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Dynamic Response of Regular and Irregular High Rise Buildings under the Influence of Shear Walls

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ABSTRACT

This examination displays the system for seismic execution estimation of tall structures dependent on an idea of the limit range technique. In 3D logical model of thirty storied structures have been created customary and sporadic structures Models and examined utilizing basic examination device ETABS. The systematic model of the building incorporates exceedingly critical segments that impact the mass, quality, solidness and deformability of the structure. To contemplate the impact of solid center divider and shear divider at various positions amid tremor, seismic examination utilizing both direct static, straight unique and non-straight static technique has been performed. The avoidances at every story level have been looked at by performing Response range strategy performed to decide limit, request and execution dimension of the thought about building models. From the underneath studies it has been seen that non-straight Response range technique give great gauge of worldwide and additionally neighborhood inelastic misshapening requests and furthermore uncovers plan shortcoming that may stay covered up in a versatile examination and furthermore the execution dimension of the structure. Story floats are found inside the limit as determined by code (IS: 1893-2002) in Response range strategy.

Key words: Shear Wall, Story Drift, Displacement, ETABS, High Rise Buildings.

1.INTRODUCTION

Numerous medium-ascent loft structures are being developed in India, utilizing shear dividers to give seismic tremor protection from fortified solid edges. These shear dividers may have openings for the windows, entryways and pipe spaces for practical reasons. The number, area and size of openings influence the conduct of the structure and in addition worry in the shear divider.

REGULAR BUILDINGS

The buildings are Symmetry about X and Y direction is called Regular buildings. Generally for this buildings the length of building is equal to width of building is same. The load distribution is uniform in vertical direction.

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IRREGULAR BUILDNGS

The irregularity in the building structures may be due to irregular distributions in their mass, strength and stiffness along the height of building. When such buildings are constructed in high seismic zones, the analysis and design becomes more complicated. There are two types of irregularities

SHEAR WALL

Shear walls are vertical stiffening elements designed to resist lateral forces exerted by wind or earthquake. The shape and location of shear wall have significant effect on their structural behavior under lateral loads. Lateral loads are distributed through the structure acting as a horizontal diaphragm, to the shear walls, parallel to the force of action. These shear wall resist horizontal forces because their high rigidity as deep beams, reacting to shear and flexure against overturning. A core eccentrically located with respect to the building shapes has to carry tension as well as bending and direct shear.

OBJECTIVE OF THE STUDY

The following are the main objectives of the project

1. To study the seismic behavior of multi story building by using IS 1893:2002
2. To compare the multi story buildings with and without shear wall at different locations on multi story Building with regular and irregular shapes .
3. To compare the results of Story Drift, Shear force, Bending moment, Building torsion of buildings without shear wall at different locations on multi story Building with regular and irregular shapes.
4. To study the buildings in ETABS V9.7.4 in Response spectrum analysis.

2. LITERATURE REVIEW

Zeeshan Baseer[1] and Syed Farrukh Anwar[2] et al.,(2015)

Limited Element displaying now a days is a basic methodology in investigating and reproducing structural building issue numerically. From this examination it was reasoned that 1. With the arrangement of opening in the shear divider the float are expanding. The float is 0.00215 for 16% 0.002183 for 30% and 0.002197 for 36% of opening float increments with increment in rate opening.

G.Amar, V.Sanjay Gokul, K.Vamsi Krishna, D.Rakesh, et al., (2016)

Tremors are the most basic stacking condition for all land based structures situated in the seismically dynamic districts. An ongoing tremor in India on January 26th, 2001 made significant harm an extensive number of RCC tall structures and huge death toll.

In this manner shear dividers are a standout amongst the best building components in opposing horizontal powers amid seismic tremor. By developing shear dividers harms because of impact of parallel powers because of tremor and high breezes can be limited.

