1-g Shake Table Tests to Study the Impact of PGA on Foundation Settlement in Liquefiable Soil

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Abstract : The liquefaction-induced ground settlement has caused severe damage to structures in the past decades. However, the amount of building settlement caused by liquefaction is directly proportional to the intensity of the ground shaking. To reduce this soil liquefaction effect, it is essential to examine the influence of peak ground acceleration (PGA). Unfortunately, limited studies have been carried out on this issue. In this study, a series of moderate scale 1g shake table experiments were conducted at the University of Nevada Reno to evaluate the influence of PGA with the same duration in liquefiable soil layers. The model is prepared based on a large-scale shake table with a scaling factor of N = 5, which has been conducted at the University of California, San Diego. The model ground has three soil layers with relative densities of 50% for crust, 30% for liquefiable, and 90% for dense layer, respectively. In addition, a shallow foundation is seated over an unsaturated crust layer. After preparing the model, the input motions having various peak ground accelerations (i.e., 0.16g, 0.25g, and 0.37g) for the same duration (10 sec) were applied. Based on the experimental results, when the PGA increased from 0.16g to 0.37g, the foundation increased from 20 mm to 100 mm. In addition, the expected foundation settlement based on the scaling factor was 25 mm, while the actual settlement for PGA 0.25g for 10 seconds was 50 mm.

Keywords : foundation settlement, liquefaction, peak ground acceleration, shake table test
Conference Title : ICEES 2022 : International Conference on Earthquake Engineering and Seismology
Conference Location : San Francisco, United States
Conference Dates : November 03-04, 2022