

**Request for Research Funding for FY 2019-2020**

<b>Requesting Office</b>	CO Structures Office	<b>Priority</b>	1 of 5
<b>Proposed Title</b>	Inspection of Flexible Filled Tendons		
<b>Justification</b>	<p>Over the past several years that Department has transitioned to utilizing flexible fillers in lieu of cementitious grout for certain post-tensioning tendons in bridges. There is a soon to be completed project (BDV27 977-10) that is evaluating the corrosion prevention mechanisms that will allow the Department to better understand the mechanisms that could initiate corrosion within flexible fillers. There are also other design related projects that are active in enhancing the design understanding of using un-bonded tendons. This proposed research is intended to expand the current knowledge base regarding the inspection of bridge components with flexible filled tendons. The current methodologies for inspecting post-tensioning tendons is related to cementitious grout filled tendons. The use of these technologies could still be viable; however, it is not understood how they will perform. Also, the use of the flexible fillers may open more opportunities that were not viable with cementitious grouted tendons. The use of acoustic emissions and strain gages where evaluated in the early stages of investigating flexible filled tendons with promise from a long-term monitoring perspective, however, they are not viable for short-term inspections.</p> <p>Another component of this research is related to providing bridge inspectors with the necessary information so that they understand what to look for when inspecting bridge components that contain flexible filled tendons. The use of the unbonded replaceable tendons could allow for a more informed inspector given the mechanics of the system.</p>		
<b>Impact</b>	<p>Recently, Florida implemented the policy of using flexible filler in most post-tensioned applications instead of cementitious grout. Flexible fillers are commonly used in Europe, but not in the U.S. With this construction method being new to us, we need to learn more about how to inspect these projects during and after construction and repair any deficiencies found. Failure to complete this research could result in inspectors being unprepared to correctly identify problems and defects within bridge structures containing flexible filled tendons.</p>		
<b>Affected Offices</b>	<p>State Materials Office, State Maintenance Office, State Construction Office</p> <p>All were involved in discussion of the research topic.</p>		
<b>Existing Work</b>	<p>Replaceable Unbonded Tendons for Post-Tensioned Bridges, 2017</p> <p>Full-scale experimental investigation of wire breakage detection in deviated multi-strand tendon systems, Journal of Civil Structural Health Monitoring, Volume 6, Issue 2, 2016, pp 217-235</p> <p>Wire Breakage Detection Using Relative Strain Variation in Unbonded Posttensioning Anchors, Journal of Bridge Engineering, Volume 20, Issue 1, 2015, Content ID 04014056</p> <p>There have been significant efforts related to inspection of cementitious grouted tendon that could be useful in evaluation of this project.</p>		
<b>Keywords Used In Existing Work Search</b> (Cannot leave blank)	Bridge tendon flexible filler inspection		
<b>Related Contracts</b> (Give contract numbers)	BDV31 977-15, BDV27 977-10		
<b>Funding Request</b>	300,000	<b>Anticipated Duration</b>	3 years
<b>Project Manager</b>	Will Potter/Ivan Lasa	<b>Contracting Method</b>	RFRP or direct contract.
<b>Urgency</b>	1	This use of flexible fillers has been fully implemented for new construction projects with a few already installed and others under construction. Being ahead and prepared for potential	

		deficiencies given the history related to cementitious grouted tendons is paramount. Having informed bridge inspectors is necessary to adequately ensure the safety of our bridges.
<b>Implementability</b>	1	This project is expected to result in implementable tools for inspection and repair of bridges with tendons with flexible filler. This could result in just a tool for the inspectors or result in Construction Specification modification.

**Project Benefits (Succinct, complete explanation)**

This project will provide both bridge construction and bridge maintenance inspectors the information they need to adequately inspect tendons with flexible filler, find deficiencies and assist in the repair of those deficiencies. This research is essential because FDOT has recently implemented the use of flexible filler instead of grout for most post-tensioning applications. This research will help to ensure success over the service life of those structures by giving FDOT the knowledge to successfully inspect and repair them.

<b>Project Benefits (Select all that apply and explain)</b>	<b>Quantifiable Benefits (units, dollars, etc...if applicable)</b>	<b>Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits</b>
<input type="checkbox"/> Materials Enhancement		This project will provide information to FDOT construction personnel to assure that tendons with flexible filler are repaired properly, improving completed bridges.
<input type="checkbox"/> Materials Savings		
<input type="checkbox"/> Time Savings		Establishing inspection and repair methods before they are needed for construction projects will save construction and maintenance time.
<input type="checkbox"/> Lives Saved/Injuries Prevented		This project will result in tools which can be used to ensure bridges with tendons filled with flexible filler are safe.
<input type="checkbox"/> Other (Explain)		

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