

Lateral Resistance of Deep Foundations in Liquefied Sand From Full-Scale Tests

The lateral resistance of deep foundations is often important in the design of bridges and high-rise structures in seismically active regions. To improve our understanding of the lateral load behavior of deep foundations in liquefied soil, BYU has conducted a series of lateral load tests on full-scale piles, pile groups and drilled shaft foundations. At Treasure Island in San Francisco Bay, static tests were first conducted in non-liquefied soil and then cyclic tests were performed with a high-speed actuator after a surface layer was liquefied using controlled blasting. Subsequently, lateral load tests in liquefied sand were conducted in Charleston, South Carolina in connection with the design of the Cooper River Bridge. These tests involved both static and dynamic loadings using a Statnamic rocket sled to evaluate damping effects due to rapid loading. Based on these tests, p-y curves were developed for liquefied sand which account for both pile diameter and sand density. These p-y curves provide reasonable estimates of pile performance observed in field, centrifuge and large-scale shaking table tests. Dr. Rollins will summarize the results from the field tests and the recommended p-y curves which are now incorporated in LPILE. He will also show videos of the blast liquefaction testing including the Statnamic loading.