Parametric Study of RC Framed Building with and without Provision of Shear Wall

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Abstract

In present day constructions, many high rise apartment buildings are constructed in which frame is the most common structural form. Generally, in multi storey buildings only frames are not sufficient to take horizontal force, which is produced by earthquake or wind, as stiffness or ductility of the frame is less. To enhance the stability of building against lateral loads there are different kinds of techniques are used such as base isolation method, bracings, providing shear wall etc., in which we have adopted provision of shear wall in building design. Analysis of shear wall thus becomes necessary for stiffness and stability purpose that can be much utilized for safety in building. In this project, the parametric study of RC framed structure with and without provision of shear wall is to be carried out and parameters like shear force, bending moment, storey drift etc. will be checked by using software like ETABS.

Keyword- Shear Wall, lateral Loads, Structural Configuration, Analysed Location, Seismic

I. INTRODUCTION

It is appreciated, that frame is most common structure form in buildings. Frame in multi-storey structure is considered as rigid frame i.e. angle between horizontal and vertical element will not change after and before the application of loads. Generally, in multi-storey buildings only frame is not sufficient to take horizontal force, which is produced by earthquake or wind, as stiffness or ductility of the frame is less. Therefore to enhance these two parameters of the structure, it is necessary to provide additional structural element in the building. "Shear wall" is a most common structural element, a purely vertical cantilever element, is incorporated in multi-storey RC building to improve structural stability. Shear walls are constructed to counter the effects of lateral loads acting on a structure. Buildings with shear wall are usually regular in plan and in elevation. Earthquake and uneven loads, i.e. weight of the structure, occupants, type of uses etc. create twisting forces on a structure. Reinforcing a frame by incorporating a rigid wall, maintains the behavior of the frame and prevents the rotation of the building in many folds.

II. AIM OF THE STUDY

In this research we deal with behavior of RC frames against vertical and horizontal forces, with different position of Shear Wall.

A. Objective of Study

- The main objective of this study is to analyze the influence of shear wall with its location and to study the various parameters of structure, as well as to compare the capacity of energy dissipation with and without shear wall in RC frame structure by using software package i.e. ETABS.
- To study the operation of computer aided software "ETABS". Preparation of model in ETABS.
- Analysis of RC frames with provision of shear wall with various locations.
- Comparison of different models and its parameter.

III. METHODOLOGY

A. Healthy Literature Review

To get the knowledge database of the problem which is occur during the project, we have decided to continue searching various project related literature's and learned them detailed.

B. Developing Square Shape Building with Different Position of Shear Wall

We have developed the model of our building in ETABS in the computer. From this drawing we have created three different cases for each building by changing the position of sh1ear wall.

C. Generating Model in Computer Aided Structural Designing Software

After generating the position of shear wall, we will input data in computer aided software. The input in the software is done ascending order from top to bottom. The design of structure is done in descending order from slab-beam-column-footing sequence.

D. Analysing and Designing of Model by Computer Aided Structural Designing Software

After inputting data in software and after attaching of the section and after doing all the preliminary data the analysis is carried out. With the help of this analysis of one building with three different cases for the location of shear wall, we will find the axial force and torsion; shear force and bending moment and percentage of reinforcement required in the building.

E. Result Comparison

After obtaining the result from the three different cases we will find out which of the structure is most economical.

IV. RESULT AND ANALYSIS

In order to fulfill above discussion, structure model is prepared on ETABS Software. The results of different parameters like Axial force, Torsion, Shear force, Bending moment, Drift, Reinforcement details are obtained and are compared in different Load Combinations as per recommendation given in IS Codes.

