



## SEISMIC PERFORMANCE OF RCC BUILDING WITH SHEAR WALLS AT VARIOUS LOCATIONS - A REVIEW

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### Abstract:-

*The occurrence of the earthquakes in the world and construction of high rise buildings demands for the construction of earthquake resistant buildings. Many of the tall buildings had collapsed in past earthquakes and the reasons attributed were poor design and construction practices. The high seismic areas may be susceptible to the severe damage in structures. In the seismic design shear walls play a major role in earthquake resisting members. Now a day, shear wall in R.C. structure are most popular system to resist lateral load due to earthquake. Shear wall is a rigid vertical diaphragm capable of transferring lateral forces from exterior walls, floors, and roofs to the ground foundation in a direction parallel to their planes. Shear walls have more strength, stiffness and resist in-plane loads that are applied along its height. Buildings with shear walls which are properly designed give a very good performance. Also the positioning of shear wall has influence on the overall performance of the building. For effective performance of building it is essential to provide position of shear wall in an ideal location. In the present paper, studies of various researches were discussed on performance of RCC building with shear wall based on its location.*

**Keywords - Shear wall, Earthquake, RCC, Seismic Forces**

### INTRODUCTION

Earthquakes demonstrate vulnerability of various inadequate structures, every time they occur. The lessons taught from the aftermath of earthquakes and the research works being carried out in laboratories give better understanding about the performance of the structure and their components. Damage in reinforced concrete structures was mainly attributed to the inadequate detailing of reinforcement, lack of transverse steel and confinement of concrete in structural elements. Typical failures were brittle in nature, demonstrating inadequate capacity to dissipate and absorb inelastic energy. This necessitates a better understanding of the design and detailing of the reinforced concrete structures under various types of loading.

Shear wall is a rigid vertical diaphragm capable of transferring lateral forces from exterior walls, floors, and roofs to the ground foundation in a direction parallel to their planes. When shear walls are designed and constructed properly, they will have the strength and stiffness to resist the horizontal forces. Shear walls are especially important in high-rise buildings subject to lateral wind and seismic forces.

In the present study, various researches were discussed on performance of shear wall based on its location, orientation and materials used for construction.

### REVIEW OF LITERATURE

Chandurkar and Pajgade, presented a study towards the solution for shear wall location in multistory building. Effectiveness of shear wall had been studied with the help of four different +models. Model one was bare frame

structural system and other three models were dual type structural system. An earthquake load was applied to a building of ten stories located in zone II, zone III, zone IV and zone V. Parameters like Lateral displacement and story drift whereas total cost required for ground floor were calculated in both the cases replacing column with shear wall.

Ainawala and Pajgade, For the study, a G+12, G+25, G+38 building with 3.5 meters height for each storey, regular in plan was modeled. This building consists of four spans of 5 meter, 3 meter, 3 meter and 5 meter in X direction and in Y direction as shown in figure 2. The square plan of all buildings measures 16m x 16m. Shear walls were modeled using three different positions. These buildings were designed in compliance to the Indian Code of Practice for Seismic Resistant Design of Buildings. The buildings was assumed to be fixed at the base. The buildings were modeled using software ETAB Nonlinear v 9.0.7 four different models were studied with different positioning of shear wall in different zones and for various heights to find out the best location of shear wall in buildings. Models were studied and dynamic analysis was performed for G+ 38 models in all the four zones comparing the lateral displacement, storey drift, concrete quantity required, steel and total cost required in all the zones

Prof. N. K. Meshram, Gauravi M. Munde, studied Seismic Analysis of Shear Wall at Different Location on Multi-storey RCC Building. The main aim of work out the solution for shear wall location in multi-storey building. It's important to work out the strength of RC shear wall of a high-rise building by dynamical shear wall location. Three completely different cases of shear wall position for a building are analyzed. Earthquake load is calculated by the unstable constant technique IS 1893 (PART-I):2002. STAAD professional V8i software is used for the analysis of structures. The structures area unit compared on four completely different parameters specifically joint displacement, axial force, bending moment and base shear. In this study, the analysis of multistoried buildings are done by STAAD PRO software using response spectrum analysis observed that time period decreases as the mode frequency increases for all model. Maximum lateral displacement increases as storey height increases for all models. Minimum lateral displacement of the building has been reducing due to the presence of shear wall placed at the center. It can be said that building with corner shear wall is more efficient than all other types of shear wall.

