Experimental Study of Full-Scale Corroded Steel Bridge Piles Repaired Underwater with Grout-Filled Fiber-Reinforced Polymer Jackets

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Abstract: Steel bridge piles, many of which have been in service for over half a century across the United States, are now deteriorating because of corrosion. They often require retrofitting to restore their capacities to their initial design capacities. Grout-filled fiber-reinforced polymer (FRP) jackets are one promising repair alternative among others. This paper presents the findings of a full-scale experimental investigation to study the behavior of steel piles with localized simulated corrosion damage that were repaired underwater using grout-filled FRP jackets. Fourteen full-scale deteriorated piles were repaired with grout-filled FRP jackets and were tested under axial compression. The repair system was able to restore the axial capacity of the piles to the initially designed capacity. A rational approach is proposed and was implemented for the design of the tested repairs in this study. The results indicate that grout-filled FRP jackets can be effectively used to repair steel H-piles with localized corrosion and that the proposed design approach can be used to design the jackets for piles with different degrees of corrosion.

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This paper describes two methods for repair of piles; both of these techniques are protected by two U.S. Patents #8,650,031 and #9,376,782 by Prof. Mo Ehsani.