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DYNAMIC ANALYSIS OF MULTI STOREY BUILDING WITH AND WITHOUT SHEAR WALL

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Abstract— Nowadays, the number of buildings is constructed and designed according to the requirements and aesthetic viewpoints of the buildings every day. Most buildings are constructed in a certain spatial configuration, such as X-shaped, V-shaped, and the x and y coordinates are not parallel to the structure. The earthquake caused more damage to the different structures of the building. The main problem is the slenderness ratio. The main purpose of this project is to compare the dynamic characteristics of buildings with different structural configurations in seismic zones and soil types. In this study, a 12-story space configuration structure was considered, and the height of 3m on each floor did not exceed 36m, with shear walls and supports at different positions of the building. The dynamic behaviour of buildings in all seismic zones of magnitude III and on different types of soil (such as media) is studied. The structure has peripheral beams that carry RC shear walls with a thickness of 230 mm. The response spectrum analysis was carried out by using software of ETABS version.

***Keywords*— Earthquake, Shear wall, Response Spectrum Analysis**

I. INTRODUCTION

Most countries suffer from earthquake damage, which is one of the main impacts on buildings. Generally, the loads on the building are horizontal loads and vertical loads. Horizontal loads are wind loads and seismic loads. The vertical load is the self-weight and applied load of all structural members. Shear walls are the most effective way to resist lateral loads and wind, and it helps to improve the seismic response of buildings. In the past few decades, due to insufficient lateral rigidity and the strength of structural members to resist earthquakes, eventually leading to collapse, multi-storey buildings have been widely constructed. Reinforced concrete shear wall is most suitable for construction in areas prone to high earthquake zone, because it provides sufficient rigid connection between structural elements and avoids many hazards to buildings. The seismic performance of a building depends on the location of the shear wall in the building. Many research papers do not mention the exact location of the shear wall in the building to improve the maximum rigidity and strength against lateral forces.

1.1. SHEAR WALL

In terms of structural engineering, a shear wall is a structural system that consists of support panels (also called shear panels) to resist the influence of lateral loads acting on the structure. The shear wall is the vertical element of the horizontal force resistance system.

1.2. FUNCTION OF SHEAR WALL

<u>Giving Lateral Strength to building:</u>

Shear Wall should give parallel shear solidarity to the structure to oppose the even seismic tremor powers, wind powers and move these powers to the establishment.

<u>Giving Lateral Stiffness to building:</u>

Shear Walls give enormous firmness to working toward their direction, which lessens horizontal influence of the structure and consequently decreases harm to structure.

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1.3. ADVANTAGES OF SHEAR WALL

- Very good earthquake performance, if proper designed.
- Easy to construct.
- Minimizing earthquake damage to structural and non-structural elements.
- Lesser lateral displacements than frames.

1.4 LATERAL LOAD RESISTING SYSTEM

Built up Concrete Shear Wall:

Shear divider is a best horizontal burden opposing framework in tall structure at high seismic zone regions. It is a solid cantilever divider gave in a RC outline working to give flexural solidness and solidarity to the primary individuals against seismic tremor. Development of shear divider in building is practical simply up to restricted stories. Shear divider will give unbending association among divider and casing individuals and it is typically given in lift center, step case and rather than traditional burden bearing dividers.

Bracing System:

Supporting is a generally productive and prudent sidelong burden opposing framework in tall structure both of steel or R.C edge to give better execution against tremor various kinds of bracings are accessible like single slanting propping, twofold corner to corner propping, K supporting, V-bracing and Knee supporting are accessible.

II. OBJECTIVES OF THE STUDY

1. To analyze the given multi storied building using response spectrum method with and without shear wall.
2. To study the behaviour of the structure under different locations of shear wall.
3. To analyze and compare the results of story drift and story displacement for with and without shear wall.

III. METHODOLOGY

Dynamic analysis by Response Spectrum Method of G+11 multi storey building with and without shear walls using ETABS software. Two models are considered namely shear wall and without shear wall. The shear walls are placed at corner of the building. The structure is analyzed for seismic analysis as per IS 1893:2016. Typical floor plan is shown below.

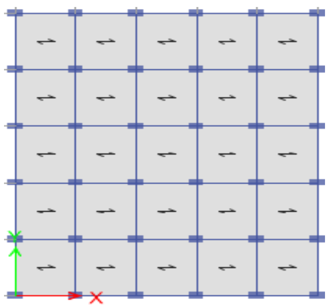

Fig 1: Building without Shear wall

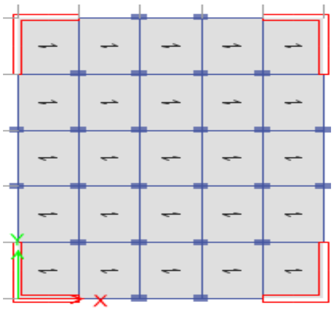

Fig 2: Building with Shear wall

IV. INPUT PARAMETERS

Table-1: Input Parameters

Particulars	Dimensions
Beam Size	230mm X 450mm
Column Size	230mm X 400mm
Spacing between the frame	3m
Floor dimension in X-direction	15m
Floor Dimension in Y-direction	15m

Table-2: Loading Conditions

Load Type	Value
Live load on floor	2 kN/m^2
Live load on Terrace	1.5 kN/m^2
Floor Finish	1.5 kN/m^2
Water Proofing on Terrace	3 kN/m^2

Table-3: Seismic Parameters

Load Type	Value
Seismic Zone	III
Zone Factor	0.16
Response Reduction Factor, R	5
Soil type	II, Medium
Importance Factor	1