The different IS Load Combinations are taken in analysis for comparison;

For Axial Force, Torsion, Shear Force, Bending Moment	*1.2(DL+LL+SIDL+EQ)*
	1.5(DL+SIDL+EQ)
	0.9(DL+SIDL)+1.5EQ
For Reinforcement	*1.5(DL+SIDL+EQ)*
	1.5(DL+SIDL-EQ)

There are three different cases that are considered in making the model and for analysis as listed below and their configurations are shown in figure below:

A. Case – I: Normal Building without Shear Wall

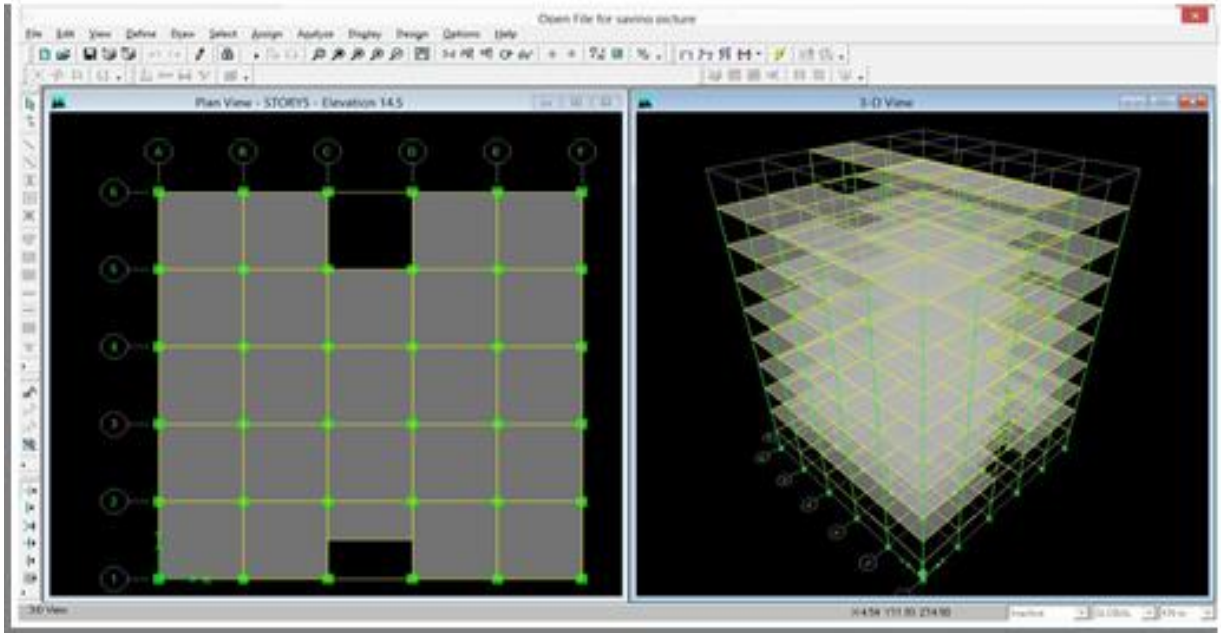

Fig. 1: Normal building without shear wall

B. Case – II: Building With Shear Wall at Staircase and Around Lift Corner

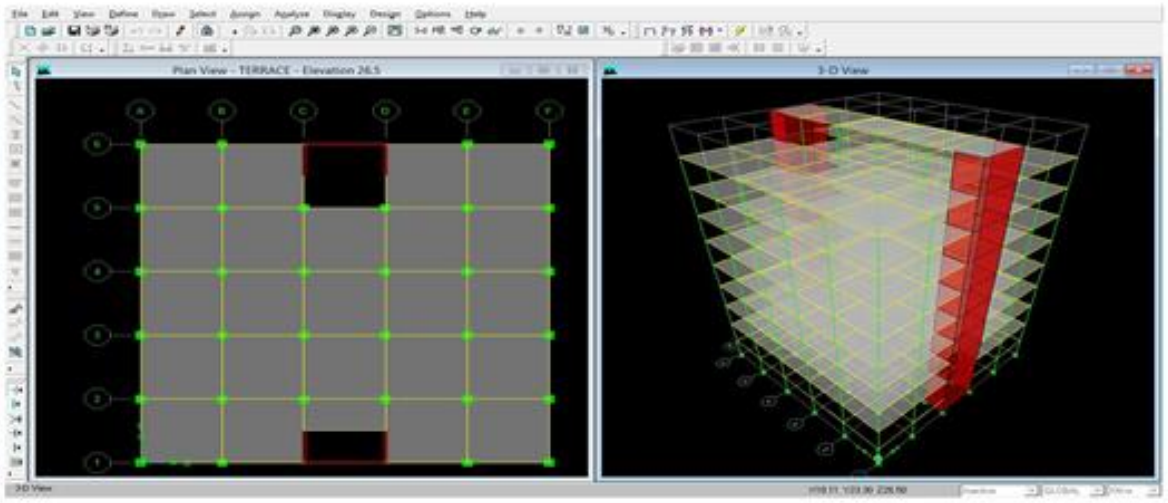

Fig. 2: Building with shear wall at staircase and around lift corner

C. Case – III: Building with Shear Wall At All Corners

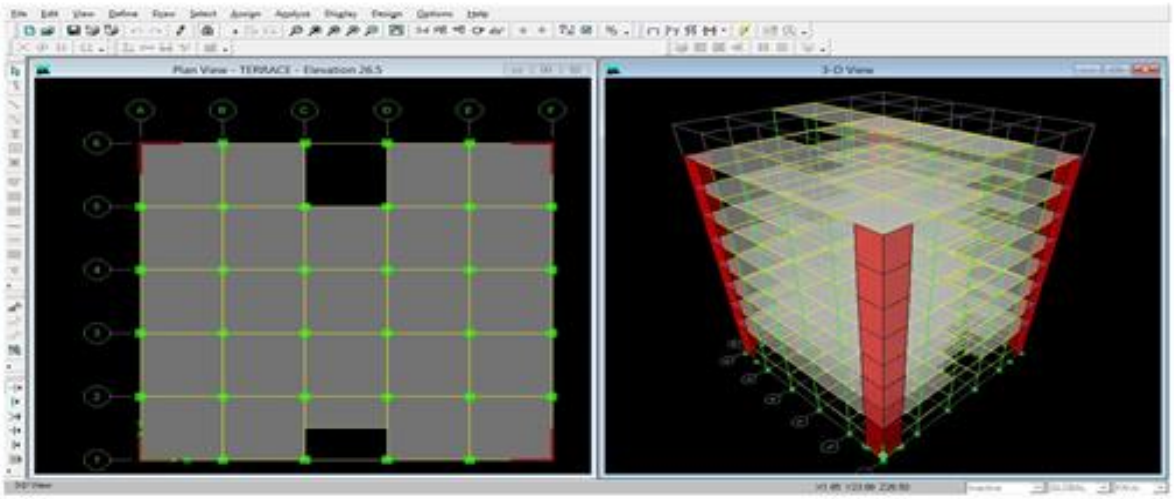

Fig. 3: Building with shear wall at all corners.

