| Mid-Cycle Request for Research Funding for FY 2020-2021 | | | |
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| **Requesting Office** | **SMO** | **Priority** | 4 of 10 |
| **Proposed Title** | Field Temperature Profiles of Drilled Shafts and Auger-Cast Piles | | |
| **Justification** | Current specifications do not require Contractors to monitor field temperatures of 1) drilled shafts supporting sign, signal, lighting or intelligent transportation systems (ITS), 2) drilled shafts with diameters less than six feet and 3) auger-cast piles, even though they contain a high level of cementitious material. Current field data indicates that drilled shafts and auger-cast piles may have temperatures at the shaft reinforcement cages of 180°F to 200°F, with core temperatures estimated as high as 220°F to 240°F and differential temperatures potentially exceeding 35°F. Therefore, one can expect that a significant number of drilled shafts and auger-cast piles built in Florida may have lower durability due to the reduction in strength, increase in porosity, delayed ettringite formation (DEF), and early thermal cracks. Research is needed to evaluate field data on drilled shaft and auger-cast piles temperature profiles to 1) determine which currently non-monitored shafts need to have temperature monitoring, 2) provide justification for specification changes to mitigate the thermal problems, including limits on maximum temperatures and cementitious material contents, and 3) model temperature profiles to accurately estimate core temperatures based on shaft diameter, cementitious material type and content, soil temperature, and concrete placement temperature. | | |
| **Impact** | Without this research, the durability of some drilled shafts and auger-cast piles may be impacted. | | |
| **Affected Offices** | SMO (Jose Armenteros), Specifications (Daniel Strickland), Construction (John Westphal), Geotechnical (Juan Castellanos), and Structures Design (Steve Nolan) | | |
| **Existing Work** | No relevant research for maximum temperatures above 180°F | | |
| **Keywords Used In Existing Work Search (Cannot leave blank)** | Drilled shaft, maximum temperature, delayed ettringite formation (DEF), cracking, cementitious material content | | |
| **Related Contracts (Give contract numbers)** | BDV25-977-25, BDV25-977-34, and BDV25-977-09 | | |
| **Funding Request** | $240,000 | **Anticipated Duration** | 24 months |
| **Project Manager** | Jose Armenteros | **Contracting Method** | Anticipated procurement method is direct contract with University of South Florida (Mullins). |
| **Urgency** | 1 | **Comments*** Savings mainly from reduced construction and maintenance costs by resulting in more durable drilled shafts and auger-cast piles | |
| **Implementability** | 2 | **Comments*** Mainly specification changes and possibly changes to Best Practices | |

| **Project Benefits (Succinct, complete explanation)** | | |
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| **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** |
| ✓ Materials Enhancement | Yes | Improved long-term durability and service life by avoiding detrimental temperature effects such as thermal cracking and delayed ettringite formation. Cost savings calculations require data from Maintenance, which is currently not being collected. |

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| ✓ Materials Savings | Yes | Reduced maintenance and rejection of elements reduces materials usage. Cost savings calculations require data from Maintenance, which is currently not being collected. |
| o Time Savings | | |
| o Lives Saved/Injuries Prevented | | |
| ✓ Other (Explain) | | Greater durability and longer service lives improve the public's driving experience |

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