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A Review on Limit State Design and Analysis of Multistorey Building with and Without Shear Wall by Using STAAD.Pro software

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Abstract – *In high rise buildings, the most commonly used lateral load resisting system is Shear wall. The horizontal loads and gravity loads can be resisted by shear wall, as it has very high in plane stiffness and strength. This makes shear wall to be quite advantageous in many structural engineering applications. Many literatures are available which deals with the design and analysis of shear wall. In this paper, the main focus is to carry out extensive literature survey and to determine the scope of work regarding shear wall analysis and design. From the literature it is clear that shear wall is the most effective lateral load resisting system which helps the building to sustain even under seismic loads. However, the scope of study is to investigate the effect of location of shear wall in a building under lateral forces.*

Key Words: Shear wall, STAAD.pro software,

1. INTRODUCTION

Shear wall is defined as vertical structural member which can resist a combination of moment, shear and axial load induced by gravity load and lateral load transfer to the wall from other structural member. RCC walls including shear walls are the usual multi-Storied Buildings requirements. Coinciding centroid and mass centre of the building during design is the ideal for a Structure. An introduction to shear wall represents a most efficient solution to stiffen a structural system of building as the main function of a shear wall is to increase the lateral load resistance.

Cross-sections of Shear walls can be used are rectangular shapes to more irregular cores such as channel, T, L, barbell shape, box etc. The use of shear wall structure is gaining popularity day by day in high rise building, especially in the construction of service apartment or office/ commercial tower. It has been proved, that shear wall system is efficient structural system for multi storied building in the range of 30-35 storeys.

1.1 RC Shear Wall and functions

Shear walls are provided to resist horizontal earthquake forces and to increase the rigidity of building. When shear wall has enough strength, it will transfer the horizontal forces to the next element in load path below. These elements in the load path may be another shear walls, slabs, floors, foundation walls, or footings. The stiffness of shear wall will prevent floor and roof framing members from moving off their supports. Also, buildings that are sufficiently stiff, usually suffer less nonstructural damage.

1.2 PROBLEM STATEMENT

The high rise buildings now-a-days are provided with soft storeys for parking purpose. When such bulding is located in the earthquake prone area, can be subjected to heavy lateral forces. Due to the presence of soft storey in a building, the lateral load resisting capacity of building decreases, thereby the stiffness of building decreases. This leads to sudden failure of structure. To increase the lateral strength and stiffness of a structure, shear walls are introduced in a structure, such that the building can sustain under the seismic loads.

2. LITERATURE REVIEW

Anshuman. S, et al 2011(1) In this paper, the main aim is to find the solution for shear wall location based on its both elastic and elasto-plastic behaviours in multi-storied building. The seismic load is evaluated and applied to the building located in zone IV. The Elastic and elasto-plastic analysis was done using both STAAD Pro and SAP software packages. From the analyses, it can be said that shear wall location should be in the shorter direction of a building, as the building has more length compared to width

Ashish S.Agrawal, et al 2012 (2) The author of this paper investigates the performance of 25 storeys building in zone V, by changing numbers of positions of shear wall with different shapes. The parameters like storey drift, displacement, and axial load are under consideration. This analysis is done using standard package ETAB. Shear walls with varied thicknesses and locations are analysed. It has been concluded that shear wall with 230 mm from base to 25th storey shows considerable reduction in the displacement of the building floor. The shear wall was placed at the centre of building. Hence, Location of shear wall affect static and dynamic axial load on the column and increases the lateral strength of the building.

Kasliwal Sagar K., et al 2012(3), This paper deals with the study of a multi-storied building with varied number and position of shear wall. The method adopted for analysis is Dynamic linear Response spectra method and statics non-linear pushover method. The accuracy check has been

applied under this study comparing the results of both the methods. The analysis is carried out in SAP 2000 software. When L type shear wall is placed at the corner and rectangular shear wall at intermediate bays of the building, then deflection, storey drift is reduced considerably. Also some results shown by push over analysis about the deflection shapes, are in life safety range, some are in elastic range and some are in immediate occupancy range. Therefore strengthening the portion going beyond the life safety range can be strengthen.

Rajesh Jayarambhai Prajapati, et al, 2013(4), The paper deals with the importance of the lateral stiffness of a building. The discussion of wind and seismic design of 30 storey building is done using Autoclave aerated block instead of brick masonry work in building. Wind Load direction is only in Y. The building is located in zone IV. The performance evaluation of building is only in terms of deflection of the building. As per discussion of results there is marginal reduction in deflection, when location of shear wall is at side centre as well as at central location. But the deflection is reduced to the larger extent by introducing shear wall at corner along both directions.

