International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 06 | June -2018 www.irjet.net p-ISSN: 2395-0072

STUDY AND ANALYSIS OF REGULAR AND IRREGULAR BUILDINGS WITH DIFFERENT SHEAR WALL POSITION USING ETABS

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Abstract - *Buildings which are locating in the earthquake regions are facing the problems due to lateral loading, hence in order to overcome this problem shear walls can be used in replacement of normal masonry walls. Shear walls enhances the stiffness, strength for structures. In this study, response spectrum analysis is carried out to study and analyze the regular and irregular building and its effect with different position of shear walls. An attempt has been made on G+24 building to get the results of storey displacement, storey, time period and base shear. Analysis is carried out in ETABS-2016 software. The results are obtained in terms of percentage reduction and it is compared on with shear wall and without shear wall. The present study is on the analysis of regular and irregular building with and without shear wall position using response spectrum analysis.*

***Key Words*: Storey displacement, story drift, base shear, time period, ETABS.**

1. INTRODUCTION

Shear wall is a structural member which can resist lateral loading. It is made up of RCC material which enables to resist lateral load. Shear walls helps to minimize the beam and column dimension. It also reduces the cost. The provision of shear walls enhances stiffness and strength. Generally , shear wall is provided in the range of thickness from 200 to 400mm.The steel required for the shear wall is of minimum percentage is 0.25% and maximum 4%.Shear walls which decreases the damage to the structure by decreasing the sway in lateral. Shear walls which shows the good performance, if it is properly detailed and designed. Shear walls which carries forces due to earthquake, overturning effect. In tall buildings there will be a chances of decrease in the displacement and collapsible chances due to more number of stories, hence these effects can be overcome by providing these walls. Shear walls are effective in minimizing the forces of quake and wind. Generally these walls are provided with or without opening .Shear walls shows better improvements with no openings. Construction of these walls is very easy because of straight forward reinforcement.

1.1 SCOPE OF STUDY

Buildings with different types of the zonal condition and for the different category can be adopted. Regular and irregular buildings with coupled shear wall can be adopted. Regular and irregular buildings with other different locations of shear wall can be adopted in order to obtain more percentage reduction in seismic parameters. Study of foundation details can be adopted for the regular and irregular buildings.

1.2 OBJECTIVE OF STUDY

The objective of this study is:-

a. Response spectrum analysis is carried out using ETABS2015 software
b. To determine the storey drift , storey displacement, time period and base shear
c. The concept behind the project is analysis of regular and irregular building of same area with different shear wall positions

2. NARRATIVE OF MODEL

The present work involves analysis of regular and irregular building of same area with different shear wall position. In this project, modelling and analysis are carried for G+24 stories modelling and analysis are done using ETABS-2016 software. There are two models model A and model B. The dimension of model A is of bay length 4.35m x4.35m for regular building Dimension of model B is of bay length 5m X 5m for irregular building. Both the models are of same area. These two models are located by the shear wall in different positions. In regular and irregular buildings 5 each models are done by ETABS.

2.1 BUILDING DESCRIPTIONS

a. Material properties

Young's modulus of (M25) concrete	25*1000 kN/m^3
Density of reinforced concrete	25kN/m^3
Young's modulus of steel	2*10^5 kN/m^2
Density of steel	Fe415
Density of Masonry	20 kN/m^3
Poisson's ratio	0.2

b. Details of building

Plan area dimension for regular building	(4.35*4.35) m
Plan area dimension for irregular building	(5*5)m
No. of floors in two models	G+24
Story height at ground floor	5m
Typical floor height	3.0m

c. Member properties

Thickness of slab	150mm
Thickness of shear wall	300mm
Columns size for the building	(800x800) mm
Beam dimensions for the building	(400x300) mm

d. Loads considered

Typical live load	3kN/m^2
Floor finish	1kN/ m^2
Wall load	12.42 kN/m^2

e. Seismic forces

Importance factor, I	1.0
Response reduction factor	5
Seismic zone factor	0.36
Type of soil	Medium soil