3. METHODOLOGY AND MODELLING OF BUILDING

Response spectrum method

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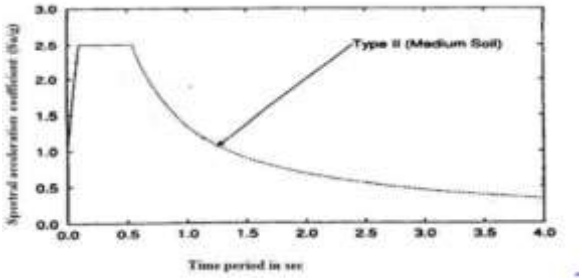
The portrayal of most extreme reaction of romanticized single level of opportunity framework having certain period and damping, amid quake ground movements. This examination is done by the code IS 1893-2002 (part1). Here kind of soil, seismic zone factor ought to be entered from IS 1893-2002 (part1). The standard reaction spectra for kind of soil considered is connected to working for the investigation in ETABS 2013 programming. Following chart demonstrates the standard reaction range for medium soil type and that can be given as day and age versus ghastly speeding up coefficient (Sa/g).



Response spectrum for medium soil type for 5% damping

Different types of loads acting on the structure

Types of loads acting on the structure are:

- Dead loads
- Imposed loads
- Wind loads
- Snow loads
- Earthquake loads
- Special loads

PROBLEM STATEMENT

In the present study, analysis of G+21 stories building in Zone V seismic zones is carried out in ETABS.

Basic parameters considered for the analysis are

1. Grade of concrete : M30
2. Grade of Reinforcing steel : HYSD Fe500
3. Dimensions of beam : 230mmX300mm
4. Dimensions of column : 230mmX480mm
5. Thickness of slab : 120mm
6. Height of bottom story : 3m
7. Height of Remaining story : 3m
8. Live load : 3.5 KN/m^2
9. Floor load : 1.5 KN/m^2
10. Density of concrete : 25 KN/m^3
11. Seismic Zone : Zone 5
12. Site type : II
13. Importance factor : 1.5
14. Response reduction factor : 5
15. Damping Ratio : 5%
16. Structure class : B
17. Basic wind speed : 39m/s
18. Risk coefficient (K1) : 1.08
19. Terrain size coefficient (K2): 1.14
20. Topography factor (K3) : 1.3
21. Wind design code : IS 875: 1987 (Part 3)
22. RCC design code : IS 456:2000
23. Steel design code : IS 800: 2007
24. Earth quake design code: IS 1893 : 2002 (Part 1)

MODELS IN ETABS V 9.7.4

Building without Shear wall

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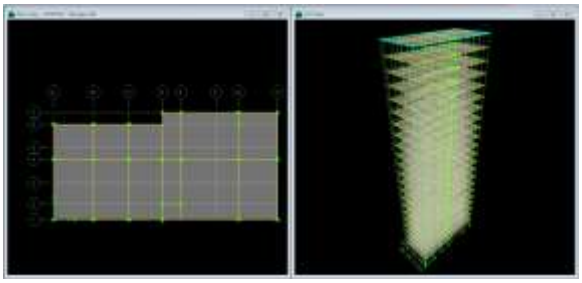
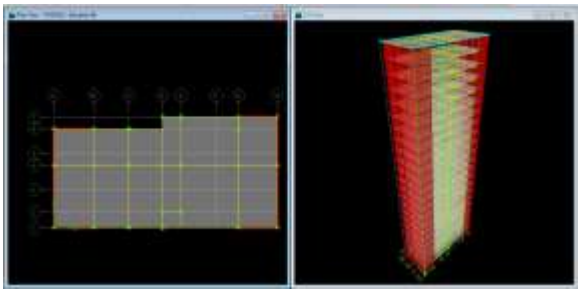
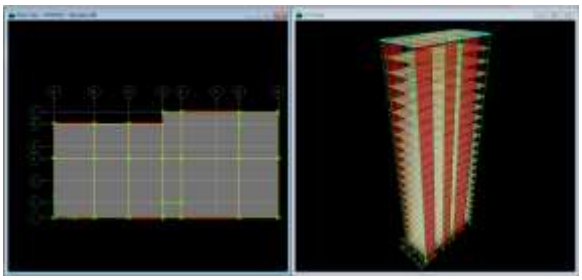