D. Axial Force and Torsion

1) Graph for Axial Force Diagram

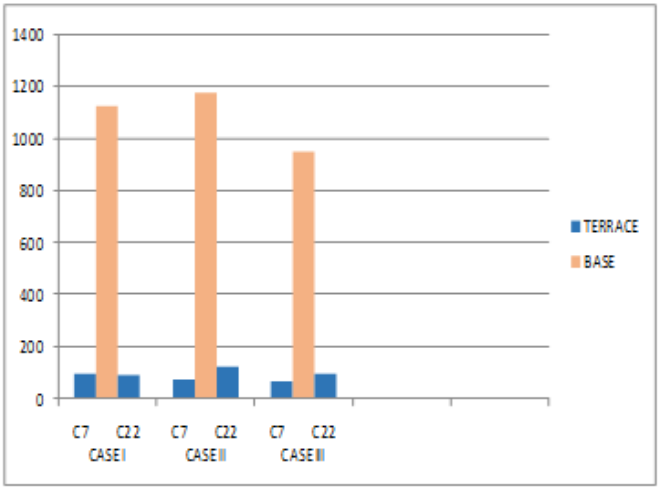

Fig. 4: Axial force, graph – I

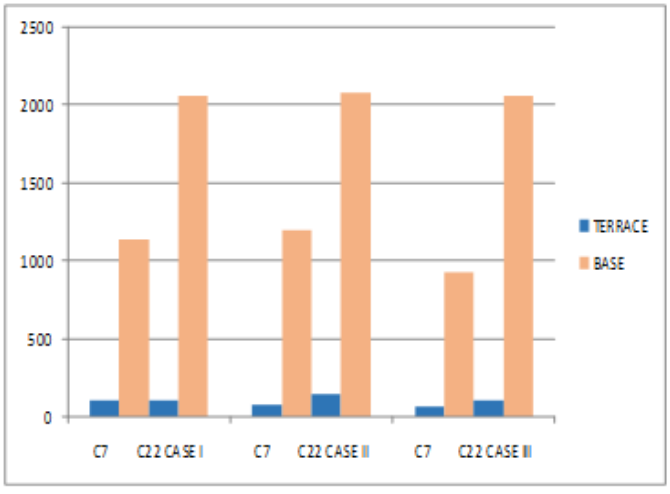

Fig. 5: Axial force, graph – II

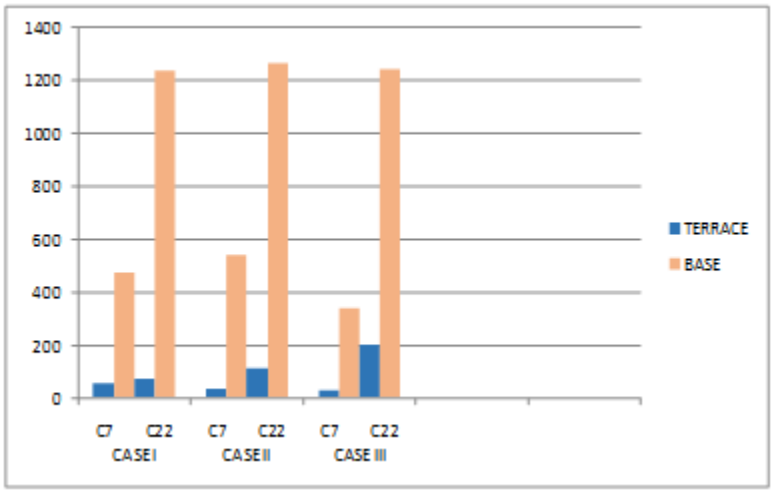

Fig. 6: Axial force, graph - III

