*A person in a suit smiling

Description automatically generated with low confidence****LIQUEFACTION ASSESSMENT IN GRAVELLY SOILS***

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**BIO-SKETCH:** Kyle Rollins received his BS degree from Brigham Young University and his Ph.D. from the University of California at Berkeley. After working as a geotechnical consultant, he joined the Civil Engineering faculty at BYU in 1987. His research has involved geotechnical earthquake engineering, soil improvement techniques, gravel liquefaction, deep foundation behavior, bridge abutment resistance, and collapsible soils. His work typically involves full-scale testing to evaluate and improve performance of bridges and buildings. In this effort, he pioneered the use of blast-induced liquefaction testing to evaluate ground improvement effectiveness and pile performance in full-scale tests. The American Society of Civil Engineers has recognized his work with the Huber research award, the Wellington prize, and the Wallace Hayward Baker award. He was a Cross-Canada Geotechnical lecturer for the Canadian Geotechnical Society.

**ABSTRACT:** Gravelly soils have liquefied at multiple sites in at least 27 earthquakes over the past 130 years. These gravels typically contain more than 25% sand which lowers the permeability and makes them susceptible to liquefaction. Developing a reliable, cost-effective liquefaction triggering procedure for gravelly soils has been a challenge for geotechnical engineers. Typical SPT- or CPT-based correlations can be affected by large-size gravel particles and can lead to erroneous results. To deal with these problems, we have developed liquefaction triggering curves for gravelly soils based on (1) shear wave velocity (Vs) and (2) a large diameter cone penetrometer. With a cone diameter of 74 mm, the Chinese Dynamic Cone Penetration Test (DPT) is superior to smaller penetrometers and can be economically performed with conventional drilling equipment. Using logistic regression analysis, the DPT has been directly correlated to liquefaction resistance at sites where gravels did and did not liquefy in past earthquakes. Probabilistic liquefaction resistance curves were developed based on 137 data points from 10 different earthquakes in seven countries. Using a similar data set, probabilistic liquefaction triggering curves were also developed based on Vs measurements in gravelly soils. The Vs-based liquefaction triggering curves for gravels shift to the right relative to similar curves based on sands. New magnitude scaling factor (*MSF*) curves have also been developed specifically for gravel liquefaction which were found to be consistent with previous curves for sand. Comparative analyses for sites at Centreport in Wellington indicate that liquefaction assessment from the DPT was very consistent with that by the cone penetrometer (CPT) for the loose gravelly soils involved.

Gravel Ejecta in 1976 Friuli Italy EQ