

Request for Research Funding for FY 2023-2024

Project Number (Research Center Use Only): GEO-24-02

Requesting Office	Geotechnical	Priority	2 of 3
Proposed Title	Residual Stresses in Florida Bored Piles		
Justification	<p>In depth analysis of recent load test results has shown that the development of residual stresses (compression and tension) in bored piles is a common occurrence, particularly for Augercast piles, and to a lesser extent, Drilled Shafts. The presence of residual stresses within deep foundations is recognized by the geotechnical community as a topic that requires a deeper understanding, however, a limited amount of work has been done to quantify the effects of those stresses in the way load test results are analyzed, and on the general performance of the foundation elements. The need for the research lies in the fact that the effects of having built-in stresses can produce erroneous load test results with potentially unconservative back-calculated side friction and end-bearing components of resistance, reduced pile/shaft service life, and unaccounted pile/shaft compression forces. The goal of the proposed effort is to quantify those effects and resolve the issue through an investigation that measures the state of stress of bored piles from the moment they are cast, to the time they are load tested, and develop an analysis approach that can be used in design.</p>		
Impact	The results of the project would allow the geotechnical community to adequately measure and account for the effect of residual stresses when designing cast-in-place deep foundations		
Affected Offices	Geotechnical (Rodrigo Herrera and Larry Jones), Construction (Juan Castellanos), Materials (David Horhota). Updates by the researcher will be presented in the annual Geotechnical Research in Progress (GRIP) meetings to district geotechnical staff and consultants.		
Existing Work	No previous local efforts have been made in this regard. External research has focused on closed end steel pipe piles jacked into layered red clay (Wang et al.), field measurements in bored piles (Nie et al.), post grouted piles (Zou, Zhang and Ling), and driven precast piles using distributed fiber optic sensors (Duffy et al.). The current effort would focus on drilled deep foundations in Florida soils, using concrete/grout mixes that are used in local practice, which as was recently detected in an Augercast pile project, tend to develop more heat than anticipated exacerbating the development of residual stresses.		
Keywords Used In Existing Work Search (Cannot leave blank)	Residual stress, bored piles		
Related Contracts (Give contract numbers)	BDV25 TWO 977-09 Use of the Thermal Integrity System for Evaluation Auger Cast Piles. Although the referenced project did not specifically address the topic at hand, it did provide a means to monitor curing temperature of drilled foundations, which will play a major role in the current project		
Funding Request	\$400,000	Anticipated Duration	24 months
Project Manager	Rodrigo Herrera	Contracting Method	Direct contract with University of Florida (Dr. Michael Rodgers)
Equipment	N/A		
Urgency	1=Urgent Need	The need to correctly analyze load test data is of significant importance	
Implementability	1=High Likelihood to Implement Results	The project findings will result in updates to the Standard Specifications	

Project Benefits (Succinct, complete explanation)

The researchers will develop guidelines for monitoring stresses in-situ, and the accompanying methodology for analysis of the data collected to account for the effect those stresses have on the calculated pile or shaft capacity. This is of significant importance to avoid un-conservative estimates of resistance that may result otherwise.

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
<input type="radio"/> Materials Enhancement	Improved quality control	Means to adequately account for stress build-up during the curing process of cast-in place deep foundations
<input type="radio"/> Materials Savings		
<input type="radio"/> Time Savings		
<input type="radio"/> Lives Saved/Injuries Prevented		
<input type="radio"/> Other (Explain)		New analysis method that will be developed to account for residual stress in the back calculation of pile or shaft resistance

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