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Strategy for Collapse Prevention of RC Buildings under Near-Fault Earthquakes

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Abstract

Active faults are the sources for disastrous earthquakes and severe ground motion at near field. There are 42 active faults and suspect active faults in Taiwan and most of these faults are in the densely-populated area. According to recent statistics, nearly 2.5 million buildings, accommodating 8.6 million people, are located within a distance of 10 kilometers around these faults. It means that more than one third of Taiwan population is under the threat of near-fault earthquakes. Near-fault pulse-like ground motions may induce large displacement and strength demands in structures and increase the risk of earthquake-induced collapse relative to the high seismic, far-field sites that have been the focus of past research on collapse risk. A question has been brought up as to how to determine the collapse safety margin of structures at near field, and how to retrofit structures to effectively augment such margin.

For the existing school buildings at near field in Taiwan, the retrofitting strategy is to increase the demand of earthquake design force, and to enhance the capacity and integrity of structure by using shear wall and strong foundation. Adequacy of this retrofitting strategy needs further investigation. Moreover, there are much more residential buildings also subjected to the threat of near-fault earthquakes. They are older non-ductile RC frame buildings, which suffer from insufficient shear strength at columns. However, these residential buildings have plenty of infilled walls, either RC or brick, with openings. The seismic collapse risk in the near-fault region might be mitigated through the participation of infilled walls with openings. The intended retrofitting strategy for the low-rise residential RC buildings is to make use of these infilled walls with openings, especially their collapse prevention behavior.

NCREE is going to establish an 8mx8m shaking table with a long stroke (2m) and high velocity/acceleration. This facility facilitates the experimental studies on the collapse behavior of shear critical columns and infilled walls with openings. This presentation illustrates the intended strategy for collapse prevention of RC frames under

near-fault earthquakes and related research planning.