Building with Shear wall at corner



Building with Shear wall at alternative position

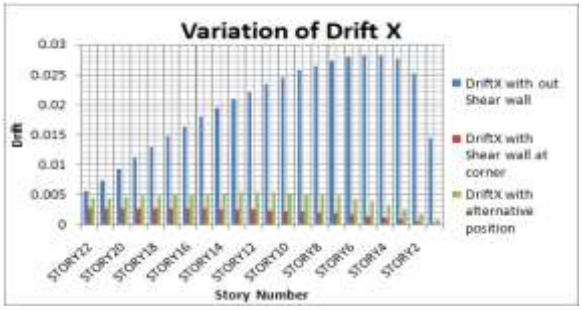


4. RESULTS AND ANALYSIS

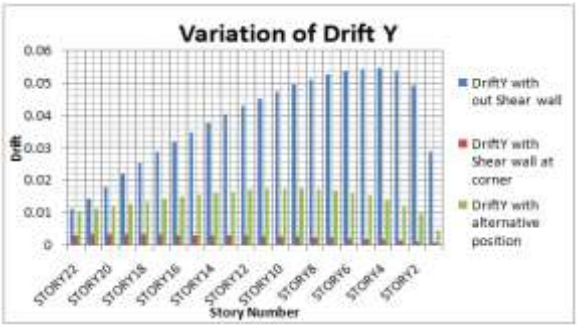
Irregular Building

Story Drift

X Direction



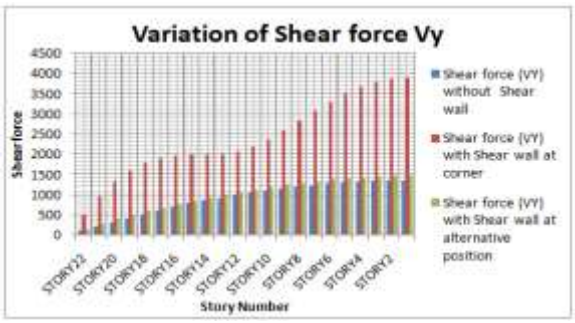
Y Direction



Shear Force

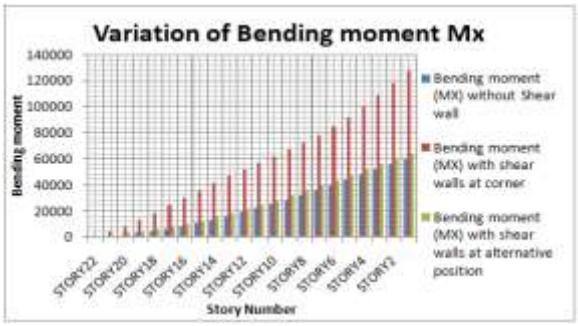
X Direction

Y Direction



Bending Moment

X Direction



Y Direction

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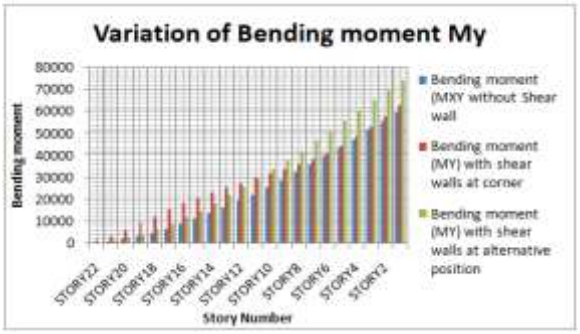
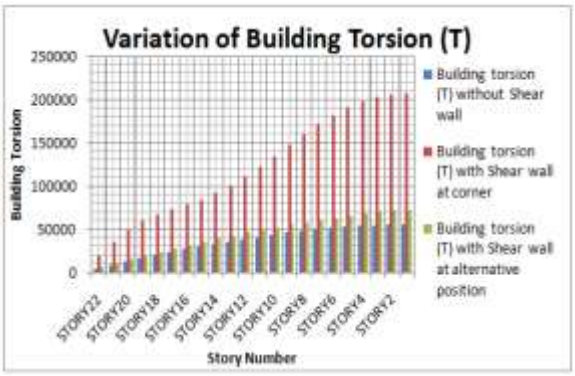