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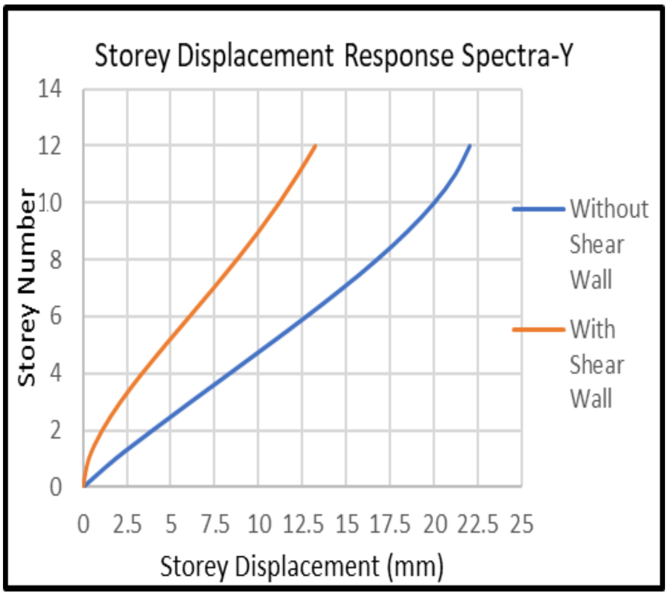
V. RESULTS

Two Parameters such as Storey Displacement and Storey Drift are compared in this study.

A. Lateral Storey Displacement

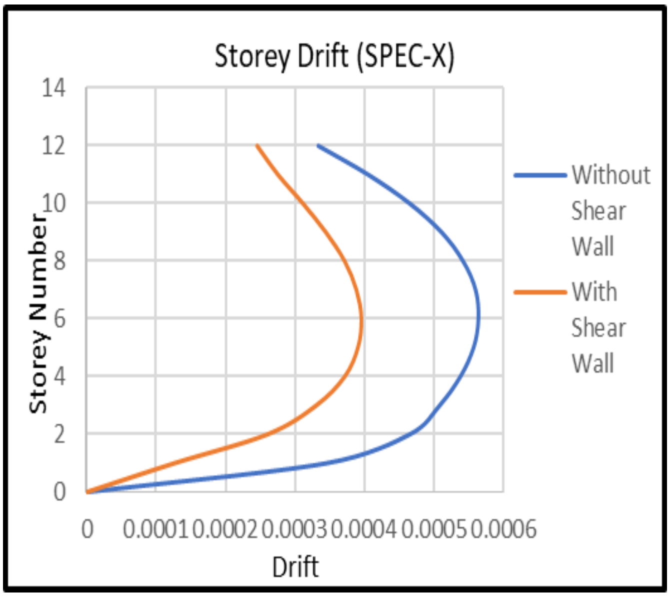
The maximum storey displacement observes for a value of shear wall due to response spectrum analysis in X- direction is 11.419mm and without shear wall is 17.414mm at the top. Therefore, a reduction up to 34.42% can be observed.

Also, the maximum storey displacement observes for a value of shear wall due response spectrum analysis in Y- direction is 13.262mm and without shear wall is 22.078mm at the top. Therefore, a reduction up to 39.93% is observed.

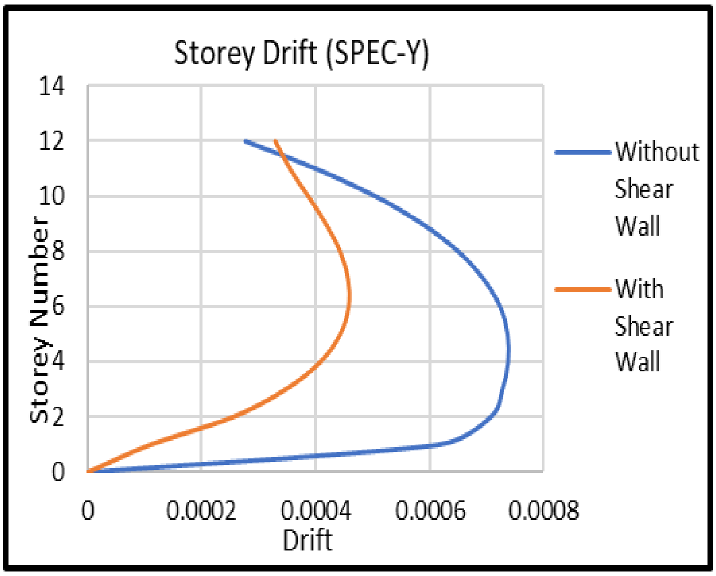


B. Lateral Storey Drift

The storey drift observes for a value of shear wall due to response spectrum analysis in X- direction is 0.000245 and without shear wall is 0.000334 at the top. Therefore, a reduction up to 26.64% is observed.



Also, the storey drift observes for a value of shear wall due to response spectrum analysis in Y- direction is 0.00033 and without shear wall is 0.000277 at the top. Therefore, a reduction up to 45.37% is observed.



VI. CONCLUSIONS

The following conclusions were made from the present study:

- The maximum storey displacement reduction of response spectrum analysis in X-direction is 34.42 %.

- The maximum storey displacement reduction of response spectrum analysis in Y-direction is 39.93 %.
- The storey drift reduction of response spectrum analysis in X-direction is 26.64 %.
- The storey drift reduction of response spectrum analysis in Y-direction is 45.37 %.

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