

COMPARATIVE ANALYSIS OF G+8 BUILDING WITH AND WITHOUT SHEAR WALL BY USING SAP 2000

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Abstract This study presents the procedure for seismic performance estimation of high-rise buildings based on a concept of the capacity spectrum method. In 3D analytical model of thirty storied buildings have been generated regular and irregular buildings Models and analyzed using structural analysis tool SAP 2000. The analytical model of the building includes all important components that influence the mass, strength, stiffness and deformability of the structure. To study the effect of concrete core wall & shear wall at different positions during earthquake, seismic analysis using both linear static, linear dynamic and non-linear static procedure has been performed. The deflections at each storey level have been compared by performing time history performed to determine capacity, demand and performance level of the considered building models.

In the present study a G+8 building is considered by using SAP2000 Software. The models namely without shear walls, with corner shear walls, with center shear walls, alternative shear walls are considered by using time history analysis method in Zone V seismic zone as per IS 1893-2016 code. The results like storey drift, shear force, bending moment, torsion, time period and frequency values are compared with and without shear wall condition.

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

I INTRODUCTION

Shear walls are components of vertical reinforcement designed to resist lateral wind or seismic stresses. Structural behavior of shear walls under side loads is affected by the form and placement of them. Lateral loads are split into the shear walls parallel to the force of action by the structure acting as a horizontal diaphragm [1, 2] . These shear walls withstand horizontal pressures because they react to shove and bend against overturn, due to their great stiffness as deep beams.

An eccentric core of building forms must have tension as well as direct shear and bending [7 8 9]. Torsion may also emerge, however, when the wind acts in the façaden of the direct surface texturing or when wind does not work via the centre of the mass of the building in order to construct a symmetrical structure with shear walls.

The walls of the shear are significantly harder than the rigid horizontal frames. Shear walls are therefore up to 35 stories inexpensive [3 4 6]. When shear walls are coupled with frames at a lower to medium elevation, it is acceptable to assume that all lateral charging is attracted by the shear walls so that only the frame may be built for gravity loads [5].

II OBJECTIVES OF THE CURRENT STUDY

The following are the main objectives of the project

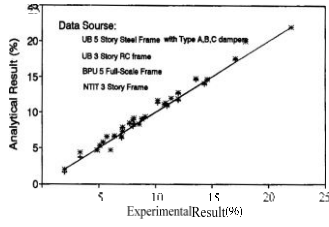
1. To study the seismic behavior of multi story building by using IS 1893:2016
2. To compare the multi story buildings with and without shear wall at different locations on multi story Building.
3. To compare the results of displacement, Shear force, Bending moment, Building torsion of buildings without shear wall at different locations on multi story Building
4. To study the buildings in SAP2000 Software package.

III METHODOLOGY USED FOR THE STUDY

A. TIME HISTORY ANALYSIS

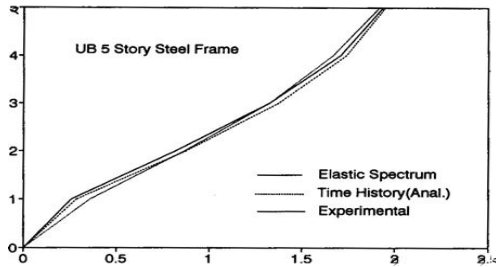
Using the to be had dynamic assessment bundles, seismic reaction examinations can be accomplished following the assessment of the visco-flexibly damped construction's damping proportions. A 5-story model's normal time data response expectation and check stop final product under a zero.6g Hachinohe tremor are portrayed in Figure 6. 1995). In this investigate, the modular pressure energy strategy is utilized to form the VE damper gatherings as support factors inside the changed program ETABS. Comparable examinations has been apparently gotten done, and the discoveries propose that the flexible time-history response of visco-flexibly damped

frameworks can be as it ought not out of the ordinary assuming that the structure's damping proportions are first precisely anticipated.



Time history plot

Exhibits the time-records reactions of a three-story metallic casing with added VE dampers under a 0.8g El tremor, both tentatively gotten and mathematically mimicked (Chang et al. 1996). Drain2D+ models the underlying givers and VE damper congregations as bracket components and bi-straight pillar and segment components, individually. In spite of the underlying members' inelastic deformity in going before tests (Chang et al.), it's miles clear that the logical outcome accurately predicts the by and large primary response. 1996).



Results of time history plot

Response spectrum analysis, 0.6g El Centro, 15% damping, lateral displacement

IV STRUCTURE PLAN AND MODEL IN ETABS

A. Model specifications

In the present study, analysis of G+8 multi-story steel building in Zone V is carried out. 3D model is prepared in SAP2000 software.