E. Shear Force and Bending Moment

1) Graph for Shear Force

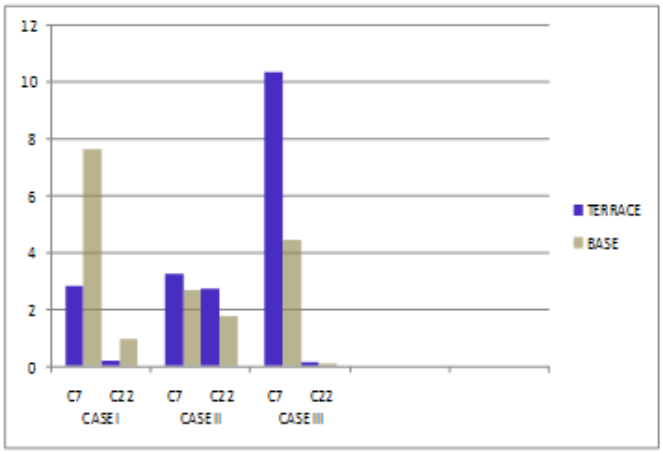

Fig. 7: Shear force, graph- I

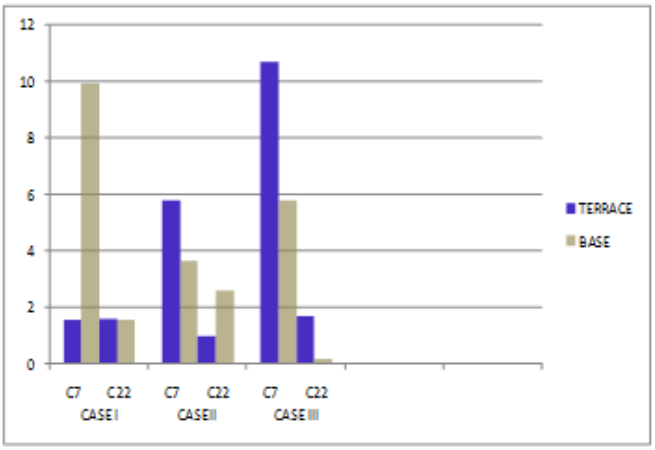

Fig. 8: Shear force, graph – II

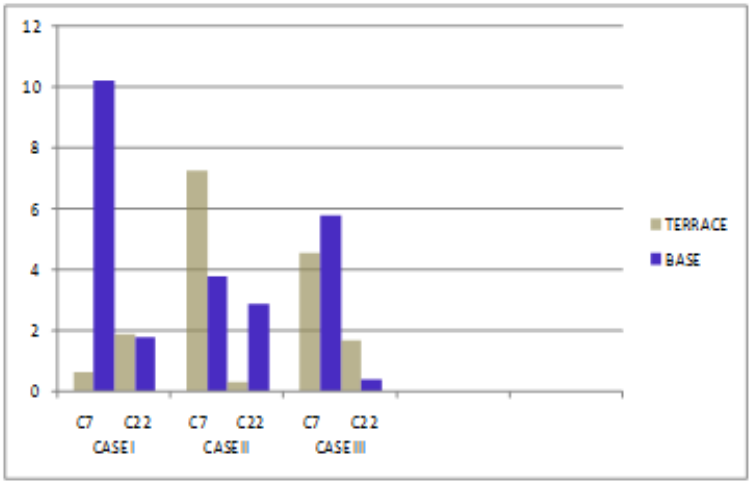

Fig. 9: Shear force, graph - III

2) Graph for Bending Moment:

