



## Soil Mechanics, Soil Dynamics and Physical Modeling Laboratories



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### **Application of shear wave velocity in the estimation of liquefaction potential of sands mixed with gravel**

#### **Abstract**

Liquefaction is a geotechnical phenomenon affecting the extent of damage caused by earthquakes in sandy soils with low and medium relative density. A natural sandy soil is not usually clean, instead, it may contain portions of fine or coarse grained soil. This study aims to better understand the effect of adding various amount of gravel on liquefaction potential of Firoozkooh sand as a host sand. For this purpose, samples of sands mixed with different amount of gravel contents were prepared and tested with different relative densities. Besides, in order to evaluate the correlation between shear wave velocity and the liquefaction resistance, bender element tests were performed. In total, 42 cyclic triaxial tests were conducted on soil samples. The results show that with a small increase in gravel content, the liquefaction resistance increases. However, by further increasing the amount of gravel up to 50 percent, the liquefaction resistance decreases. When the gravel content increases more than 50 percent, the structure of the soil transfers from the state of being controlled by the sand matrix to the state of being controlled by gravel matrix eventually leading to an increase in liquefaction resistance. The results of bender element tests show that the shear wave velocity continuously increases by increasing the amount of gravel content. In order to fully investigate this phenomenon, the test results were scrutinized from the view point of the parameters controlling the soil structure such as the intergranular and interfine void ratios. The results show good conformity between intergranular void ratio and the potential of liquefaction. Finally, it is concluded that the relative density is not a good parameter to demonstrate the behavior of gravelly sandy soils and it is recommended to use other parameters such as intergranular void ratio. Keywords: liquefaction potential, shear wave velocity, Firoozkooh sand, gravel, bender elements test.