2.2ETABS MODEL GENERATION

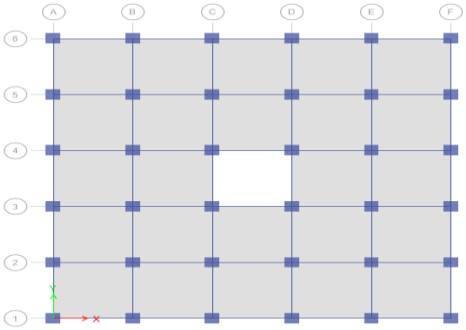

Figure 1:Plan view of regular building without shear

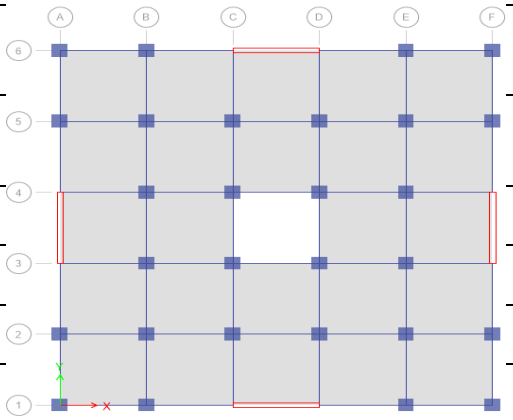

Figure 2:Plan view of regular building with shear wall

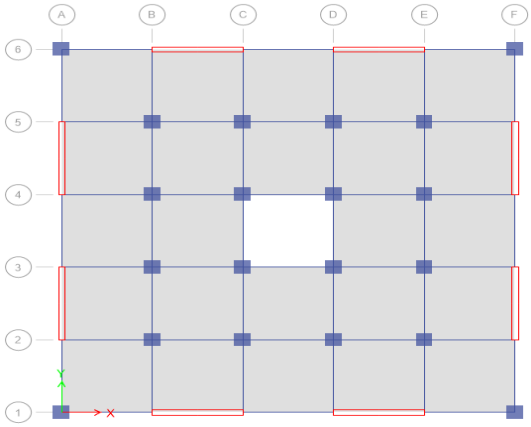

Figure 3:Plan view of regular building with shear wall

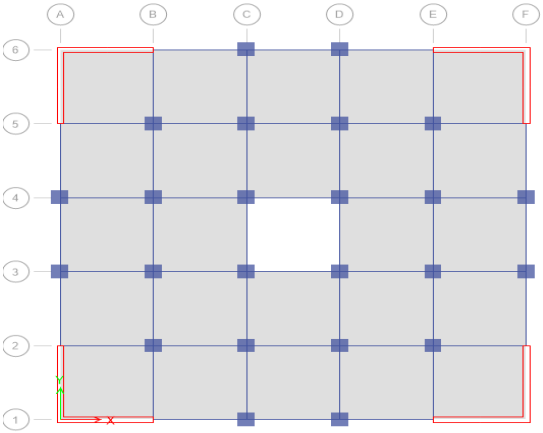

Figure 4:Plan view of regular building with shear wall

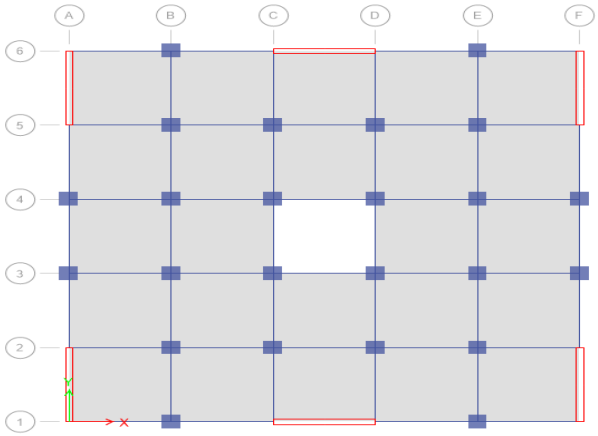

Figure 5:Plan view of regular building with shear wall

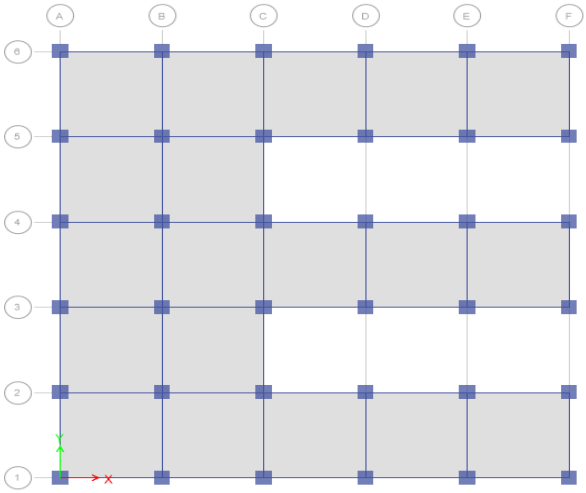

Figure 6:Plan view of irregular building without shear

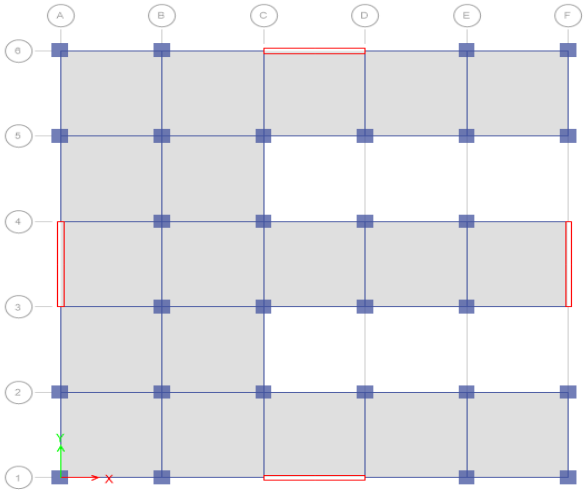

