A Review Paper "Shear Wall" Under Lateral Loading

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Abstract— Shear wall is a supporting structural element, which is used in high rise building. Mostly shear wall design to bear lateral loading which is due to wind load or seismic load by environmental condition such as seismic load wind load and many others. Shear wall provide enough strength and stiffness to whole lateral displacement. In other word we can say that, shear wall system is one of the most commonly used lateral load system. Shear wall is a vertical member which is used to bear horizontal loading or lateral loading. In this paper, we mainly focused on the basic fundamental of shear wall and its design, which is discussed in to the various post works. This research for the improving the strength and stiffness performance of the shear wall and find out the best position to apply shear wall and shear wall design in high rise building. We know that shear wall play an important role as a resistor for lateral loading on high rise building. The effect of shear walls, when it is placed at different location and different shape is also the important part of this literature paper. Shear wall having capacity to improve the strength and stiffness under lateral loading.

Key words: Shear Wall, Lateral Loading, Displacement & Stiffness

I. INTRODUCTION

When we discussing about the shear wall there are few question picked in our mind. Let us discuss, now going to the first question, what is the shear wall? When we search the answer we get shear wall is a vertical supporting member mad by concrete. It is a post or pre made structure which is placed in a building to improve the strength and stiffness of building. When we got the knowledge about the shear wall we going to the second question, what is the requirement of shear wall? When we saw a high rise building then we want a supporter for the building to improve the capability to resist the horizontal loading. To give a better response under the lateral loading we demand a economic design that is the shear wall. Know we know that what is the shear wall? And what is the requirement of shear wall? Now we going to the next question, how shear wall is placed? Shear wall is placed in high rise building to improving the strength and stiffness. and it is placed as a building structure in the building wall or in mid or side wall, there are various type of shear wall such as L type, C type, I type and o type are the main shear wall shape. According to the IS code 1893:2002 it varies 140mm to 500mm as the requirement of building. Know we have the basic knowledge about the shear wall. Let us going to the next question, which type of shear wall we can placed into the building? This question answer is given in the above description that we can use L, C, T, I and O type of shear wall in the building.

II. CONCEPT OF SHEAR WALL

Shear wall is a supporting member for the high rise building structure. Which is provide to improve the strength and stiffness of high rise building. According to the Is code 1893:2002, These shear wall are different in structural shape as such C, L, T, I and O .The thickness of the shear wall depend on the material used in the construction. On the basis of material it varies 140mm to 500mm. In the present market construction style there are various type of shear wall present in the market such as concrete block shear wall, steel shear wall, plywood shear wall and mid plywood shear wall. That is the basic concept of shear wall which is mostly used in the construction site and its play an important role in the construction of high rise building.

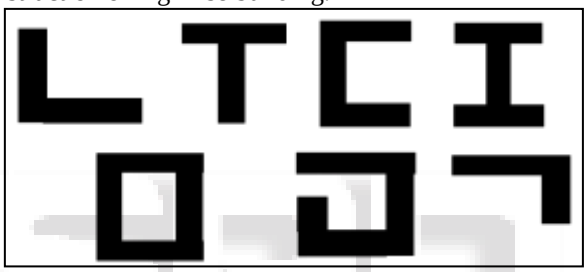

Fig. 1: Flanged Shear Wall

III. EFFECT & RESPONSE OF SHEAR WALL

Shear wall use for provide the resistant capacity for the high rise building and provide more strength to the building. Efficiency of shear wall is purely depend upon its rigidity or its stiffness. A solid shear wall is more efficient than a shear wall with opening. But sometime it is not possible to construct a shear wall without openings such as opening for doors, window etc.

In case of opening to improve the efficiency of shear wall, concrete the pier of shear walls by spandrels. Pier is nothing but the portion of shear wall between to opening and spandrel is the portion of shear walls above the openings. The resulting wall appeared by the interconnecting spandrels of piers of shear wall is known as coupled shear wall

