

Deep Foundation Behavior in Liquefied Sands

Deep foundations must be designed to deal with lateral loads and axial forces resulting from soil liquefaction. Prof. Rollins will survey approaches for considering lateral pile resistance in liquefied soils based on centrifuge, shaking table and full-scale blast liquefaction testing. Prof. Rollins first employed blast liquefaction for lateral load testing on piles and drilled shaft at Treasure Island in San Francisco. Later, static and dynamic lateral load tests, using a statnamic rocket sled, were conducted in Charleston, South Carolina for the Cooper River Bridge. 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 shaking table tests. Dr. Rollins will also highlight blast liquefaction testing that has been used to determine negative skin friction and down drag on a steel pile in Vancouver, Canada and three CFA piles in Christchurch, New Zealand. In contrast to some theories, measured negative skin friction in the liquefied sand was not zero. As the liquefied sand reconsolidated, the sand exerted negative friction which was about 50% of the positive skin friction before liquefaction. Dr. Rollins will show videos of blast liquefaction, sand boil formation, and Statnamic load testing.

Bio-Sketch



Kyle Rollins received his BS degree from Brigham Young University and his Ph.D. in Civil Engineering from the University of California at Berkeley. After working as a geotechnical consultant, he joined the Civil Engineering faculty at BYU in 1987 following after his father who was previously a geotechnical professor. His research has involved geotechnical earthquake engineering, deep foundation behavior, bridge abutments, collapsible soils and soil improvement techniques. He has published nearly 150 technical papers and supervised over 100 graduate students. He was recognized as the engineering educator of the year by the Utah State Engineers Council and received the Maeser Research Award at BYU. ASCE recognized his work with the Huber research award and the Wellington prize. In 2009, he was the Cross-Canada Geotechnical lecturer for the Canadian Geotechnical Society.