

Rehabilitation of Deteriorated Timber Piles with Fiber Reinforced Polymer Composites

Fatmir Menkulasi

Wayne State University, Detroit, MI, USA

Hadi Baghi, David Hall, Nahid Farzana

Louisiana Tech University, Ruston, LA, USA

Contact: fatmir.menkulasi@wayne.edu

Abstract

Louisiana has a large inventory of timber bridges in service. The timber piles in these bridges are succumbing to the effects of biological degradation that initiates in the wet-dry zones. Replacing these deteriorated piles is a costly process and in-situ repair of the piles with fiber reinforced polymers (FRP) is an economic alternative. An experimental program was conducted to evaluate the capacity of FRP strengthened deteriorated timber piles under axial loads with different lengths and depths of deterioration zone. A total of 11 monotonic tests were conducted. The investigated repair technique increases the capacity of damaged piles by 98% to 383% and enhances the capacity of undamaged piles by 3% to 22%. All failure modes were observed in the wooden portion of the pile outside the repaired region. Strain gage measurements indicate that the FRP shell is mobilized more when the annular void is smaller.

Keywords: Timber piles; deterioration; fiber reinforced polymer composites; grout; repair; testing.