

## SEISMIC PERFORMANCE EVALUATION OF R.C. SHEAR WALLS WITH IRREGULAR OPENING

Zohreh BARIBAN FATIDEH

*M.Sc. Student of Earthquake Engineering, School of Civil Engineering,  
College of Engineering, University of Tehran, Tehran, Iran  
zbariban@ut.ac.ir*

Mohammad KHANMOHAMMADI

*Assistant Professor, School of Civil Engineering, College of Engineering, University of Tehran, Tehran, Iran  
mkhan@ut.ac.ir*

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### ABSTRACT

Reinforced concrete shear walls have been usually used as the main lateral load-bearing components in concrete building because of their rigidity, bearing capacity and high ductility. Openings are generally present in walls according to the intention of the services, doors and windows, in other words for provision of architectural design. The presence of openings influences on the seismic response of the walls. Although the using of opening in shear walls is common among practitioners, however limited research on walls with openings has established to investigate their effects on seismic response. In this line it is required to comprehensively understand the influence of opening parameters such as size, location on the seismic performance of walls and consequently building behavior.

The main objective of this study is to investigate the effect of irregular openings in concrete shear wall seismic performance. In this paper, a nonlinear 3-D finite element analysis (FEA) model using ABAQUS was developed based on experimental data and calibrated with laboratory results. Based on calibrated models, a parametric study is carried out and the effect of aforementioned parameters on seismic behavior of shear walls with opening is investigated. The result of analysis show that the seismic performance of reinforced concrete shear walls is affected by size and location of openings.

### INTRODUCTION

Reinforced concrete shear walls are used widely as the main lateral resisting members in buildings. Architectural and mechanical requirements make that pierce shear walls regularly or irregularly. Since, staggered openings were not deeply inquired in the past and due to lack of detailed recommendations related to the seismic design and evaluation of these types of walls, use of them to be a serious concern. With regard to the application and importance of modeling shear walls with or without openings, several analytical and experimental studies have been proposed in literature. However, few experimental and analytical studies of the seismic behavior of shear walls with irregular openings are available. Among the limited experimental research conducted on shear walls with irregular openings, can be pointed to the research of Yanez et al. (1991). The results show that stiffness of walls was dependent on the size of the opening but not dependent on their arrangement. Other research studies for the same field were conducted by Ali and Wight (1991). In this paper the result of their work on a typical building with pierced shear walls in Chile, which remind intact after the earthquake in 1991 was published. Li and Wu (2003) to compare with Yanez et al (1991) experimental study, flanges were added to their specimens. It can be concluded that the size and the arrangement of the openings did not have a significant effect on the wall with irregular openings and flanges. Wu and Li (2003a) with using a reliable nonlinear finite element program analyzed the Yanez et al. (1991) and Ali and Wight (1991) models. A parametric study was conducted on the