Figure 7:Plan view of irregular building with shear wall

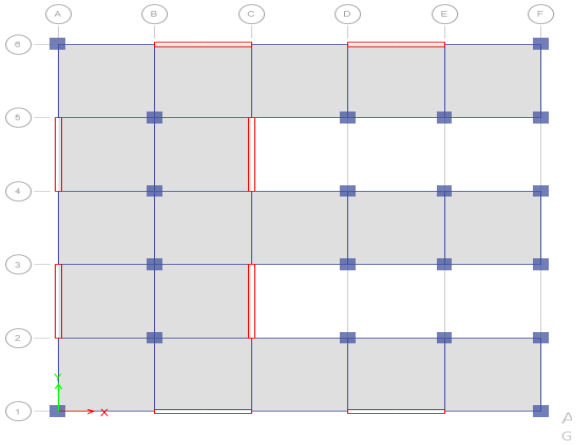

Figure 8:Plan view of irregular building with shear wall

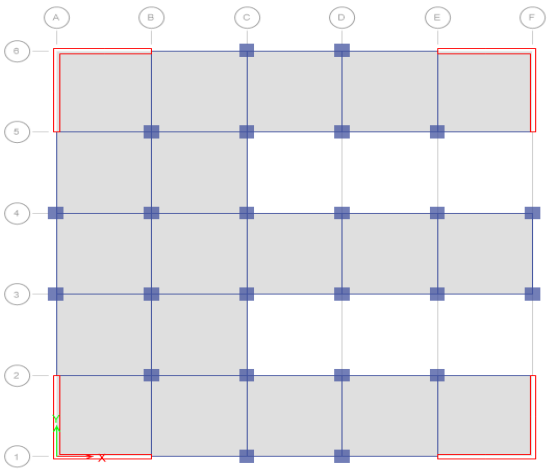

Figure 9:Plan view of irregular building with shear wall

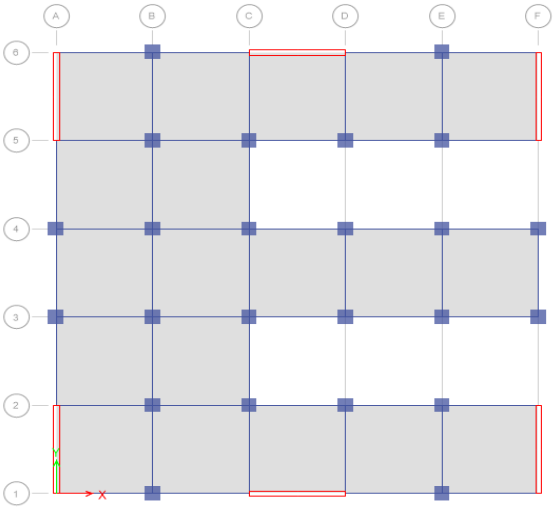

Figure 10:Plan view of irregular building with shear wall

3. RESULTS AND DISCUSIONS

3.1 STOREY DISPLACEMENT

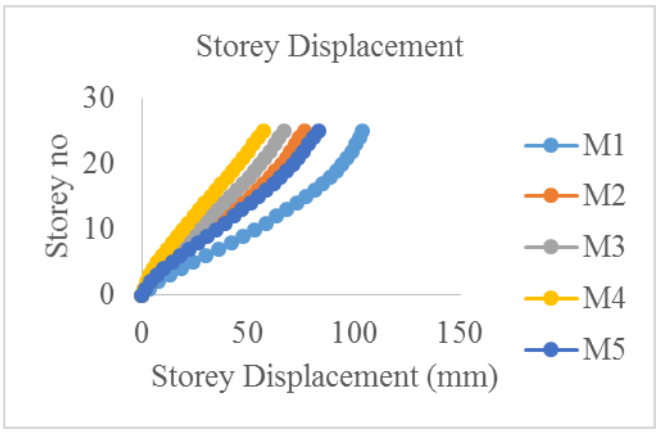

Figure 11: Storey displacement for regular building along X and Y direction

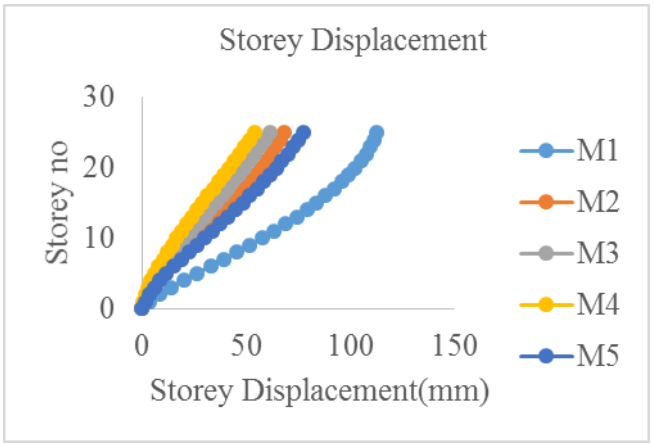

Figure 12: Storey displacement for irregular building along X direction

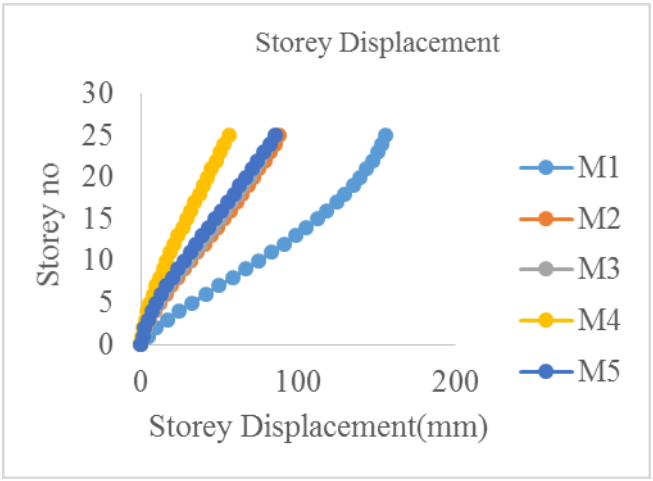

