Deflection and Cost Comparison in RC-Frame, RC-Frame with Shear Wall and Bracing

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***Abstract*- In short type of building to prevent the deflection by increase property of element. But in high-rise building apply many different type of methodology to resist deflection. A shear wall and a bracing system in a RCC framed structure is a wall or system which is designed to resistshear, the lateral force due to earthquake or wind and to control the deflection and to increases the ductility demand. Shear wall is a structural member used to lateral force i.e. parallel to the plane of the wall.Wall bracing is a construction technique used to improve the structural performance of a building.Using of staad.pro v8i software take 5 storey, 10 storey and 20 storey building frame and each storey have two zone(zone3 and zone5).Now compare to all three types and in construction which is economical and fulfil the criteria of quality that will use. In this paper a comparison cost and deflection of ordinary building with shear wall and bracing in RCC framed structure with different locations is studied and results arepresented using Staad pro v8i Software.**

Keywords*- *RC frame; Bracing; Shear wall

I. INTRODUCTION

Reinforced concrete building is most common type of construction in India. When high rise buildings are constructed these building have problems to bear lateral deflection due to lateral load and moment at base.

A. *Shear wall*- Shear wall is a structural member used to resist lateral forces i.e. parallel to the plane of the wall. For slender walls where the bending deformation is more, Shear wall resists the loads due to Cantilever Action.

- Shear walls are especially important in high-rise buildings subject to lateral wind and seismic forces.
- Lateral forces caused by wind, earthquake, and uneven settlement loads, in addition to the weight of structure and occupants, create powerful twisting forces. This leads to the failure of the structures by shear.

B. *Bracing*-Wall bracing is a construction technique used to improve the structural performance of a building.

- Bracing systems include wood or steel components that help evenly distribute loads and increase the safety of the structure.
- While traditional framing can support the weight of the roof and floors above, it is not able to resist lateral stresses caused by wind, earthquakes or other forces.
- Bracing requirements are set by the International Residential Code Section 602

C. *Bracing in RCC Structure*-

1. Concentric bracing:-Both ends of the brace join at the end points of other framing members
2. Eccentric bracing:-One or both ends of the brace do not join at the end points of other framing members

II. LITRACTURE REVIEW

Tanawade et.al. (2016) analyzed elastic seismic response of reinforced concrete frames with reinforced concrete bracing member in K or A at different level braced pattern with G+11 building with 5 bay structures in both minor and major direction.[1] This approach focus on the planning of A-braces in a particular bay,level and its combination,which ultimately reduce lateral direction so that economic can eventually by achieved in compression to the frame of the same moment.

Ziaullakhan, B.R. Narayana, syedahmad Raza (2015) By using advance software of structural design, ETABS, analysis of G+14 building in earth quack zone 4 is done. By result it is concluded that when a building is subjected to lateral and torsional deflection under the application of earthquake load as a result[2], wider range of movement can be included in building. Result of stiffness and stability of structure are the most important in multi-storey buildings. So bracing can be the more easy and economical and efficient to method to reduce the lateral direction. As the result of the storey shear and storey displacement is considered.

Umesh, R. Braider, Shivraj Mangalgi (2014) address different types of bracings were arranged in outer part of elevation of a multi-storey building subjected to earthquake load. Results of comparative study were shown in different graphs for different models. The building was analysed on parameters which include such as time period and lateral displacement. A building of G+10 storey of reinforced concrete structure with 25*20m ground elevation in medium soil condition was examined. By checking the

result from ETABS software in linear static, linear dynamic and push over condition conclusion was made that results are same that obtain by consider IS code method. They found that value of base shear gets changed in different bracing arrangement. They concluded the value of base shear can be reduced by using X bracing or V bracing.

III. METHODOLOGY

In this study a building having regular plan is considered for analysis as shown in fig. All stories including ground storeys having 3.5m floor to floor height is considered for the analysis. Area of plan of building is 480m^2. Structures are having 5-bay in X-direction and each bay is having a length of 6m and in Z-direction number of ways are 3 with different length two bays are having length of 6m and middle bay is having a length of 4m.Three types of columns are considered in this study. Some columns are rectangular and some columns are square as per structure requirement. Two types of beams having different cross sections are used. Sizes of beams are 300X600 and 300X450. Slabs with a thickness of 200mm are used. A floor finishing of 50mm is provided. Supports of the structure are made fix at the bottom. Three types of walls are used – main wall, partition wall and parapet wall. The thickness of wall varies as main wall is having a thickness of 230mm, partition wall and parapet walls are half of the main wall thickness. Height of main wall and partition wall is same as the height of stories. Parapet wall is considered with a height of 1m. Shear wall are provided in some models and the thickness of shear wall is taken 230mm. In some other models cross bracings are provided these bracings are having steel-I section ISMB-100. Building is located in two types of earthquake-zones. ZONE- III AND IN ZONE V. Soil condition are considered medium stiff and a damping ratio of 5% and importance factor is taken1. Dead loads and live loads are applied accordingly. Earthquake loads are applied as per IS 1893 (Part -1) 2002 [3].

