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Review: Important Element in Building: Shear wall vs Brace

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Abstract- **As new technology are becoming more versatile and commercially available, their usage is also becoming popular in improving the seismic resistance. This paper reviews the effect of shear wall and brace independently on a building for simulation conducted by various researchers.In order to minimize the damages due to earthquake, shear wall are efficient in terms of cost and effectiveness. On the other hand bracings can absorb great degree of energy which is exerted by earthquake.**

Keywords- **Stiffness, High Rise, Structural stability, Spectrum.**

I.INTRODUCTION

Earthquake causes very tremendous damages as it is unexpected in nature. Disasters due to earthquake have become a great issue now-a-days. It frequently occurs all over the world. The prediction of location, the time of occurrence, intensity of earthquake is very difficult to understand. So it is very necessary to adopt the suitable assumptions before design by keeping in mind the dangerous seismic effects. Generally, structures are designed for dead load, live load, wind load, etc. which is not sufficient for taking earthquake load. It is not necessarily safe against seismic load. The design adopted in the Indian Code IS 1893(Part 1) :2002 ―Criteria for Earthquake Resistant Design of Structure‖ to ensure that structure possess at least a minimum strength to withstands minor earthquake occurring frequently; resist moderate earthquakes without significant structural damages though some non structural damages may occur; and aims that structure withstand major earthquake without collapse.

In order to dissipate energy of earthquake different areas, regions, countries have different provisions of providing such system. Shear wall and bracing system are the most efficient system as they gains more plane stiffness, reduces lateral displacements and dissipate energy during strong motions. Damages due to earthquake can be prevented by adding such structural elements like shear wall and bracing systems. It is very important now-a-days to prevent such an unforeseen disaster by implementing such systems. It has been observed that, it is a need to adopt the structural systems, which can resists the lateral loads due to seismic effect in RC framed structures. This paper is the review of study of the comparison of the responses of RC structures, with shear wall and bracings in multistoreyed residential building. In this paper, the analysis of the RC framed structure with position of shear wall and bracing system is studied.

1.Shear wall
This system has a combination of shear wall and RC frame provides a resistance to lateral loading. The potential of wall-frame structure totally depends on the extent of horizontal interaction, which is controlled by the relative stiffness of the reinforced concrete frames and shear walls and the height of the building.

The taller the structure and the stiffer the RC frames, the larger the interaction. The RC frame is deflected in shear mode while the shear wall is responded in bending as similar to a cantilever. The structural compatibility of lateral deflection develops interaction between them. The lateral sway of the RC frame combined with the shear wall deflected in the parabolic sway results in improved stiffness of this system significantly because the shear wall is effectively restrained by the moment frame at the top levels whereas at the bottom levels, the moment frame is restrained by the shear wall. Therefore, the combined action of structural elements is truly based on the relative rigidity of the both and their respective modes of deflection.

2. Brace System
They are widely used to reduce lateral displacements and dissipate energy due to strong ground motions in the steel structural. Same concept is also applicable for concrete frames braced frame also increases capacity of structure. Concrete and steel bracing has flexibility, economical, occupy less space, easy to erect and also meets required strength and stiffness.

II. RESEARCH FINDINGS

R. Rajeshwari et al: This study is conducted on on a moment resisting frame with shear wall and steel braces in

zone V with equivalent static analysis. The analysis is done in Staad-Pro and a multistoried model is being simulated. the main finding is that the beam and column forces are being reduced upto 50 % however the selfweight has been increased too. The lateral displacement of the has been decreased by 80 %.

Praveen kumar et. al. : The computer aided analysis is done by using E-TABS to find out the effective lateral load system during earthquake in high seismic areas. The performance of the building is evaluated in terms of Lateral Displacement, Storey Drifts, Base shear and time period.Lateral displacement variation of 15 Storey models shows 15.46%, which is higher than other two types of models. From the results of G+19 models, the top storey displacement of X-Braced model is 5.59% lesser than shear wall model. Therefore it's recommended to provide bracing for buildings more than 15 storeys. It's observed that weight of shear wall is 88.9% higher than bracing in all three types of modelled structure.

Rajendra Prasad Singh, Two types of frame models are developed and evaluated by Time history analysis by STAAD-Pro. In the present work G+9 multi Storey building is analyzed by using shear wall and braced frame at corner of the structure. It is analyzed and results of Storey drifts, maximum bending moment, maximum shear force, deflections are evaluated and compared.It is found that the structure with the dual systems (combination of shear wall and bracings) at the corner will give minimum lateral displacement than the normal building at top 4.84mm. Lateral deflection is decreased by 86% in x-direction in dual system when compared to normal building Lateral deflection is decreased by 89% in z-direction in dual system when compared to normal building

V.S.Damam, This paper deals with simulation of the G+10building against the seismic load with four kinds of arrangement of shear wall and then check for the lateral displacement and storey drift in various seismic zones according to IS 1893:2002.If the dimensions of shear wall are large then major amount of horizontal forces are taken by shear wall.In zone V and IV like high earthquake intensity areas, provide shear walls on all four corners and Centroid of the building to reduce deflection.

MD. Samdhani Azad : This study focus the building behavior against seismic forces either SW or steel bracing. The analysis of both systems either shear wall or steel bracing systems using ETABS Software analyzed to determine the behaviour and performance of each of models is done. According to their results, they have compare the maximum displacement and storey drift of models. They concluded that the model, shear wall at mid portion is the safest among the other models assessed in the research purpose

Umesh R. Biradar : In this paper, they have analyzed seven models of different bracing systems for linear statics(ESA), linear dynamics, non-linear static (Pushover analysis) and non-linear dynamic analysis (time history analysis) by ETABS software. According to this paper, IS Code method does not gives suitable results as the natural time period for bare frame and braced frame is same and they have obtained the satisfactory results of time periods in ETABS by using ESA and RSA method. Natural time period are reduced by 15.49%, 12.87%, 11.32%, 11.17%, 11.17% and 4.83%. For X-bracings 12.87%; natural time period is reduced. Hence X-bracings are preferred in this project.

III. CONCLUSIONS

1. Shear wall and bracing are good structural solutions for reduction of lateral displacement and story drift.
2. Shear wall seems to be more effective than the braces for control of deflection
3. The ease of construction of shear wall is better than brace however there is a greater cost of construction in shear wall.
4. Location of shear wall and bracing are crucial part of the energy dissipation. This need further research.

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