



Soil Mechanics, Soil Dynamics and Physical Modeling Laboratories



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Experimental and analytical investigation of seismic behavior of existing buried concrete rectangular liquid storage tanks

Abstract

Buried or semi-buried concrete rectangular liquid storage tanks are important structures in the storage of fluids, especially water, which in Iran a substantial number of this type of tanks for storage of drinking water are used. Behavior Recognition of these tanks for predicting their damages during earthquake and make appropriate solution for retrofitting of them is necessary. These tanks have some expansion joints that are proportional to their dimensions of the structure are divided into several parts. In addition to the expansion joints, existence three phases and soil-structures-fluid interaction adds complexities of the issue. For this purpose, a series of 1g shaking table tests on 1:30 model of this type of tanks have been conducted to determine the effect of various parameters on the tank behavior. In addition to qualitative observations of the destruction and the model behavior, parameters such as: water pressure, soil pressure, acceleration and displacement have been recorded by proper instruments during the tests. By checking the resulting data, changing of water dynamic pressure along the tank, dynamic soil pressure on tank wall and displacements of tank parts are achieved. According to the results the displacements of an empty tank is more than the full one and these displacements result more geotechnical failure around the tank. As well as increasing the soil relative density around the tank, diminish geotechnical failure. Finally, experimental results with some existing correlations in the literature and the codes were compared that show Housner methods for water pressure calculation and Wood method for soil pressure calculation have good agreement.