Building Torsion

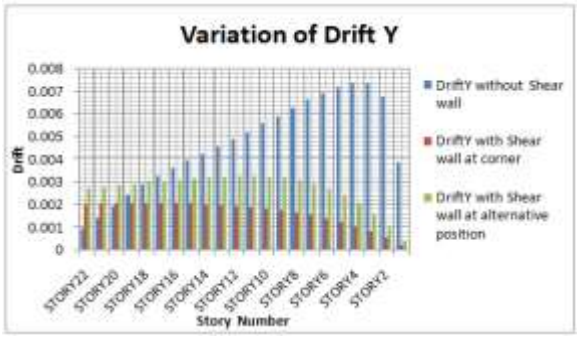


Regular Building

Story Drift

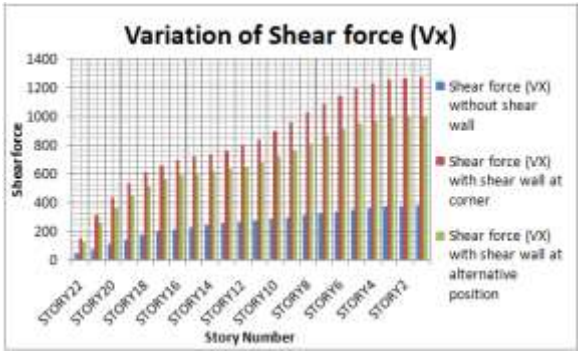
X Direction

Y Direction



Shear Force

X Direction



Y Direction

Bending Moment

X Direction

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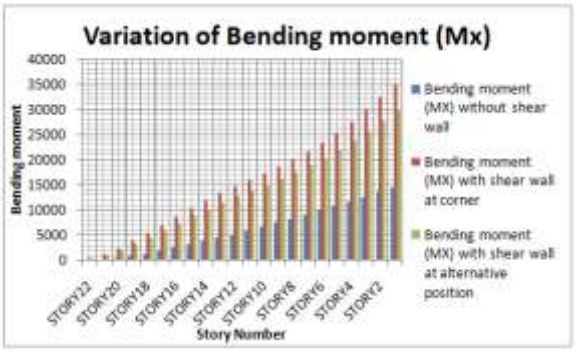
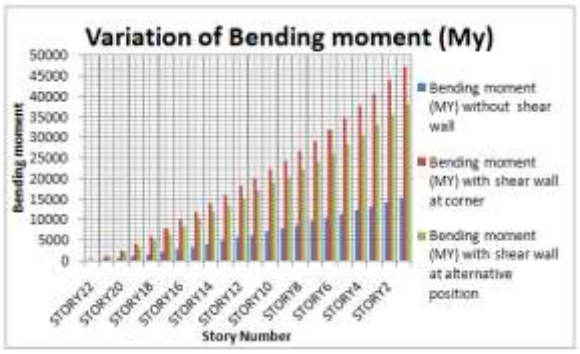
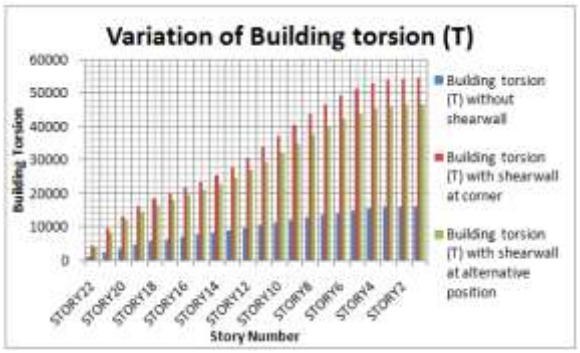


Y Direction



Building Torsion



5. CONCLUSIONS

From the above study the following conclusions were made

1. For customary building and sporadic structures the estimations of float in both X and Y bearing are less to fabricate utilizing shear divider than working without shear divider and the shear dividers at corner will give preferable outcomes over shear dividers at elective position for both X and Y course.
2. The estimations of Shear compel in both X and Y-Direction discovered lower an incentive for working without shear divider at elective position and shear divider at corner than structures. What's more, the shear divider at elective position has higher qualities than shear divider at corner position.
3. The benefits of Building Torsion (T) discovered lower an incentive for working without shear divider at elective position and shear divider at corner than structures. Furthermore, the shear divider at elective position has higher qualities than shear divider at corner position.
4. From twisting minute (M) perspective the benefits of bowing minute are observed to be less qualities for the working with shear divider elective position than working with shear divider at corner.
5. Opening in the shear dividers lead to a noteworthy increment in the bowing minute and shear drive in the sections associated with that shear divider and when opening is at best the level of the expansion is less for the opening at the base.
6. It was watched for a specific opening in divider when the opening position is moved from one position to other position.
7. From this investigation it was presumed that expansion in the level of Shear divider results in decline in the float and expands the Shear drive, Bending minute, Building Torsion

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