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| Proje Başlığı: | Investigation of the Effectiveness of Jet Grout Columns for Liquefaction Mitigation by Field Experiments |
| Proje Türü: | TÜBİTAK 1001 Projesi |
| Proje Yürütücüsü: | Assoc. Prof. Dr. Mehmet Rifat KAHYAOĞLU |
| Proje Özeti: | Earthquake induced cyclic loads are one of the important factors triggering liquefaction in saturated loose granular soils (silty sand).   During liquefaction, pore water pressure between the soil particles increases and effective stresses decreases, then the soil loses its bearing capacity by exhibiting fluid-like behavior. Thus, life and economic losses can reach significant levels due to structural damage of the buildings and their foundations. Ground improvement methods are utilized to prevent the liquefaction tendency of soil. Constructing high-modulus (rigid) structures into the soil with a jet-grout column is one of these methods. The demand for jet-grout is increasing due to its applicability in different soil types and wide areas, ease of manufacture, economic accessibility, adequacy of strength features, usability for existing foundations, and most importantly, effectiveness in preventing liquefaction and liquefaction settlements.  The underlying assumptions of this method are; the jet-grout columns and the surrounding soil will deform equally in pure shear, the earthquake-induced shear stresses will concentrate on rigid structural element (column), liquefaction potential will decrease since the surrounding soil will be densified during jet-grout injection. In some studies, results were incompatible with these assumptions. In literature, very few experimental and field studies on the efficiency of jet-grout columns in preventing liquefaction are encountered. The jet-grout column behavior under cyclic loading has not yet been adequately clarified. Thus, the need for detailed investigation has arisen. In this project, field experiments will be conducted to investigate the effectiveness of jet-grout columns against liquefaction.  For experiments, a site which is known with high liquefaction potential will be used. Dynamic loading for triggering liquefaction will be created by blasting. Liquefaction potential of soils will be re-evaluated according to the result of cone penetration (CPT) conducted at sites.  Jet-grout columns will be installed discretely in pattern with equal distance. Cement-water slurry ratio used for jetting will be changed to form columns with different rigidity. Thus, it will be possible to make a different application in terms of the rigidity ratio of soil-column. Besides, a layout to examine the soil-column area ratio will be included. The jet-grout columns will be installed discrete in pattern for the case used to obtain the effect of soil-column area and rigidity ratio. Before, during and after the experiment, before and after jet-grout column installation, alterations in soil parameters will be recorded with frequent measurements. Measurements will serve to collect data for pore pressure, shear stresses-strains, and strength parameters and shear wave velocity changes. Thus, a point where researchers disagree, whether the rigid columns reduce the shear strain of soil during the earthquake can be commented. Outcomes will be compared with the existing studies to discuss the reliability of the study.  In the light of project outputs, it is aimed to provide recommendations that can guide future studies, to propose simple relationships or graphics for the preliminary evaluation of jet grout column dimensions, and to raise awareness that more realistic approaches can be developed by investigating soil liquefaction with field experiments. |
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