

## SEISMIC VULNERABILITY ASSESSMENT OF RC SHEAR WALL-MOMENT FRAME DUAL STRUCTURAL SYSTEM CONSIDERING NEAR-FIELD EARTHQUAKES

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Dual system, which is designed to provide greater strength and ductility of the structure, is one of the most common seismic resistant systems in the world. On the other hand strong earthquakes of the past decade have revealed destructive effects of motions in vicinity of faults.

The purpose of this study was to investigate the seismic behavior of dual structural system in form of concrete moment-resisting frame accompanied with RC shear walls, against near-field earthquakes.

A 20 stories reinforced concrete shear wall-special moment frame structure have been designed according to ASCE7 requirements. The nonlinear model of the structure was performed on the Open System for Earthquake Engineering Simulation (OpenSees) platform. Nonlinear static, time history and incremental dynamic analysis with 56 near-field records are performed on them and performance evaluation, using the proposed method of FEMA695 guideline, was done. Since the earthquake occurred is a random phenomenon, so it looked a probabilistic approach. For this purpose the fragility curves is presented (Figure 1). In order to further understand the structural collapse behavior in the near field, the response of the structure at the moment of collapse especially the formation of plastic hinges is investigated (Figure 2).

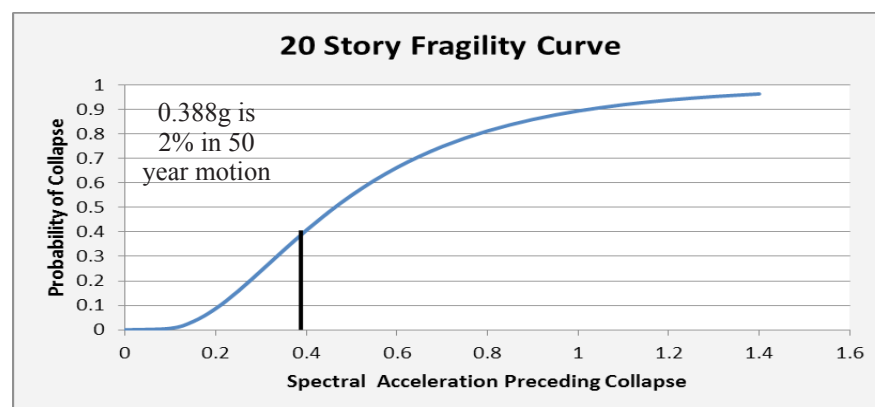


Figure 1. Fragility curves for near-field records

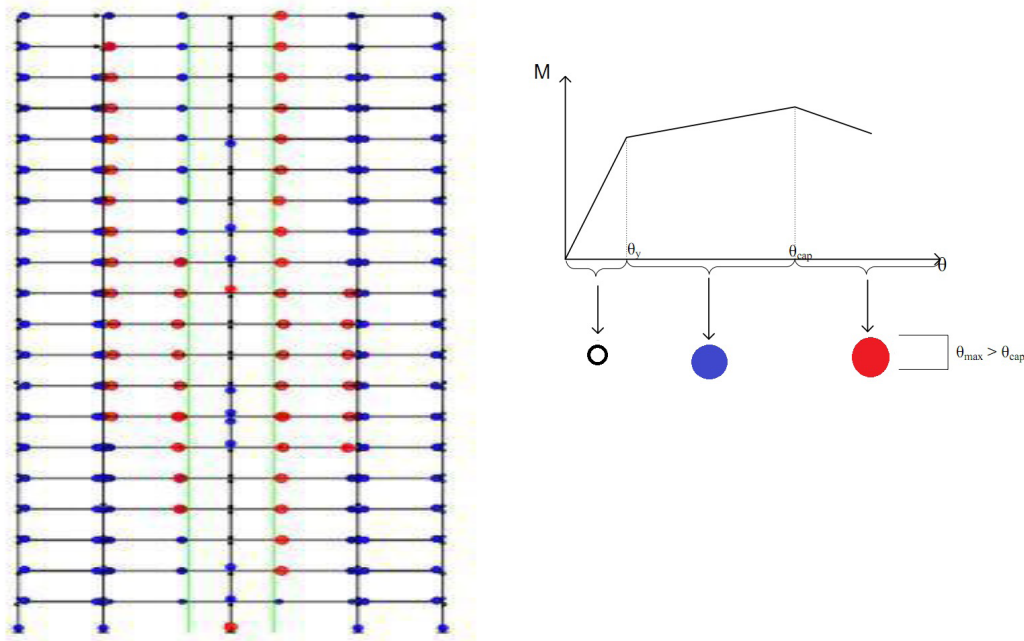


Figure 2. Formation of plastic hinges at the moment of collapse against Supersition Hills record

The results show that special characteristics of near-field earthquakes such as higher mode effects, especially in high rise buildings, can cause formation of plastic hinges at the mid height of shear wall, didn't considered by codes, resulted in weak seismic performance, so more attention should be paid to their design.

## REFERENCES

- FEMA (2009) Quantification of Building Seismic Performance Factors, FEMA P695, Washington, DC
- Haselton CB (2006) Assessing seismic collapse safety of modern reinforced concrete moment frame buildings, Stanford University
- Haselton CB (2008) Beam-column element model calibrated for predicting flexural response leading to global collapse of RC frame buildings: Pacific Earthquake Engineering Research Center
- Panagiotakos TB and Fardis MN (2001) Deformations of reinforced concrete members at yielding and ultimate, ACI Structural Journal, 98(2)
- PEER/ATC 72-1 (2011) Modeling and Acceptance Criteria for Seismic Design and Analysis of Tall Buildings 2011, Applied Technology Council, Pacific Earthquake Engineering Research Center