P. P. Chandurkar, et al , 2013(5)The writer discusses parameters like Lateral displacement, storey drift , and total cost required for ground floor when the column is replaced with a shear wall. For this study, a 10-storey building is modeled and analyzed using ETAB software. The performance of building is evaluated by locating the building into four zones, and a comparison is done between, lateral displacement, story drift, concrete percentage required % Ast in column, steel and cost required in every zone for all models. From analysis, it is concluded that in 10 story building, provision of shear wall in short span at corner is economical as compared to other building models.

Varsha R. Harne, 2014(6) In this paper, RCC building is located in zone II. IS 1893:2002 is referred and earthquake loads are applied. This earthquake load is evaluated by seismic coefficient method. The analysis were performed using STAAD Pro. Position of shear wall is kept at three different location in a building and comparative analysis is carried out. Different shapes like Box shaped, L shaped and cross shaped shear wall are located at three different location in a building such as along periphery, at corner and at middle positions. The evaluation of performance of the building is done in terms of lateral force, drift ,deflection, shear force and bending moment in beams at different storey level. It was concluded that, Hence, building with shear wall at the periphery is more efficient than all other positions of shear wall in a building.

Er. Raman Kumar,(7) 2014, The study of average displacement, Member forces, storey drift, of the buildings are analyzed by Seismic Coefficient Method using STAAD pro 2005 is carried out in this paper. Two reinforced concrete framed regular buildings in seismic zone V are under consideration having different locations of shear have been analyzed in this study. Ten and Fifteen-storied buildings have been taken with four different locations of shear-walls i.e. at centre, external frame, internal frame, and combined external and internal frames. The study concludes that, the storey drift is minimum when shear walls are provided in the internal frame of building.

2.1RESULTS AND DISCUSSIONS

Some of the papers studies about the position and location of shear wall at outer and internal bays of the building. It is seen that, position of shear wall in internal bays shows better results in terms of displacement as compared to shear wall in the external bays of a building. Some studies are related to the thickness and height of shear wall in a building. The results shows that, the minimum thickness and maximum height of shear wall in a building can helps to reduce the deflection and storey drift in a building. Some studies concluded that shear wall at the core shows better results as compared to other positions. Some studies deals with the evaluation of steel and cost of building required for the building provided with the shear wall. Hence it was concluded that shear wall provides lateral strength and stiffness to the building and improves the performance of building under seismic forces.

2.2. CONCLUSIONS

Based on the critical review of literature, the main objective of this study is comparing the parametric analysis of behavior of shear wall location in RC Buildings using STAAD pro. From the analysis of the entire model we will find out the optimum position of shear wall. This shall be helpful to be employed in design a RC building to overcome the ill effects of earthquakes and also enhances the confidence of the structural designer.

REFERENCES

[1] Anshuman. S, D. Bhunia, B. Ramjiyani, "Solution of Shear Wall Location in Multi-Storey Building;" International Journal Of Civil And Structural Engineering ISSN 0976 – 4399, Volume 2, No 2, 2011; pp. 493-506

[2] A. S. Agrawal, S.D.Charkha, "Effect Of Change In Shear Wall Location On Storey Drift Of Multistorey Building Subjected To Lateral Loads"; International Journal of Engineering Research and Applications (IJERA); ISSN: 2248-9622; Vol. 2, Issue 3, May-Jun 2012, pp.1786-17932012

[3] Kasliwal S. K., Prof. M. R. Wakchaure, Anantwad S, "Effects Of Numbers And Positions Of Shear Walls On Seismic Behaviour Of Multistorey Structure;" International Journal Of Advanced And Innovative Research; ISSN: 2278-7844, september 2012; pp.189-193

[4] R. J. Prajapati & V. R. Patel, "Effect Of Different Position Of Shear Wall On Deflection In High Rise Building," International Journal of Advances in Engineering & Technology, ISSN: 22311963, Vol. 6, Issue 4,2013 pp. 1848-1854

[5] P. P. Chandurkar, Dr. P. S. Pajgade, "Seismic Analysis of RCC Building with and Without Shear Wall," International Journal of Modern Engineering Research (IJMER); ISSN: 2249-6645; Vol. 3, Issue. 3, May - June 2013 pp.1805-1810

[6] V. R. Harne, "Comparative Study of Strength of RC Shear Wall at Different Location on Multi-storied Residential Building;" International Journal of Civil Engineering Research; ISSN 2278-3652 Volume 5, Number 4 (2014), pp. 391-400

[7] Er. R. Kumar, Er. S. Singh Sidhu, Er. Shweta Sidhu, Er. H. Singh Gill, "Seismic Behavior Of Shear Wall Framed Building;" International Journal of Engineering Technology, Management and Applied Sciences; ISSN 2349-4476; Volume 2 Issue 1, July 2014, pp.28-38