Analysis Of High Rise Structure With Shear Wall At Different Positions: A Review

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Abstract- *India at present is a fast growing economy. Population growth will increase demands of land. To construct high rise structure are more advantage to provide they demands in construction industry. After many practical studies it has shown that use of lateral load resisting systems in the building configuration has tremendously improved the performance of the structure in earthquakes. Framed and Shear walls are mainly flexural members and usually provided in high rise buildings to avoid the total collapse of the high rise buildings under seismic forces. Shear walls are provided in elevator Authors Name/s per core, face & corner of the structure to increase the stiffens and behaviour of structure., there by resisting the horizontal and vertical forces effectively*

Keywords- Seismic, TEKLA, storey, Indian Standard, high rise

I. INTRODUCTION

Lateral forces on buildings such as wind, earthquake and blast forces can be produced critical stresses in the buildings that it cause excessive lateral sway of the buildings and undesirable stresses and vibrations in the buildings. Design and structural evaluation of the building systems subjected to lateral loads form the important task of the present generation and the designers are faced with problems of providing adequate strength and stability of buildings against lateral loads. Different lateral loads resisting systems are used in high-rise building as the lateral loads due to earthquakes are a matter of concern. Steel plate shear walls system and steel bracings system are used in steel structures buildings and their effect shows unequal variations and behaviour against seismic loads. Recently, laminated composite plate shear walls are used as a lateral loads resisting system where the laminated composite plates are used as infill plate in shear walls. The laminated composite plates are created by constructing plates of two or more thin bonded layers of materials and it can be either cross-ply laminates or angle-ply laminates.

II. SHEAR WALL

Shear walls are vertical elements of the horizontal force resisting system. Shear walls are constructed to counter the effects of lateral load acting on a structure. In residential construction, shear walls are straight external walls that typically form a box which provides all of the lateral support for the building. When shear walls are designed and constructed properly, and they will have the strength and stiffness to resist the horizontal forces.

When shear walls are designed and constructed properly, and they will have the strength and stiffness to resist the horizontal forces. In building construction, 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. Examples are the reinforced-concrete wall or vertical truss. Lateral forces caused by wind, earthquake, and uneven settlement loads, in addition to the weight of structure and occupants; create powerful twisting (torsion) forces. These forces can literally tear (shear) a building apart. Reinforcing a frame by attaching or placing a rigid wall inside it maintains the shape of the frame and prevents rotation at the joints. Shear walls are especially important in high-rise buildings subjected to lateral wind and seismic forces. In the last two decades, shear walls became an important part of mid and high-rise residential buildings. As part of an earthquake resistant building design, these walls are placed in building plans reducing lateral displacements under earthquake loads. So shear-wall frame structures are obtained.

III. LITERATURE REVIEW

D. Yuvaraj et.al (2022) research paper analyzed the load-bearing capacity of a steel building with different systems. A 40-story residential building was designed and measured under the wind load conditions. The structural properties of the steel building were investigated using different types of bracing such as X Bracing, Chevron Bracing and V Bracing, and structural analysis was performed using TEKLA software. This analysis assumes wind speed as a zone of 50 m/s.

Based on the real period (sec), it was estimate that the chevron model has the lowest natural period value (sec), which is a more efficient model than other models. Time taken in first mode was based on Chevron braced structure and in other all with respect to braced structure, 61. 00% more without braced, 22. 33% more in K-braced and 3. 83% and more in V-braced structure. Displacement is minimum in Chevron braced structure and in other all with respect to braced structure, 152. 21% more without braced, 49. 89% more in Chevron braced and 14. 02% more in V-braced structure. Based on the Story Drift (mm), it is estimated that the chevron model has the lowest Story Drift value (mm), which is a more efficient model than other models.

K. Senthil Kumar (2022) the research was limited to reinforced concrete (RC) multi-storied commercial building with FOUR different zones II, III, IV & V .The analysis was carried out the help of FEM software ETABS. The building model in the study has ten storeys with constant storey height of 3m. Different values of SEISMIC ZONE FACTOR are taken and their corresponding effects are interpreted in the results.

