LIQUEFACTION AND REMEDIATION OF SILTY SOILS

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ABSTARCT
Liquefaction of saturated loose granular sand and non-plastic silty sand deposits during seismic loading is one of the most dramatic threats to the safety of structures during earthquakes. Liquefaction-induced damages to highways and structures have been observed in almost all major earthquakes. Rational liquefaction screening tools and design methods for liquefaction remediation techniques are urgently needed to identify liquefaction prone areas and mitigate liquefaction-induced losses. Among many techniques, sand deposits densified by dynamic compaction (DC) and vibro-stone column (SC) are more resistant to liquefaction, and have performed well during earthquakes. Silty sand deposits appear to perform well when improved by either technique supplemented with wick drains. This paper presents a rational procedure to determine the level of densification achievable using each technique, with or without supplemental wick drains, for liquefaction mitigation of loose sand and non-plastic silty soils. It also presents a liquefaction screening method for these soils. These design methods were developed based on an analytical model for simulation of the performance of soil deposits during ground improvement works, using energy principles governing soil liquefaction and soil densification by consolidation during dynamic compaction and stone column installation. The results from this simulation model and the design charts developed based on this model have been compared with instrumented field test and available case histories through collaboration with Advanced Geosolutions, Inc. and Hayward Baker, Inc.