Request for Research Funding for FY 2020-2021			
Requesting Office	CO Structures Office	**Priority**	5 of 6
Proposed Title	Confinement Effect of Narrow Baseplates or Reaction Area on Anchor Breakout, Part 2		
Justification	The confinement effect of Metal Railing Narrow Baseplates on Adhesive Anchor Breakout was previously researched as part of project BDV28-977-06. That project was successful in proving that the ACI equations for minimum anchor embedment length were overly conservative. This project is a continuation of that project for SS screw anchors but will examine other types of anchorages using FRP materials.		
Impact	Favorable results will provide alternate choices for anchors with reduced anchor embedment and supporting foundation concrete quantities. It will also provide standardized guidance for FRP anchor design which currently does not exist.		
Affected Offices	The Structures Design Office would need to update SDG 1.6 for any modification factor and the affected Design Standard Plans (Indexes 515-022, 515-051, 515-052, 515-061 & 515-062; Roadway Design Office would need to update Index 515-070 & 515-080 for revised embedment depths and 522-001 (RAILING DETAIL) for revised concrete dimensions.		
Existing Work	Some work has been done by Eligenhausen & Fichtner (2003) but is not directly applicable to wall top mounted anchors due to edge effects and did not consider screw or FRP anchors. This is a continuation of project BDV28-977-06, Confinement Effect of Metal Railing Narrow Baseplates on Adhesive Anchor Breakout Resistance, by Suksawang. Post installed concrete use mechanical anchors engineering properties, Transportation Research Board 95th Annual Meeting, 2016, 24p Moving Research Into Practice. Implementing Products from NCHRP Research on Adhesive Anchor Systems, Transportation Research Board Attachment of a Combination Bridge Rail to Concrete Parapet Utilizing Epoxy Adhesive Anchors, Transportation Research Circular, Issue E-C220, 2017, pp 69-86 A Study of Methods to Evaluate the Durability of Post-Installed Bonded Anchors, Concrete Journal, Volume 54, Issue 3, 2016, pp 260-267 Recommended Procedures for Development and Splicing of Post-Installed Bonded Reinforcing Bars in Concrete Structures, ACI Structural Journal, Volume 110, Issue 3, 2013, pp 437-446 Basic Study on Pullout Resistance Mechanism of Taper-tipped Post-installed Anchors, JR East Technical Review, Issue 26, 2013, pp 25-30 Design Method for Tension Load Capacity of Post-Installed Bonded Anchor Bolts and Associated Issues, Concrete Journal, Volume 51, Issue 3, 2013, pp 243-250 Influence of Column Construction Type on the Bearing Capacity of Bonded Anchors, Procedia Engineering, Volume 40, Issue 0, 2012, pp 195-198 Performance of Retrofit Highway Barriers with Mechanical Anchors, ACI Structural Journal, Volume 107, Issue 4, 2010, pp 381-389 Mechanism Analysis for Concrete Breakout Capacity of Single Anchors in Tension, ACI Structural Journal, Volume 105, Issue 4, 2008, pp 609-616 Behavior and Design of Adhesive Bonded Anchors, ACI Structural Journal, Volume 103, Issue 6, 2006, pp 822-831		
Keywords Used In Existing Work Search **(Cannot leave blank)**	Anchor confinement effect, screw anchor, post-installed concrete anchor, FRP anchor dowels.		

Related Contracts (Give contract numbers)	BDV28-977-06		
Funding Request	$200,000	**Anticipated Duration**	2 years
Project Manager	Steven Nolan/Will Potter	**Contracting Method**	direct contract with university
Urgency	5	This project scored fifth in a rating of research ideas by FDOT's Central and District Structures Design Offices.	
Implementability	1	Implementation would require revision of FDOT Standard Plans and Structures Design Guidelines.	

Project Benefits (Succinct, complete explanation)

The research includes:

- Investigate other types of anchors (e.g. screw anchor and other noncorrosive adhesive anchors such as FRP bolt [i.e. Stongwell fibrebolt) and FRP rebar)
- Use anchors and adhesive rebar (steel and FRP) for connecting structural components such as barriers, concrete parapet replacement, and railings.
- Explore the potential use of adhesive anchor for tie bar application (e.g. wingwall, backwall, bridge widening). This could mostly be done analytically, after some basic verification testing of confinement effect of construction joint. There is a potential cost saving here particularly for retrofitting. For tie bar applications in backwall and wingwall, there is the potential of reducing the embedment length and eliminating corrosion concerns in aggressive environments.
- Develop some SDG criteria and design examples based on ACI-318-19

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		Corrosion-resistant enhancement for adhesive dowelled tie-bars using FRP
o Materials Savings		More efficient anchoring designs will result in materials savings.
o Time Savings		This project will allow the use of anchoring methods that do not require adhesives and therefore are immediately effective.
o Lives Saved/Injuries Prevented		
o Other (Explain)		

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