

Studying the Impact of Using Tubular Concrete-Filled FRP Pile Foundations on the Seismic Response of Structures

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ABSTRACT: Pile foundations, either precast or cast-in-situ, are popular for usage worldwide in many important and costly projects such as bridges in transportation networks, or jetties in harbor areas, *etc.* In addition, the stability and safety of such strategic structures count to a great extent on the serviceability of the carrying foundations or piles. Thus, the integrity of the pile-foundation systems governs sharply the service life of the supported structures. Moreover, traditional pile foundations include using materials as steel and concrete. Such materials when used in harsh environments such as sea water or salty soil layers suffer severe deterioration including loss of concrete durability, steel corrosion, and sometimes marine borer attacks. Consequently, high repair or replacement costs of the foundation systems led researchers in the last few decades to investigate the feasibility of using FRP composite piles, such as concrete-filled tubular FRP piles. These piles are non-corrosive with benefits of easier construction and repair, and advantages as improved durability in harsh environments and cost savings in terms of life cycle analysis. In spite of that, one of the main drawbacks of composite piles is their relatively short track record of performance and absence of long-term durability data. The main focus in this paper is to study the effect of having FRP filled tubes piles on the seismic behavior of the supported structures. This concerns the soil-structure interaction and the expected behavior of the composite system. This paper describes a proposed methodology to assess the structural capacity of foundations with concrete-filled tubular FRP piles under earthquakes. Results are presented to verify the expected benefits versus the effects on the lateral capacity of structures.

KEY WORDS: Seismic; Response; Concrete; FRP; Pile foundations.