Basic parameters considered for the analysis are

1. Utility of building : Residential building
2. Number of stories : G+8
3. Shape of regular building : Rectangular
4. Geometric details
 - a. Ground floor : 3m
 - b. floor to floor height : 3m

5. Material details

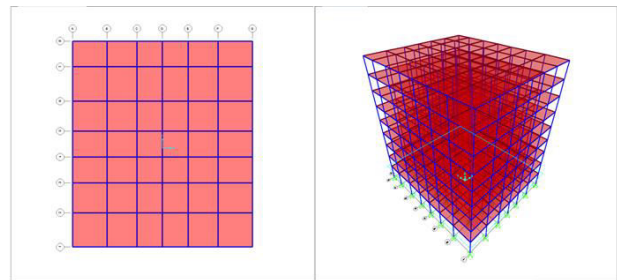
- a. Concrete Grade : M40 (COLUMNS AND BEAMS)
- b. All Steel Grades : HYSD reinforcement of Grade Fe550
- c. Bearing Capacity of Soil : 200 KN/m²

6. Type Of Construction : R.C.C FRAMED structure

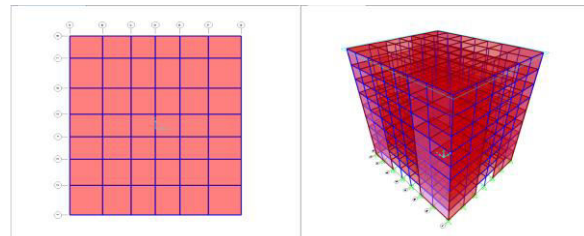
7. Column : 0.6m X 0.6m
8. Beams : 0.4m X 0.6m
9. Slab : 0.150m
10. Earthquake Zone 5 : Zone V

Wind speed : 39m/s.

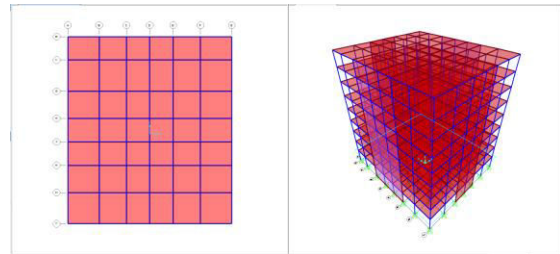
BUILDING MODELS IN SAP2000



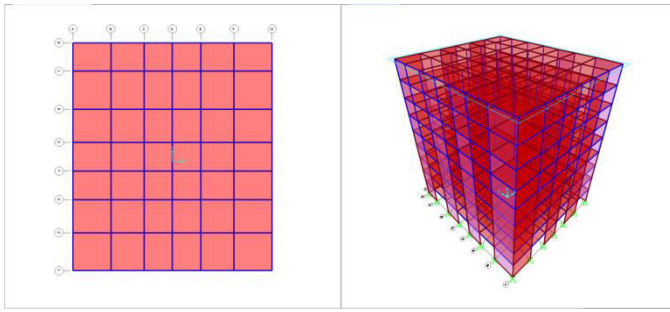
BUILDING WITHOUT SHEAR WALL



BUILDING WITH CORNER SHEAR WALL



BUILDING WITH CENTER SHEAR WALLS



BUILDING WITH ALTERNATIVE SHEAR WALLS

V RESULTS AND ANALYSIS

Storey Drift

Drift is the lateral movement of structure. The drift of a multistorey structure relative to the level below is known as storey drift. The difference between the roof and floor displacements of any given storey when the building moves during an earthquake, normalised by the storey height, is known as inter storey drift. An interstorey drift of 0.10, for example, implies that the roof is moved one foot in respect to the floor below for a 10 foot high storey.

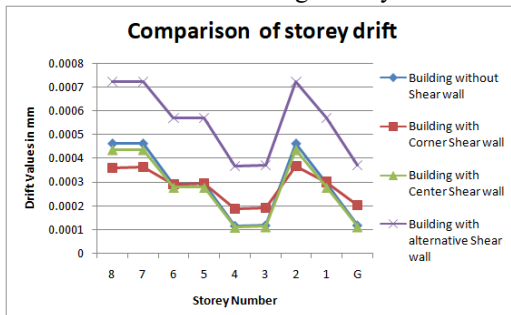
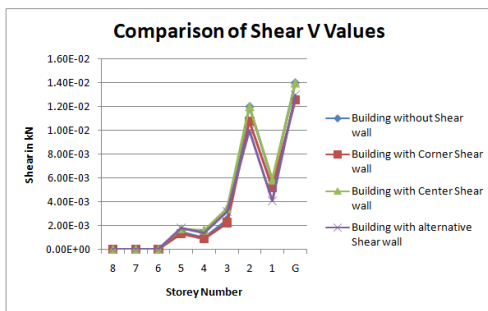


FIGURE 3: Comparison of storey drift

Storey Shear force

The unbalanced vertical force to the right or left of the section can be described as the shear force at the cross section of the beam.



