825-1829 Design and Evaluation of Steel Bridges with Double Composite Action, 2010 STEEL BRIDGES WITH DOUBLE-COMPOSITE ACTION: INNOVATIVE DESIGN, Transportation Research Record, Issue 1696, 2000, p. 299-309		
Keywords Used In Existing Work Search **(Cannot leave blank)**	Double composite bridge, Florida double composite bridge, UHPC shear stud		
Related Contracts (Give contract numbers)	BD544-18		
Funding Request	$450,000	**Anticipated Duration**	3.5 years
Project Manager	Will Potter/Sam Fallaha	**Contracting Method**	RFRP or direct contract to FIU
Urgency	2	There is a lot of interest within the Department to move this forward. With the complexities of interchanges increasing, having cost effective and viable solutions is required.	
Implementability	2	Implementation depends on positive results of this research. Implementation also depends on economic viability, which in turn depends on the future price of an emerging new material, UHPC.	

Project Benefits (Succinct, complete explanation)

Steel box girder bridges are the second most expensive types of bridges to construct, with a typical price of $140 to $180 per square foot. In comparison, simple prestressed girder bridges typically cost $105 to $145 per square foot and simple span steel girder bridges typically cost $125 to $142 per square foot. Despite the high cost, steel box girder bridges continue to be the best solution for curved bridges, particularly at congested interchanges. This research seeks to improve the economic viability of steel box girders for those applications, bringing the cost more in line with the cost of steel girder bridges.

Use of cast in place UHPC as a replacement for steel material could result in longer and fewer field segments, which are generally controlled by pick weight. UHPC is a high early strength material, so construction progress can continue soon after its placement. This research could result in faster bridge construction because fewer pieces or lighter segments need to be placed and connected at the job site.		
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		Using the combination of concrete/UHPC and steel could result in a materials enhancement due to the composite integration of both types of materials.
o Materials Savings		This research could result in material savings.
o Time Savings		This research could result in construction time savings.
o Lives Saved/Injuries Prevented		
o Other (Explain)		

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