



ACCELERATED BRIDGE CONSTRUCTION  
UNIVERSITY TRANSPORTATION CENTER

<b>UTC Project Information</b>	
Project Title	Rapid Repair and Retrofit of Timber Piles Using UHPC
University	FIU
Principal Investigator	Mantawy, Islam Azizinamini, Atorod
PI Contact Information	imantawy@fiu.edu aazizina@fiu.edu
Funding Source(s) and Amounts Provided (by each agency or organization)	ABC-UTC Funds: \$50,000 FIU Match Funds: \$25,000
Total Project Cost	Total Funds: \$75,000
Agency ID or Contract Number	Accelerated Bridge Construction University Transportation Center (ABC-UTC) 69A3551747121
Start and End Dates	01/01/2020 - Active
Brief Description of Research Project	<p>One of bridge substructure system utilizes a pier consists of a beam supported over timber piles. This substructure system is common practice in county bridges. Many reasons can lead to the deterioration of these timber piles can deteriorate over an extended period of time such as biological damage caused by fungi, termites, powderpost beetle, carpenter ants, and bacteria or physical damage due to floating in water, overload, failure of adjacent piles, and fires. Replacing the damaged timber pile may be considered an obvious option to address the damage; however, the cost of an effective repair and retrofitting of timber piles can be much cheaper. Different repair and retrofit techniques are available for the timber piles and some of the retrofit options failed to result in the expected performance levels. The best repair technique should restore the load carrying-capacity of the timber piles and at the same time should be cost-effective. The superior mechanical properties of UHPC, such as high compressive strength and high tensile strength make this material a perfect solution to repair and retrofit timber piles. This project proposes the use UHPC as repair and retrofit material for timber piles, however, many research questions should be answered such as the bond strength between timber and UHPC, the surface preparation for timber piles to enhance the bond strength with UHPC, the effect of UHPC thickness of repair/retrofit. These questions, among others, will be answered under this project. The objectives include:</p> <ul style="list-style-type: none"> <li>• Studying the bond strength between timber and UHPC as repair/retrofit material;</li> <li>• Defining the best surface preparation for timber piles in order to enhance the bond strength;</li> </ul>

	<ul style="list-style-type: none"> <li>• Studying the load-carrying mechanism of timber piles repaired or retrofitted using UHPC;</li> <li>• Conducting small scale testing to study the bond strength and load-carrying mechanism between timber and UHPC;</li> <li>• Conducting large scale component testing of timber piles repaired/retrofitted using UHPC under realistic axial and lateral loading schemes;</li> <li>• Studying repair methods for in-service weathered piles; and</li> <li>• Developing detailed finite element models for both small scale material testing and large scale component testing for better understanding of the local and global behavior of timber piles repaired/retrofitted using UHPC.</li> </ul>
<p>Describe Implementation of Research Outcomes (or why not implemented) Place Any Photos Here</p>	<p>This is an active research project. Upon completion, outcomes will be reported.</p>
<p>Impacts/Benefits of Implementation (actual, not anticipated)</p>	<p>This is an active research project. Upon completion, impacts/benefits will be reported.</p>
<p>Web Links</p> <ul style="list-style-type: none"> <li>• Reports</li> <li>• Project website</li> </ul>	<p><a href="https://abc-utc.fiu.edu/research-projects/fiu-research-projects/rapid-repair-and-retrofit-of-timber-piles-using-uhpc/">https://abc-utc.fiu.edu/research-projects/fiu-research-projects/rapid-repair-and-retrofit-of-timber-piles-using-uhpc/</a></p>