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Analysis of Earthquake Resistance Structure by Using ETABS

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Abstract

Structural Analysis is a branch which involves in the determination of behavior of structures in order to predict the responses of different structural components due to effect of loads. ETABS (Extended Three Dimensional Analysis of Building Systems) is software which is incorporated with all the major analysis engines that is static, dynamic, linear and non-linear, etc. The main purpose of this software is to design multi-storeyed building in a systematic process. The effective design and construction of earthquake resistant structures have great importance all over the world. Our project "Analysis Of Earthquake Resistance Structure By Using ETABS" is an attempt to analyze a residential building using ETABS.A G+17 storey building is considered for this study. Analysis is carried out by static method and design is done as per IS 456:2000 guidelines.

Keywords: - *Seismic Analysis, ETABS 2016, Displacement, Storey Shear.*

INTRODUCTION

ETABS is the present day leading design software in the market. Many design companies use this software for their project design purpose. So, this paper mainly deals with the comparative analysis of the results obtained from the analysis of a multi storied building structure when analysed manually and using ETABS software.

LITERATURE REVIEW

A. Rinkesh R. Bhandarkar, Utsav M Ratanpara, Mohammed Qureshi(2017): They concluded that the displacement is decreased in shear wall structure as

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compared to frame structure. The story stiffness is more in shear structure than the frame structure. The story drift is decreased in shear wall structure than the frame structure. They concluded that the performance of shear structure is better than the frame structure. The shear structure is suitable in earthquake prone area due to its higher stiffness and less displacement.

B. Mr. Abhay Guleria (May 2014):

The case study in this paper mainly emphasizes on structural behaviour of multi-storey building for different plan configurations like rectangular, C , L and I-shape. He analyzed 15-storey RCC frame building on ETABS software. Post analysis of the structure, maximum shear forces, bending moments, and maximum storey displacement are computed by him and then he compared for all the analyzed cases. After all analysis, he concluded that overturning moment varies inversely with storey height .He also concluded that L-shape, I-shape type buildings give almost similar response against the overturning moment. From dynamic analysis, he studied that mode shapes are generated and it can be concluded that asymmetrical plans undergo more deformation than symmetrical plans.

C. Abrar Ahmed, Prof. Shaikh Abdulla, Prof. Syed Arfat:

According to them the fundamental natural time period is observed to be the less for the model which is symmetry in shape as compared to asymmetry in shape. They concluded that the base shear yields low value in Response spectrum analysis when compared with the Equivalent Static Analysis.

D. Mayur R. Rethaliya, Nirav S. Patel, Dr. R.P. Rethaliya:

Their literature available is based on the provision of old seismic codes IS1893-1984 and IS 1893-2002.Study on effect of shape of building shows that buildings with higher irregularity, produces more deformation. They concluded that soft soil yields higher base shear as compared to medium and hard soils. The story drift values are also more as building with regular configuration.

DESCRIPTION OF MODEL STUDY

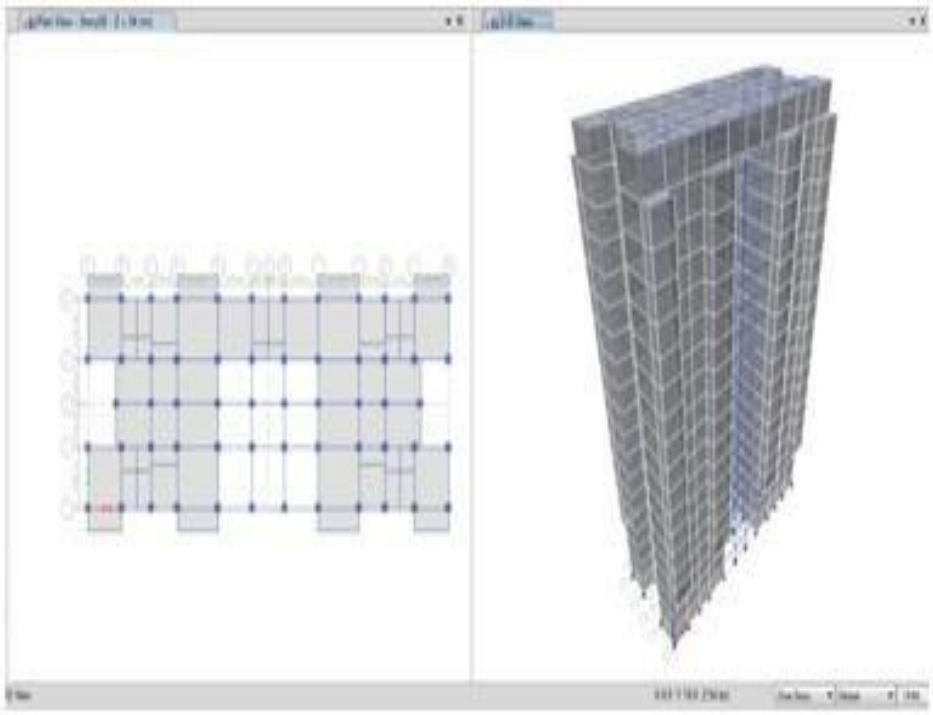
Problem statement

Analysis of a G+17RC framed structure (36.7m X 13.57m) located in Pune (zone III) for residential purpose with & without shear wall using ETABS and by manual calculations.

