

ABSTRACT

The use of Fiber-reinforced polymer (FRP) reinforcing bars world-wide in recent years have demonstrated its success and practicality. Corrosion of steel in concrete is a major cause of deterioration of reinforced concrete structures, especially in aggressive environments. Piles in Florida are often installed in marine environments or in other environmentally aggressive regions. Under such conditions and without sufficient cover, reinforcing steel in concrete piles are vulnerable to corrosion and the lifespan of support structures can be reduced. Florida Department of Transportation (FDOT) in its standard plans for concrete piles allow Carbon Fiber Reinforced Polymer (CFRP) as a corrosion resistant alternative to improve the durability of concrete piles. However, the high cost of CFRP bars has limited widespread implementation. The Florida Department of Transportation standard permits the use of CFRP bars for both the longitudinal reinforcement and the lateral reinforcement. This project targets corrosion resistant alternatives for the lateral (spiral) reinforcement of piles to decrease the cost of support structures in aggressive environments. To achieve this, the confinement behavior of GFRP spirals in prestressed concrete piles are investigated under impact. FDOT standard plans require the use of spiral ties for the lateral reinforcement in piles. The role of the spiral ties is to resist impact loading when the pile is installed and to maintain the position of the strands under high loads. If confinement in concrete piles is provided by a less expensive non-corrosive material, then cheaper corrosion-resistant prestressed concrete piles can be produced.