Figure 13: Storey displacement for irregular building along Y direction

3.2 STOREY DRIFT

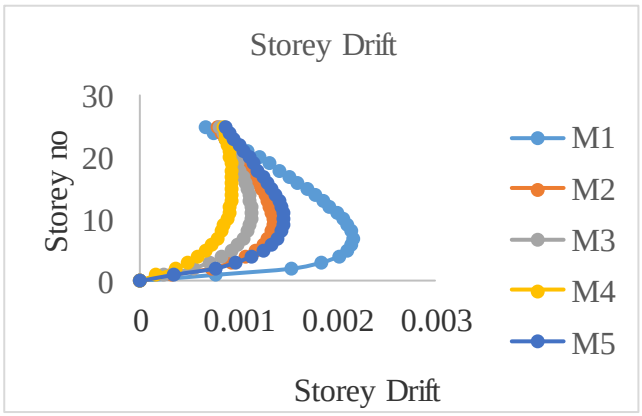

Figure 14: Storey drift for regular building along X and Y direction

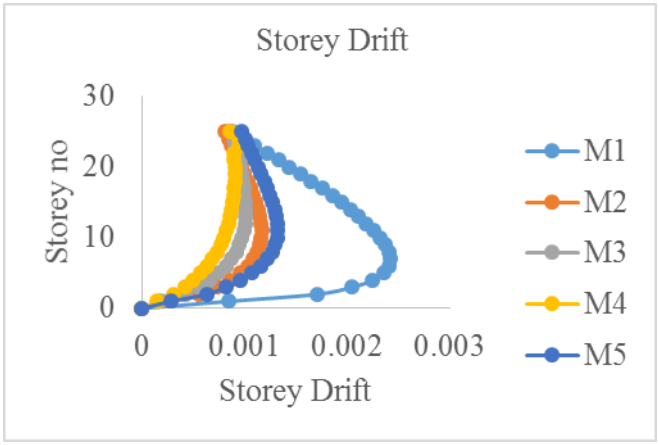

Figure 15: Storey drift for irregular building along X direction

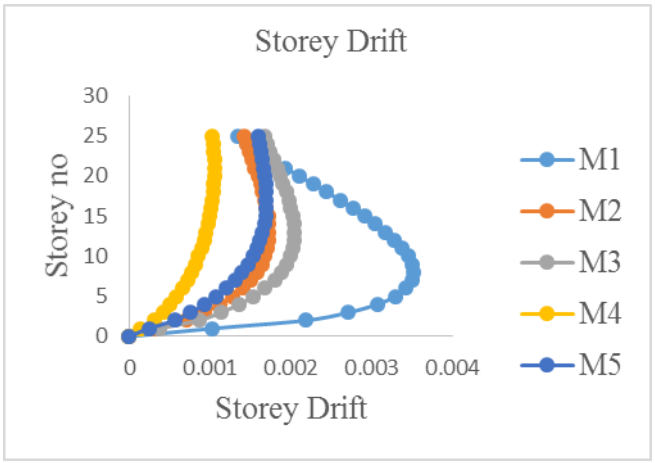

Figure 16: Storey drift for irregular building along Y direction

3.3 TIME PERIOD

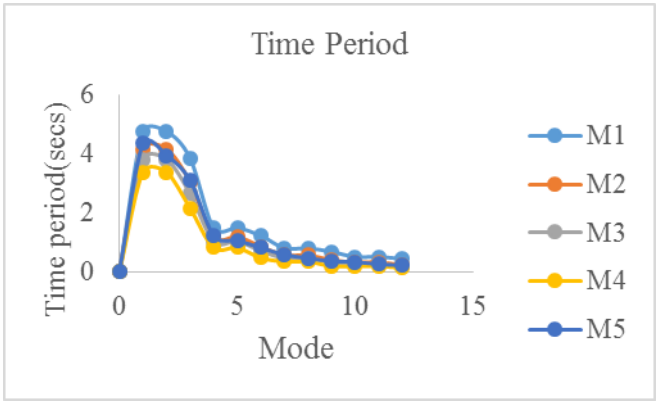

Figure 17: Time period for regular building along X and Y direction

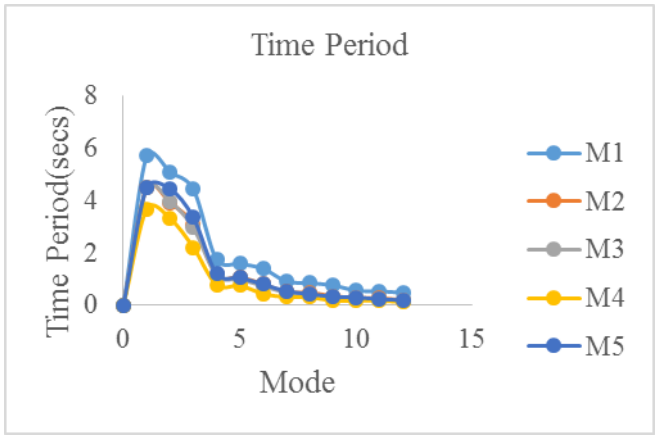

Figure 18: Time period for irregular building along X and Y direction

