

Shaking Table Tests of Freestanding Ceramic Vase

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Abstract. Earthquake damage to freestanding nonstructural components has occurred in past earthquakes. Ceramic vase is one of the most vulnerable freestanding nonstructural components especially in museums and historical buildings. The vase is commonly placed on the floor without any mechanical attachment between the floor and its bottom. Under the action of friction force in between, there are basically four types of response mode, i.e., rest, slide, slide-rock, and rock. These kinetic behaviors are determined by the friction coefficient and floor motions. Shaking table testing is conducted to understand the seismic behavior, where four motions, consisting of two historic and two artificial ones, are selected and generated. Marble stone panel is fixed on the surface of the shaking table to simulate the floor, which is very popular in modern residential and office buildings. The kinetic friction coefficient is acquired with slow-pull test, which is used to define the possible response modes. The rocking and sliding responses of the vase are observed by accelerometers and highspeed camera. Results show that the response mode of the vase is highly dependent on the input peak acceleration, i.e., the higher the peak acceleration, the larger the rocking angles. In addition, the dynamic response varies with the excitation of different input motions indicating that the frequency contents of the input motion also affect the rocking intensity. The floor motions have relatively long period contents close to the rocking period of the vase, consequently, the dynamic response is larger than that of El Centro, which is the applied ground motion. Furthermore, three-dimensional laser scanner is used to quantify the geometric properties, then a simplified model is built to analyse the kinetic properties of the vase.

Keywords: Ceramic vase, Rock, Slide, Shaking table, Seismic performance.

DOI 10.7414/4sponse.ID.14