Geophysical Research Abstracts
Vol. 12, EGU2010-9718-1, 2010
EGU General Assembly 2010

Mitigation of Liquefaction in Sandy Soils Using Stone Columns

Levent Selcuk (1) and Kamil Kayabalı (2)

(1) Yüzüncü Yıl University Architectural Engineering Faculty Department of Geological Engineering, Van, Turkey (lselcuk@hotmail.com), (2) Ankara University Engineering Faculty Department of Geological Engineering, Ankara, Turkey (Kamil.Kayabali@eng.ankara.edu.tr)

Soil liquefaction is one of the leading causes of earthquake-induced damage to structures. Soil improvement methods provide effective solutions to reduce the risk of soil liquefaction. Thus, soil ground treatments are applied using various techniques. However, except for a few ground treatment methods, they generally require a high cost and a lot of time. Especially in order to prevent the risk of soil liquefaction, stone columns conctructed by vibro-systems (vibro-compaction, vibro-replacement) are one of the traditional geotechnical methods. The construction of stone columns not only enhances the ability of clean sand to drain excess pore water during an earthquake, but also increases the relative density of the soil. Thus, this application prevents the development of the excess pore water pressure in sand during earthquakes and keeps the pore pressure ratio below a certain value.

This paper presents the stone column methods used against soil liquefaction in detail. At this stage, (a) the performances of the stone columns were investigated in different spacing and diameters of columns during past earthquakes, (b) recent studies about design and field applications of stone columns were presented, and (c) a new design method considering the relative density of soil and the capacity of drenage of columns were explained in sandy soil. Furthermore, with this new method, earthquake performances of the stone columns constructed at different areas were investigated before the 1989 Loma Prieta and the 1994 Northbridge earthquakes, as case histories of field applications, and design charts were compiled for suitable spacing and diameters of stone columns with consideration to the different sandy soil parameters and earhquake conditions.

Key Words: Soil improvement, stone column, excess pore water pressure