Results stated that displacement increases by more than 628% if seismic ZONE changes from II to V. The displacement of building models increases with the increasing number of seismic Zones. The displacement was high at the roof and very low at the base. The displacement increased by more than 250% from wind speed 33 m/s to 50 m/s. The displacement of building models increases with the increasing number of seismic Zones. The displacement was high at roof and very low at the base. The storey drift increases by more than 666% when compare to ZONE II to ZONE V. The storey drift increases with the increasing of seismic zone factor and the maximum storey drift was available at ZONE V. The storey shear increased by more than 238%. The Storey Shear decreased as height of the building increased due to wind pressure and reduced at top floor in all the building models. The storey shear is maximum at the base.

P. Venu Madhav et.al (2022) in the research paper, model was subjected either by one or a set of loads employing several sorts of forces which includes dead load, Imposed load, seismic load, and wind load. The commercial structure was built using ETABS (Extended Three-Dimensional Analysis of Building System) software, this facilitates the generation of much more systematized storeys in a concise manner. Analysis and Design of G+9 Commercial Building using ETABS was done on a step-by-step process for designing this G+9 commercial building, so for this G+9 Storey limit state process has been regarded, along with the design of each and every structural component has been performed manually in full compliance with IS 456: 2000 standards, of drawings and detailing done in Autocad.

Using ETABS software and manually confirmed the design of a G+9 commercial building in accordance with Indian Standard Code Book (IS456). The Extended Three-Dimensional Analysis of Building System programme is superior to other software in terms of efficiency and timeliness.

Abhishek K. Patil et.al (2021) author used Equivalent Static method to analyse G+5 storey structure to repel earthquake forces using Staad pro software. The analysis was performed as per the specification of IS codes IS 1893, IS 875, IS 456:2000. Results stated that the bending moment and shear force of seismic and non-seismic structure is same while there is difference between axial force and displacement.

Anurag Kumar Pandey and Anjali Rai (2021) research paper investigated regular commercial buildings with two different slab arrangements Waffle Slab and Normal conventional slab.

Results stated that maximum story displacement for normal conventional slab was 0.828% higher than flat slab. The maximum time period of normal conventional slab was 0.2% higher than flat slab. The maximum story drift of conventional slab was 0.5% higher than flat/waffle slab. The base shear of flat slab was 26.92% higher than the conventional slab. Instead of having high base shear building was safe in Flat slab.

Assal Hussein (2021) research paper presented dynamic analysis of four-story shear frame under moderate ground motion to determine the dynamic response. The algorithm of the analysis is developed using MATLAB® code to get mode shapes, response spectrum acceleration, maximum displacement, maximum shear forces, and modal participation mass at each story.

Results showed that the first mode shape has more contribution than the other modes because a higher percentage of the mass of the shear frame responds to the ground motion, and 88.53% of shear-frame mass participating responds to the ground motion in the same mode.

Harish K Singh and Ganesh Jaiswal (2021) objective of the research paper was to analyze the seismic behavior and performance of the g+30 story steel structure (building) and compare with the best performance with x-bracing and shear wall. All the members of the framed section were designed as per IS456:2000, IS800:2007 and load combination for seismic force were considered as per IS1893(Part-1):2016, where the designing and analysis was performed using analytical application Tekla.

The results stated that structure with shear wall having less value of story displacement from all others models. Which was a more efficient model as compared to all models. Structure with shear wall having minimum base shear value compared to other models. Structure with shear wall having maximum value of story stiffness in both directions.

P.Nagasri Anjaneyulu and Dr. Dumpa Venkateswarlu (2021) objective of the research paper was to investigate the parameters of the design for beams, column, slabs and other structural components and prepare the 3D models of the structure by using the Tekla software for detailed analysis and design.

Results concluded that the efficiency and reliability of the software in the field of designing is much better than that of the manual work. It has been seen that the software generated results were more efficient and economical which included the various different conditions under the designing conditions which are difficult to consider when done manually.

IV. CONCLUSION

Research papers from different authors were invested and found that different technologies to be moderately used to increase efficiency of high rise structures to resist lateral loads.

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