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Material Properties

Length X Width	36.7m X 13.57m
No of Storey	G + 17
Beam	450mm X 450mm
Column	600mm X 600mm
Slab Thickness	125mm
Support Conditions	Fixed
Thickness of External Wall	230mm
Grade of concrete & Steel	M30 & Fe500



Plan and 3D view

METHODOLOGY

Following factors were taken into consideration for analysis of G+ 17 structure.

- Zone Factor (Z)-0.16
- Importance Factor(I)-1
- Response Reduction Factor(R)-3
- Damping Factor-1

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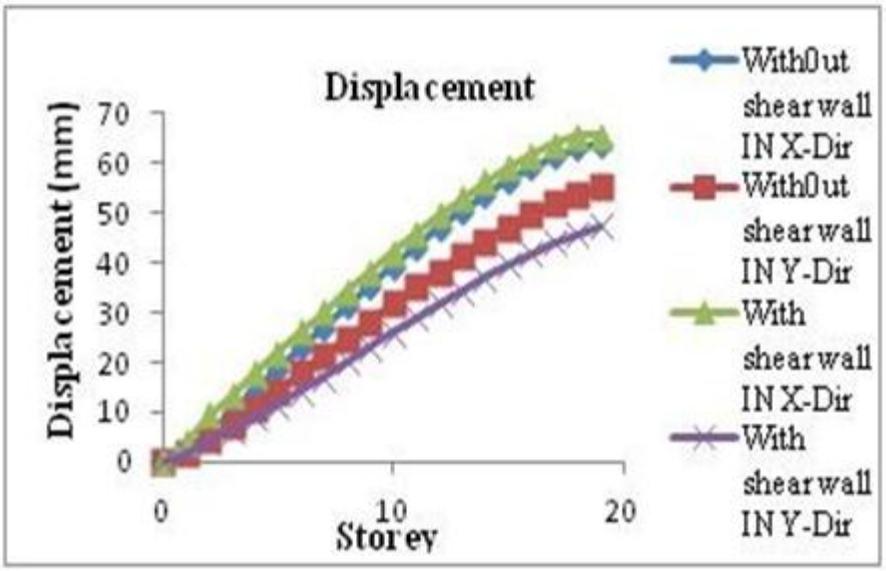
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LOAD COMBINATIONS

Sr. No.	Combinations
1	0.9DL+1.5WL(+X)
2	0.9DL+1.5WL(+Y)
3	1.2(DL+LL)
4	1.2(DL+LL+WL(+X))
5	1.2(DL+LL+WL(+Y))
6	1.5(DL+LL)
7	1.5(DL+WL(+X))
8	1.5(DL+WL(+Y))
9	0.9DL+1.5seis(+X)
10	0.9DL+1.5seis(+Y)
11	1.2(DL+LL+seis(+X))
12	1.2(DL+LL+seis(+Y))
13	1.5(DL+seis(+X))
14	1.5(DL+seis(+Y))

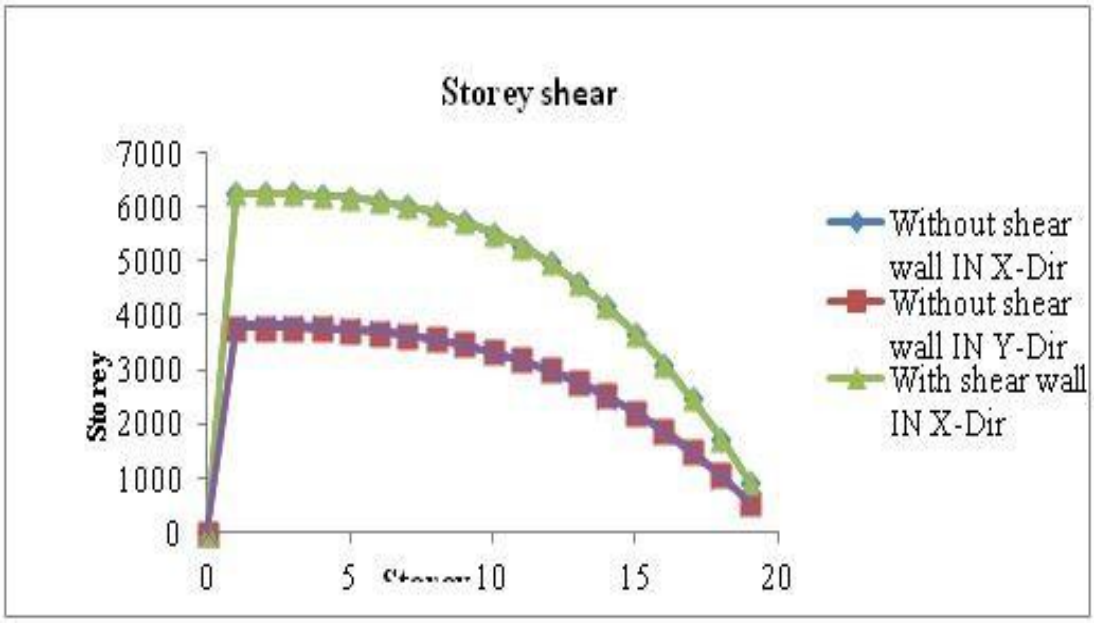
FIGURES

Storey Displacement: Storey Displacement is displacement with respect to base of the structure.



Storey Shear: Storey shear is the sum of design lateral forces at all levels above the storey under consideration.

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CONCLUSION

- In X direction, the displacement is increased in shear wall structure as compared to without shear wall structure.

- In Y-direction, the displacement is decreased in shear wall structure as compared to without shear wall structure.

- In X and Y directions, the Storey Shear values did not change for shear wall structure and without shear wall structure.

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