3.4 BASE SHEAR

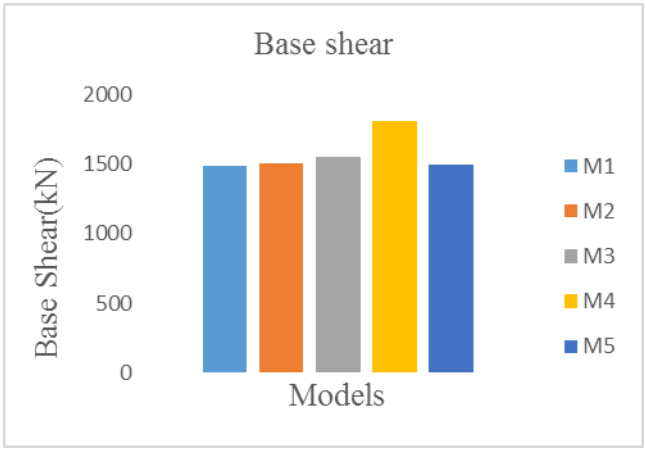

Figure 19: Base shear for regular building along X and Y direction

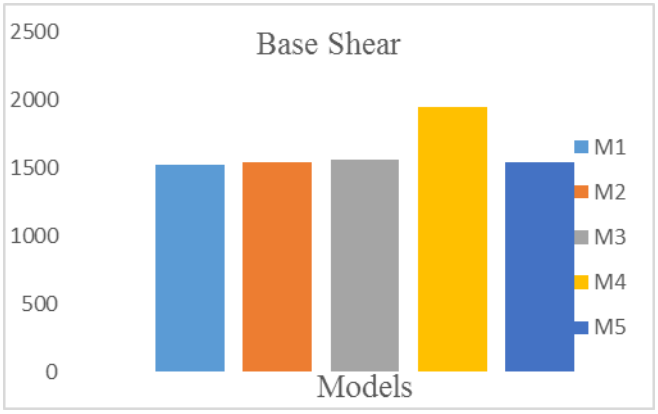

Figure 20: Base shear for irregular building along X direction

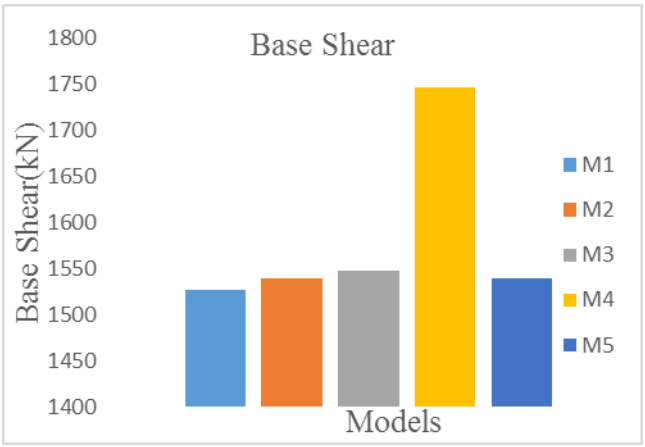

Figure 21: Base shear for irregular building along Y direction

4. CONCLUSIONS

1. **Storey displacements:** It was found that maximum reduction in storey displacement was observed to be in M4 by 44.83% for regular building. In irregular building it was observed to be in M4 by 52.25% along X and 64.17% along Y direction.
2. **Story Drift:** Maximum reduction in storey drift was observed in M4 by 56.62% for regular building. In irregular building it was observed to be in M4 by 62.53% along X and 70.09% along Y
3. **Time period:** Maximum reduction in time period was observed in M4 by 56.62% for regular building and 35.46% for irregular building.
4. **Base shear:** Base shear values for regular and irregular building is observed to be increased after adding the shear wall in both the directions. Base shear value for regular building is observed to be increased by 17.96% for M4. In regular building is observed to be increased in M4 by 21.55% in X direction and 12.57% in Y.

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