

The Influence of Irregular Openings on Strength & Dynamic Characteristics of Shear Walls

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Concrete shear walls are one of the main lateral resisting elements in high rise buildings. Architectural and mechanical restrictions in many cases demands opening in concrete walls. However, there is not sufficient information about dynamic behavior of such walls. The aim of this study was determination of characteristics of walls with irregular openings. For this purpose, 5, 10 and 15 story walls were modeled with various types of openings in size and location. Area of openings was 5% and 20% of story area where located in center, eccentric and staggered in studied models. Nonlinear static pushover analysis was conducted using Perform 3D program to investigate the influence of regular and irregular openings on dynamic behavior of shear walls. Openings cause changes in dynamic behavior of shear walls such as ultimate load, reduction factor, ductility and higher mode effects. Generally, obtained results shown that the openings in some situations may cause better seismic behavior in shear walls. For example, openings may provide walls with larger reduction factor and greater ductility. However, use of openings may improve seismic behavior in some type of shear walls, but reduction in ultimate load restricts designers in use of very large openings. To compare the target displacement with the real displacement that structure may encountered in earthquake, nonlinear dynamic analysis was conducted for all models. The results shown that the target displacement values that contains from FEMA guideline in shear wall structures, less than the real one that the earthquake makes in structures, so the corrective coefficient was suggested to multiply to the target displacement for shear wall structures.