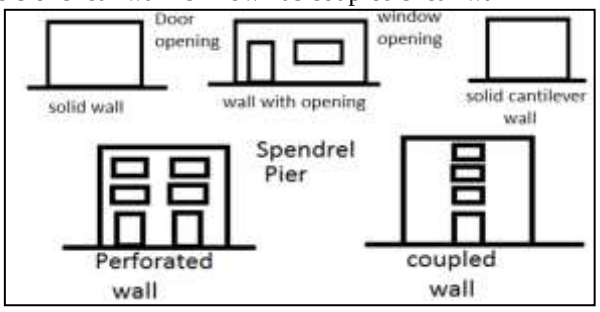

Fig. 2: Shear Walls- Solid, with Opening, Coupled

IV. LITERATURE REVIEW

- Rahul Rana et al performed on push over analysis of a 19 story concrete shear wall building located in san Francisco a gross area of 430000 SQ FT .He worked with lateral system of building consist of concrete shear walls. The building is newly designed conforming to 1997 uniform building code, and push over analysis was performed to verify code's underlying intent of life safety performance under design earthquake. After analyse the structure he concluded that, push over analysis is a useful tool of performance based seismic engineering to study post yield behaviour of a structure .Push over analysis was performed on nineteen story concrete building with shear wall lateral system and certain unique design features.
- Qiuhoung Zhaq et al studied on the traditional composite shear wall and an innovative shear wall. The traditional reinforcement of concrete wall is in direct contact with the boundary steel frame whereas the innovation system is a gap in between. He performed the cyclic test on both the system. Both the system showed highly ductile and inelastic behaviour. Both of them were able to tolerate more than 17 cycles of inelastic shear displacement and reach maximum inter storey drift of more than 0.05. The innovation of composite shear wall system was found to be more ductile than the traditional composite shear wall but the strength and stiffness of traditional system is found to higher. By discussing gap in the traditional and innovative system, he concluded that the damage to concrete wall under relatively large cycles was much less than the damage to concrete wall in the traditional system.
- Anshuman s. et al did their analysis on elastic and elastic-plastic with the help of STAAD Pro and SAP V 10.0.5(2000) on a 15 storey building located in earthquake zone IV and calculate bending moment and storey drift in both the cases. Shear forces and bending moment were considerably reduced after providing shear wall. He observed that the inelastic analysis performance point was small and within elastic limit therefore results obtained using elastic analysis are adequate.
- Misan abidi et al reviewed on shear wall for soft storey high rise buildings. In this review paper he focused on the high rise building, RC frame linear behaviour of shear wall, soft story, and weak story. In which he discussed that the shear wall resist the majority of lateral load in the lower portion of the building, and the frame support the majority of the lateral loads in the upper portion of the buildings. At least after studying on shear wall for soft storey high rise buildings he concluded that the use of shear wall is good way to provide more level of ductility and getting stable behaviour and appear to be an novel approach to reduced effect of soft story in seismic response.
- Anuj chandiwala et al has performed on Earthquake analysis of building configuration with different position of shear walls. In this study, he worked on the functioning of optimum steel and reasonable concrete section with economic condition. He expressed that the result of moment occurring in a particular column have been displayed. Which include sesmic load and other lateral load resisting structural system. After the analysis, he concluded that the F- shaped shear wall gives best result when placed at end and L-shaped flanged section. Hence the placed shear wall can obstruct these oscillation completely, which finally reduced the bending moments.
- P.P. Chandurkar et al did a detail study to find out the solution for shear wall location in multi storey building with the help of four different type of models. She used ETAB nonlinear v 9.5.0 to analyse her model. She analysed the ten storey building for earthquake. Which is located in zone II, zone III, zone IV and zone V. She use different parameter as such lateral displacement, storey drift. She concluded that the shear wall in short span at corner is economical as compared to other models. It was observed that shear wall is economical and effective in high rise building and providing shear wall at adequate locations. Working with this type of shear wall location, the displacement in the high rise building due to seismic loading is lesser in compression to other model type
- N. Janardhan Reddy et al performed on the seismic analysis of multi storied building with shear walls using ETABS-2013. For the analysis of the building for seismic loading with two different zone (zone II and zone V) is considered with soil I & soil III type. He analysed the building by using the equivalent static method and dynamic method. He presented the result of both method in to the tabular form and compared by graphical representation. After analysing, he concluded that the performance of structure with shear wall is better than structure without shear wall and shows better performance with respect to displacement.

V. FUTURE SCOPE

There are lot of functional fundamental and the various aspects to carry on this fundamental research. If we want to work on the shear wall designing and the material there are lot of scope. We can use different light material, which have high strength with light weight such as plastic mix concrete material. And we can progress on the shape such as hollow shear wall and various other. These fundamental function provide lot of scope in designing and material. We can change the material for better response with high strength and stiffness. To seen all fundamental experimental paper on shear wall we got these basic future scope, which help in for studies and experiments. Most of people work on the fundamental studies of strength and stiffness. When someone worked on some different angle they can worked on their material and designing process.

VI. CONCLUSION

From the above review we can say that shear wall can be provided for reducing the displacement, resist the lateral load and seismic loading. Shear wall along the periphery is most efficient for all type of shear wall. The shear wall

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