Tarun Magendra (et.al), studied, Optimum Positioning of Shear Walls in Multistory-Buildings. The basic objective of this work is to analyze different models with Shear walls and compare them using ETABS, to get the optimum positioning of Shear walls inside the structure. Four different cases of shear wall position for G+10 storey building with keeping zero eccentricity between mass center and hardness center have been analyzed and designed as a frame system by computer application software ETABS. parameters were considered to present a comparison between the different frames are Maximum Storey Drift, Maximum Storey Displacement, Storey Shears and Storey Overturning Moment. The frame with Shear Walls clearly provides more safety to the designers and although it proves to be a little costly, they are extremely effective in terms of structural stability. It is observed that Box-type Shear Walls showed better results

Prof. Rahul T. Pardeshi et.al, studied Analysis of Irregular High-rise Building Using Shear Walls At Different Locations. They used Staad Pro V8i to analyze the certain irregular high rise building by changing the location of shear wall. The present work contains the experimental investigation on reducing the size of the member to make structure economical and efficient by locating shear wall at varying places in irregular shape building. it is observed that deflection was reduced and reached within the permissible deflection after providing the shear wall in shorter direction. Shear wall symmetrically in the outer most moment resisting frames give better performance for regular shape building. The shear wall location was found to be more effective towards shorter column as compared to other locations. Shear wall at outer side was most efficient and resulting in reduction in base shear as compared to original building.

Mr.K.LovaRaju(et.al), they conducted non-linear analysis of frames to identify effective position of shear wall in multi storey building. An earthquake load was applied to a G+7 storey structure of four models with shear wall at different location in all seismic zones using ETABS. Push over curves were developed and has been

found the structure with shear wall at appropriate location is more important while considering displacement and base shear.

Syed.M.Katami et.al , studied the results of time history analysis which addressed the effect of openings in shear walls near- fault ground motions. A model of ten storey building with three different types of lateral load resisting system: Complete shear walls, shear walls with square opening in the centre and shear wall with opening at right end side were considered. From the results it was observed that shear walls with openings experienced a decrease in terms of strength.

Varsha.R.Harne, presented G+5 storey RCC building which is subjected to Earthquake loading in zone II to determine the strength of RC wall by changing the location of shear wall using STAAD.Pro. Seismic coefficient method is used to calculate the earthquake load as per IS 1893 – 2002 (Part I). Different models compared to other models the shear force and bending moment, for structure with shear wall along the periphery is found to be maximum at the ground level and roof level respectively. Hence the shear wall provided along the periphery of the structure is found to be more efficient than all other types of shear wall.

Suresh et.al., studied to find the effective, efficient and optimum location of shear walls in high rise irregular RC building. In this paper the optimum location of shear wall has been investigated with the help of three different models. Model 1 is frame structural system and other two models are dual type structural system with central core wall and corner shear wall. An earthquake load calculations are based on IS 1893(PART-1)-2002 and applied to (G+20) storey R.C building in zone-2 and zone- 5. The analysis is performed using ETABS Software package. The conclusion was made that plan without shear wall gives more displacement and more drift compare to plan with shear wall along four edges. Hence by providing shear wall along four edges storey displacement, storey drift, storey shear can be reduced and also there is increase strength and stiffness of the structure. Hence it was concluded that by providing shear wall along four edges is found to be optimum position of shear wall.

Donthireddy Raja Shekar Reddy at.al studied the Seismic Analysis of Multi Storied Building with Shear Walls of Different Shapes. In this paper The multi store building with G+14 storey's are analyzed for storey drift story displacement and base shear using ETABS software. For the analysis of these building for seismic loading with all Zones (Zone-II, III, and IV & V) is considered. The analysis of these building is done by using dynamic method (Response spectrum analysis). In the study of seismic behavior of the building with shear walls of four different Shapes in all zones were compared. First part of the study included the dynamic analysis of Building. The storey drift, story displacement and base shear will be obtained.

#### CONCLUSION

The high-rise structure without shear wall gives more displacement and more drift compare to plan with shear wall along four edges. Hence it can be concluded that, by providing shear wall along four edges we can reduce storey displacement, storey drift, story shear and, we can increase strength and stiffness of the structure. Structure with shear wall at optimum location is more important while considering displacement and base shear of any high-rise building. Also various aspects of performance of shear wall presented by many of the investigator. To improve the performance of shear wall. Structure with shear wall at appropriate location is more important while considering displacement and base shear. Raising of shear wall up to the entire height of building is not necessary and it is sufficient to raise the shear wall up to mid height of building. Also the shear wall provided along the periphery of the structure is found to be more efficient.

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