Comparison of Shear V Values

Storey Torsion

Torque is a twisting or turning force that causes rotation around an axis, which might be a fixed point or a centre of mass.

Torque may also be defined as a spinning object's capacity to overcome turning resistance, such as a gear or a shaft.

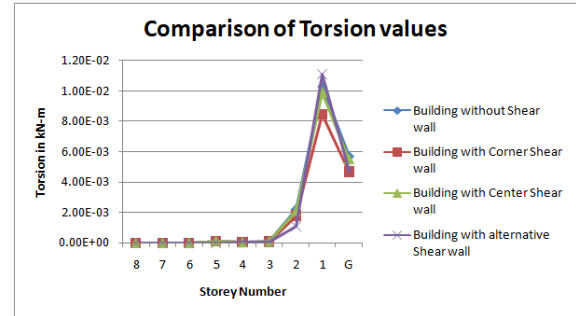
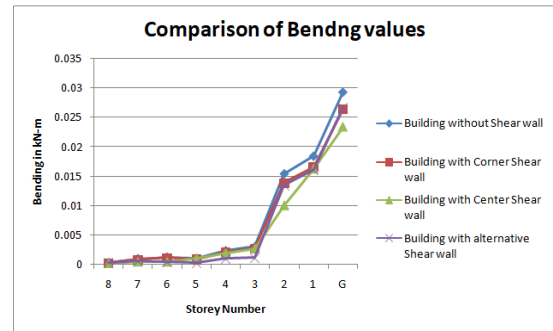


FIGURE 8: Comparison of Storey Torsion

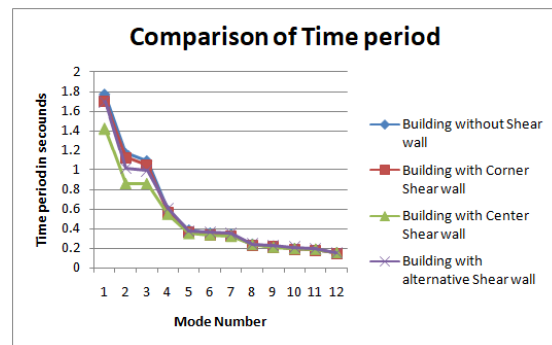
Storey bending moment

The unbalanced vertical moment to the right or left of the section can be described as the bending moment at the cross section of the beam.



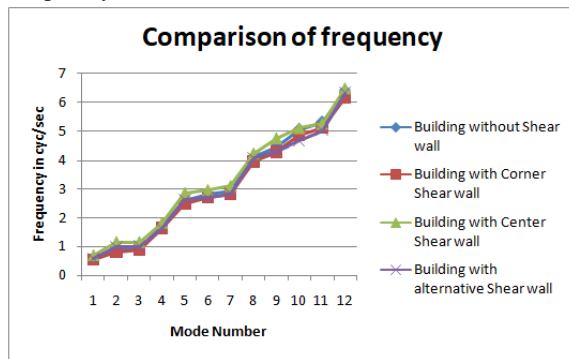
Comparison of bending moment values

Time period Values



Comparison of time period values

Frequency values



Comparison of frequency values

VI CONCLUSION

From the above analysis results the following conclusions were made

1. The values of the drift are obtained less values for the building model made with alternative shear wall 2 case than the remaining building namely without bracings, corner shear walls, center shear wall and alternative shear wall models. So as per the drift values the efficient building structure is alternative shear wall 2 case.
2. The storey shear values shows less intensity for the building model made with center shear wall case. So the center shear wall case will be efficient model as per the storey shear.
3. The storey bending values shows less intensity for the building model made with center shear wall case. So the center shear wall case will be efficient model as per the storey bending.
4. The storey torsion values shows less intensity for the building model made with center shear wall case. So the center shear wall case will be efficient model as per the storey torsion.
5. By providing shear walls at various positions and locations the values of time period and frequency increasing when we compared with other building models this will give extra resistance for the structure
6. Opening in the shear walls lead to a significant increase in the bending moment and shear force in the columns connected to that shear wall and when opening is to top the percentage of the

increase percentage increase it is less for the opening percent.

7. It was observed for a particular opening in wall when the opening position is shifted from one position to other position.
8. From this study it was concluded that increase in the percentage of Shear wall results in decrease in the drift and increases the Shear force, Bending moment, Building Torsion

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