



**TriDurLE**

**National Center for Transportation  
Infrastructure Durability & Life-Extension**

UTC Project Information – National UTC TriDurLE	
Project Title	Evaluation of Downdrag Loads on Bridge Pile Foundations in Inundated Collapsible Soils
University	Alabama A&M University Department of Mechanical and Civil Engineering Normal, AL 35762
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Funding Source(s) and Amount Provided (by each agency or organization)	One hundred percent cost-share fund of \$49,279.99 (100% federal fund versus 100% match from Alabama A&M University).
Total Project Cost	\$49,279.99 UTC \$49,279.99 (match) Alabama A&M University
Agency ID or Contract Number	OSP # 16278
Start and End Dates	5/1/2020 through 6/30/2121
Brief Description of Research Project	<p>The research project provides an analytical model for the assessment of the downdrag force acting on the bridge pile foundation as a result of the inundation of collapsible soil layer(s) and its impact on the pile settlement and its axial load capacity (i.e., serviceability and durability/life of the bridge). To tackle this problem, the amount of settlement that the collapsible soil layer experiences due to inundation is estimated. In addition, the post-inundation soil characterization (i.e. change in soil properties such as unit weight, relative density, friction angle) should be evaluated. The collapsible soil model/characterization is established based on large amount of related experimental database. The post-inundation collapsible soil model is integrated into a soil-pile axial model for the evaluation of the negative skin friction acting on the pile skin based on the relative pile-soil displacement and developing pile-soil mobilized shear stress along the pile. The proposed approach introduces a more realistic soil-pile interaction mechanism compared to the current practice (FHWA/AASHTO) that only depends on pile-soil shear strength.</p> <p>The research work is compiled in a software package for design and analysis purposes.</p>

<p>Describe Implementation of Research Outcomes (or why not implemented)</p> <p>Place Any Photos Here</p>	<p>The developed model/technique is compiled in a software package with a user-friendly graphical interface for input/output data (i.e., a design tool). The findings of the technique will be published in an international journal and a national conference for the comparison with current practice (FHWA/AASHTO).</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>The developed model/technique, which is compiled into a software package, allows the designer to predict the response of the pile (i.e., pile settlement) under existing axial loads from the superstructure along with the downdrag force caused by the excessive settlement of inundated collapsible soil. Such a scenario could take place at any time during the bridge life. The established mechanism/technique is more realistic compared to the current practice (FHWA/AASHTO) that only depends on pile-soil shear strength.</p>
<p>Web links</p> <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project website</li> </ul>	<p>A final report of the proposed research work is submitted by the end of the project period.</p>