

## Near Fault Effects: Research Needs in Geotechnical Engineering

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### Abstract

The near-fault ground motion is characterized by a large high-energy pulse and a distinctive pulse in the velocity time history, such as Chi-Chi earthquake in 1999 in Taiwan. In order to consider and simulate the strong ground motion of near-fault, the southern laboratory of NCREE will be equipped with a high performance six degree-of-freedom seismic simulation testing system. The maximum horizontal stroke and velocity of the test system are  $\pm 1.0$  m and  $\pm 2.0$  m/s, respectively. The long-stroke and high-speed shaking table can be used to simulate the near-fault ground motion. The facility will provide research opportunities to advance the state of knowledge on near-fault issues. In geotechnical engineering, there are at least two topics should be investigated for the effects of near-fault ground motion in the near future.

The first topic is the seismic performance of embankment dams subjected to near-fault earthquakes. In Taiwan, there are 15 embankment dams located within a 10 km perimeter of the Category-I active faults. Most of them were constructed at least 20 years ago, with design earthquakes much smaller than current practices. Therefore, it is necessary to investigate the performance of these embankment dams under strong earthquakes, especially for near-fault earthquakes.

Another research topic proposed is the soil liquefaction induced by near-fault earthquakes. An extensive research has been studied to understand the mechanism of liquefaction, liquefaction potential, hazard mapping and also to develop the countermeasures against liquefaction. However, the study on near-fault effects of liquefaction is still limited. The generation of excess pore water pressure is related to cyclic shear strain of the soil, and the shear strain of soil is also proportion to the velocity of motion. Therefore, the significant velocity pulse in the strike normal component of near-fault ground motion would be more susceptible to liquefaction and associated damages. This problem can be investigated by the liquefaction tests using the shaking table constructed in Tainan.