The Effect of a Bridge Pier Column Retrofit's Configuration on Minimizing Local Scour for Existing Circular Pier Columns

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Throughout history, bridges have collapsed due to various issues including design failure, environmental processes, and inspection inadequacy. Bridges are vital pieces of infrastructure and must be protected from failure. One of the most common causes of bridge failure is scour. Traditionally, scour has been addressed by armoring the riverbed around the pier columns. This investigation takes the unique approach of attempting to alter a pier column's shape with a retrofit to change the natural forces causing scour instead of simply using countermeasures to combat the results of scour forces. The purpose of this investigation was to find a retrofit shape that could be fitted onto existing circular pier columns to efficiently minimize scour. It was hypothesized that if a pier column's shape was altered utilizing a retrofit in the shape of a 15 degree torpedo, then scour would be minimized due to the water approaching and departing the pier column with ease, as well as providing a reduced obstruction to water flow. Four different pier retrofit configurations were tested: the circular pier column (control), the 15 degree torpedo retrofit, the 30 degree torpedo retrofit, and the 45 degree torpedo retrofit. Each configuration was tested five times in a testing tank with a simulated river flow for 36 hours. It was discovered that even though the 15 degree torpedo performed better than the circular pier column, the hypothesis was not supported. The 45 degree torpedo provided the best results with the smallest scour hole due to its short length and sharp angle. The use of a feasible, cost effective retrofit would improve bridge safety and extend the service life of existing bridges without undergoing costly repairs or replacement.

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