

Analysis of Shear Wall With Opening

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Abstract - In high rise building shear wall is used to resisting the lateral loads that may be induced by the effect of wind and earthquakes. Some researches on the analysis of shear wall with openings were performed, but some restrictions prevent those research results from being applied to the practical analysis and design procedure. It is necessary to use element models for an accurate analysis of a box system structure with openings. Comparative study concludes that changing the position of shear wall of reinforced concrete structures with various opening sizes in buildings openings are economical. The scope of the present work was to study seismic responses of the ten storey RC shear wall building with or without openings. Developed mathematical modeling and analyzed the reinforced concrete shear wall building by using different nonlinear methods (time history and seismic method). These methods differ in respect to accuracy, simplicity, transparency and clarity of theoretical background.

Key Words: Opening in shear wall, Coupled wall, RC shear wall building, Time history analysis, Rectangular opening, ETABS.

1. INTRODUCTION

The reinforced concrete shear wall is important structural elements placed in multi-storey buildings which is situated in seismic zones because they have a high resistance to lateral earthquake loads. Shear walls building structure will be perforated with rows of openings that are required for windows in external walls or doors or corridors in internal walls. Simplified methods for stiffness of shear walls with openings are recommended in several designs. It is necessary to know the effects of openings sizes and configurations in shear wall on stiffness as well as on seismic responses and behavior of structural system so that a suitable configuration of openings in shear walls can be made. Reinforced concrete multi-storey buildings are adequate for resisting both the vertical and horizontal load.

1.1 OBJECTIVE OF THE STUDY

Shear walls in apartment buildings may have rows of openings that are required for windows in external walls or internal walls. The size and location of openings may vary from architectural and functional point of view. Its some adverse effect on stiffness of shear wall as well as on the seismic response of frame structures. Thus, the main objective of this study is to study the effects of openings & its configurations in shear wall on seismic response of the buildings.

1.2 SHEAR WALL WITH OPENING

Shear walls with openings are called coupled shear walls which act as cantilevered walls joined by coupling beams. Openings for windows and doors affect the behavior of the structure and cause to decrease the strength of shear wall. We have studied in three cases with or without opening, rectangular and square openings shear wall. In the past decades, large amount of research carried out in shear wall structures with different arrangements of rectangular openings.

They were studied on seismic behavior of R.C. walls with square openings of different size and arrangement under reversed cyclic loading. It was concluded that the stiffness of walls is dependent on the size of the openings and not on their horizontal locations. The studies R.C. structural walls with rectangular openings by modeling four specimens with a scale of 1/5 with five floors. They tested by applying cyclic lateral load through a hydraulic actuator. His study stated that the walls with rectangular openings exhibited ductile flexural behavior and the door openings located close to the edge of the boundary column triggered early shear-compression failure.

2. MODEL DESCRIPTION

For this study, a multi-storied (G+10) building modeled with and without opening, with rectangular opening and square opening in shear wall using ETABS software. Stiffening of the shear wall around the opening is represented by thickening the width of shear wall around the opening. The model was meshed in order to obtain results with higher accuracy. The earthquake load and load combinations were applied as per IS 1893 – 2002 and the seismic analysis was done by using ETAB. The shear wall was designed using limit state method and was detailed as per IS 456 – 2000 respectively.

Table -1: Data Assumed

Number of storey	G+10
Typical storey height	3m
column size	500mm X500mm
Beam size	300mm X 600mm
Slab thickness	150mm
Shear wall thickness	300mm
Grade of concrete	M25
Grade of steel	Fe500



3. CONCLUSIONS

In this work, by performing of RC shear walls building with openings multi-storied building was carried out to compare with the different dimension by using ETABS software in multiple areas. All the analysis can be check seismic load in opening shear wall of different shapes and dimension for with or without opening in frame RC shear wall building. The findings of this investigation provide better perception of seismic response of these walls. Rectangular and square opening shear walls to be proved that they are very advantageous and useful for design purpose.

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