World Academy of Science, Engineering and Technology
International Journal of Urban and Civil Engineering
Vol:12, No:12, 2018

Simulation Analysis of a Full-Scale Five-Story Building with Vibration Control Dampers

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Abstract : Analysis methods to accurately estimate the behavior of buildings when earthquakes occur is very important for improving the seismic safety of such buildings. Recently, the use of damping devices has increased significantly and there is a particular need to appropriately evaluate the behavior of buildings with such devices during earthquakes in the design stage. At present, however, the accuracy of the analysis evaluations is not sufficient. One reason is that the accuracy of current analysis methods has not been appropriately verified because there is very limited data on the behavior of actual buildings during earthquakes. Many types of shaking table test of large structures are performed at the '3-Dimensional Full-Scale Earthquake Testing Facility' (nicknamed 'E-Defense') operated by the National Research Institute of Earth Science and Disaster Prevention (NIED). In this study, simulations using 3- dimensional analysis models were conducted on shaking table test of a 5-story steel-frame structure with dampers. The results of the analysis correspond favorably to the test results announced afterward by the committee. However, the suitability of the parameters and models used in the analysis and the influence they had on the responses remain unclear. Hence, we conducted additional analysis and studies on these models and parameters. In this paper, outlines of the test are shown and the utilized analysis model is explained. Next, the analysis results are compared with the test results. Then, the additional analyses, concerning with the hysteresis curve of the dampers and the beam-end stiffness of the frame, are investigated.

Keywords : three-dimensional analysis, E-defense, full-scale experimen, vibration control damper
Conference Title : ICSAUDA 2018 : International Conference on Simulation for Architecture and Urban Design Applications
Conference Location : Bangkok, Thailand
Conference Dates : December 13-14, 2018