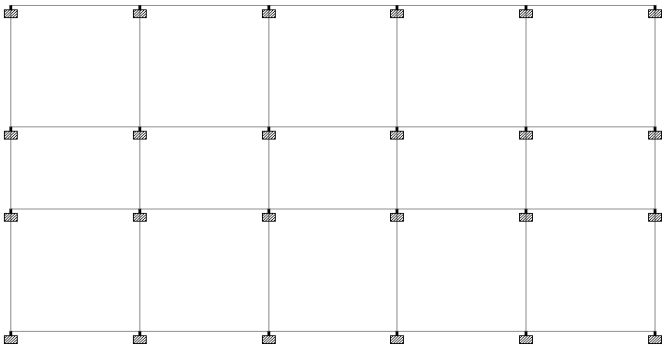

Fig. 1. Plan of Model

A. Models considered

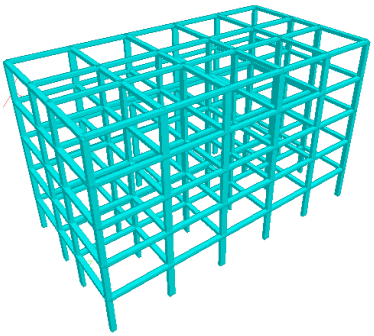

Fig. 2. G+5RC frame system,

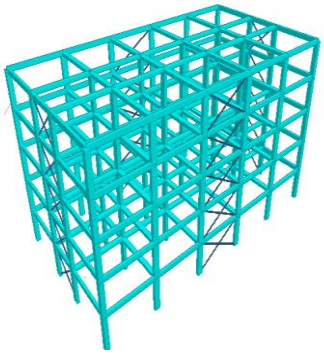

Fig. 3. G+5 with Bracing

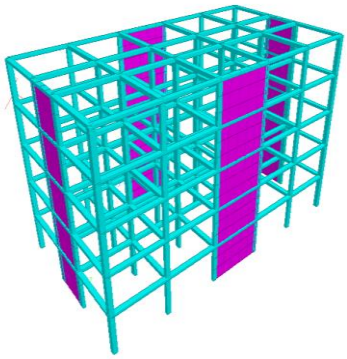

Fig. 4. G+5 with Shear Wall

- Similarly models are considered for G+10 and G+20 building
- They are analyzed for both the zones i.e. zone 3 and zone 5
- In totality 18 models are taken into consideration
- Concrete grade M-30 with steel reinforcement of Fe-500 are used in all models
- Bracings which are used in models are made of steel.

B. Seismic zone in India[4]

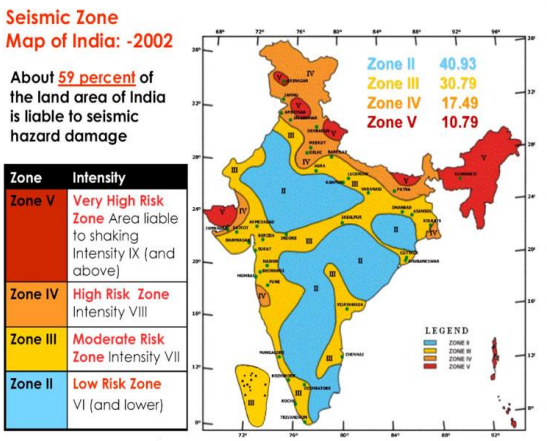

Fig. 5. Seismic Zonation and intensity map of India

IV. RESULT

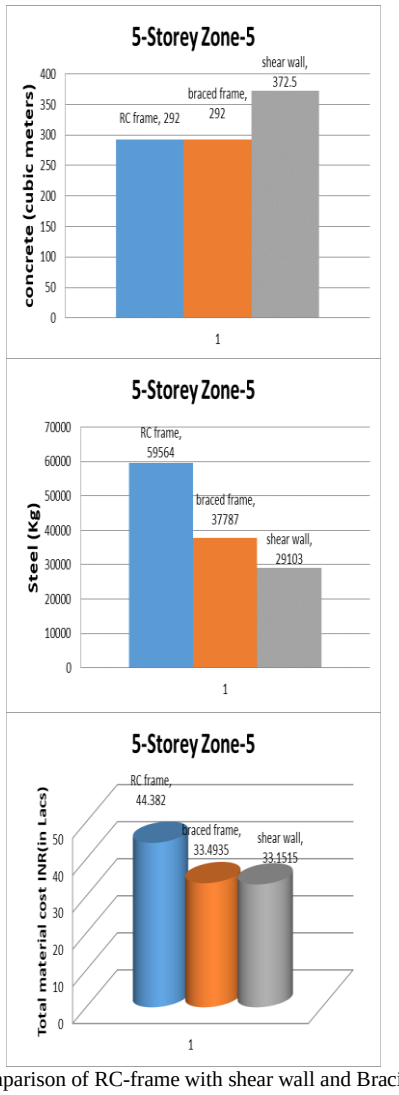

Fig. 6. Cost Comparison of RC-frame with shear wall and Bracing frame

V. CONCLUSION

- After comparison we observed that when we applied shear wall and bracing it is more resist earthquake then general building.
- The amount of concrete used in case of shear wall structure is more than that of bracing and Rc-frame.
- Deflection and bending moment in case of shear wall are very less as compare to Rc-frame and bracing so structurally shear wall structure is more suitable.

REFERENCES

[1] Tanawadeet.al."analyzed elastic seismic response of reinforced concrete frames with reinforced concrete bracing member" international journal of advance civil engineer ISSN 2250-323 volume 4 number 3 (2016).

[2] Ziaullakhan,B.RNarayana,syedahmadRaza"lateral and torsional deflection under the application of earthquake load" International Journal of Recent Technology and Engineering (IJRTE) ISSN: 2277-3878, Volume-2, Issue-4,

[3] IS 1893(PART 1): 2002, "criteria for Earthquake Resistant design of structure",5th revision ,Bureau of Indian standard, New Delhi.

[4] http://nidm.gov.in/images/safety_eq3.jpg