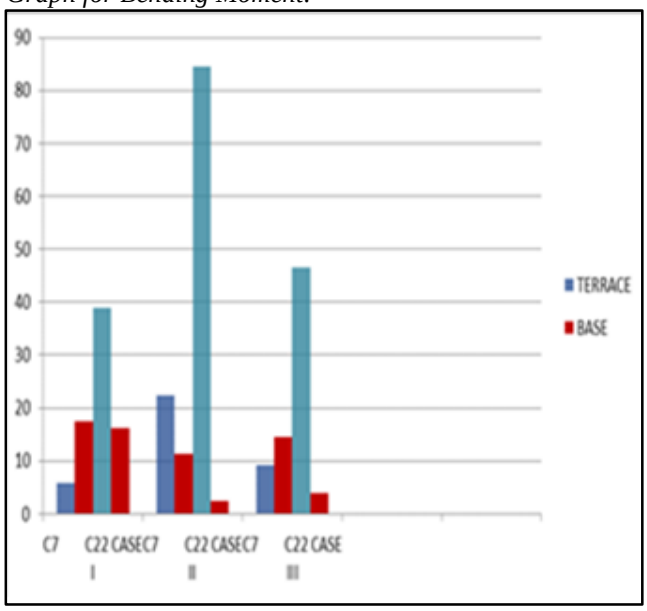

Fig. 10: Bending moment, graph- I

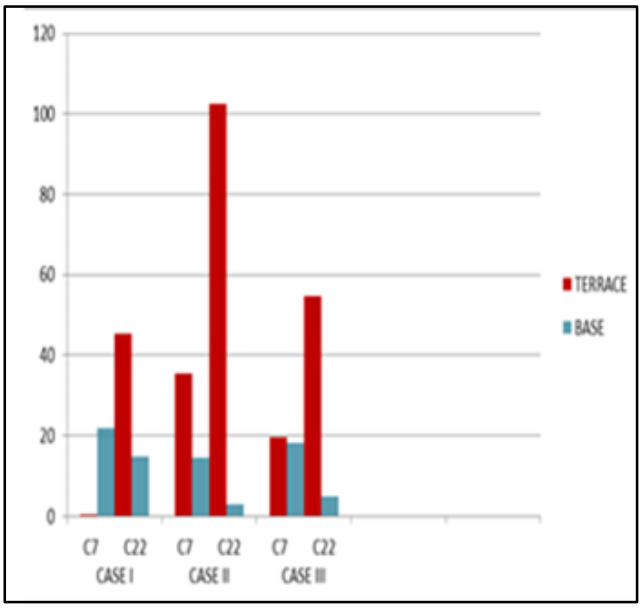

Fig. 11: Bending moment, graph - II

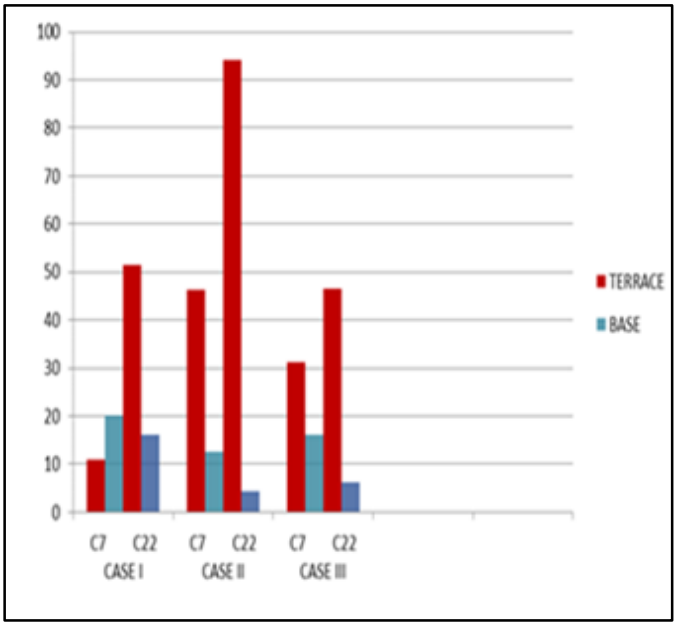

Fig. 12: Bending moment, graph – III

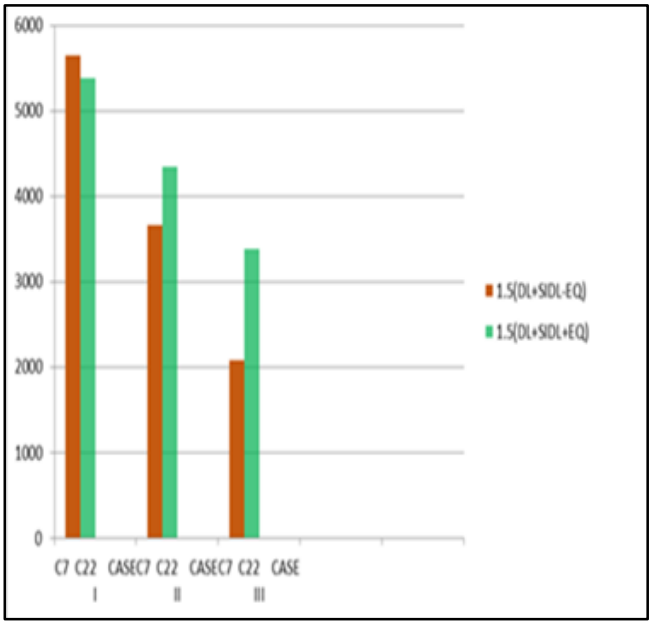

Fig. 13: Graph of Reinforcement

V. CONCLUSION

- All the data is compared with case – I and conclusion is obtained.
- It can be seen from the results and graph that variations of values in different parameters are dependent on different load combinations as well as location of shear wall.
- From the results it can be seen that in all the cases shear force and bending moment are reduced in great extent and in case – II & case – IV the values bending moment is increased due to configuration of shear wall.
- Percentage of Reinforcement can be reduced up to 50% over all.
- Drift in all the cases is found within permissible limits but the values of drift are reduced due to provision of shear wall.
- After comparing all the parametric values of different model cases, it is concluded that case – III is most suitable shear wall configuration in all the cases.

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