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A Study on Different Location Of Shear Wall Subjected To Ground Motion

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Abstract: Shear walls are structural members used to elongate the strength of R.C.C. structures. These shear walls will be construct in each level of the structure, to form an effective box structure. Equal length shear walls are placed symmetrically on opposite sides of outer walls of the building. Shear walls are added to the building interior to provide more strength and stiffness to the building when the exterior walls cannot provide sufficient strength and stiffness. It is necessary to provide these shear walls when the tolerable span- width ratio for the floor or roof diaphragm is exceeded. The present work deals with a study on the improvement location of shear walls in symmetrical high rise building. Position of shear walls in symmetrical buildings has due considerations. In symmetrical buildings, the center of gravity and center of rigidity coincide, so that the shear walls are placed symmetrically over the outer edges or inner edges (like box shape). So, it is very necessary to find the efficient and ideal location of shear walls in symmetrical buildings to minimize the torsion effect. In this work a high rise building with different places of shear walls is considered for analysis. The multi storey building with 26 storey is analyzed for its displacement, strength and stability using ETABS-2015 software. For the analysis of the building for seismic loading with Zone-V is considered with soil medium. The analysis of the building is done by using equivalent static method and Response spectrum method.

I. INTRODUCTION

In high-rise buildings, it's necessary to produce enough rigidity for lateral wind or earthquake hundreds concrete wall panels are designed for buildings in unstable zones because of their high bearing capacity, high malleability and rigidity. The beams and columns are large, and also the reinforcement on the beam and column connections is sort of significant so the joints are severely clogged and it is troublesome to put the concrete and vibrate at the joints Safety. This sensible problem needs the introduction of wall panels in tall buildings.

"Structural forms"

Lateral masses can broaden excessive stresses, create rocking actions or motive vibrations, so it's miles very critical to have enough electricity of the shape towards vertical masses. Earthquake and wind forces are the best sizeable lateral forces performing on homes. The load resistance gadget or the form of the shape need to take in the electricity precipitated via way of means of those transverse forces via way of means of moving or deforming without collapsing. Determining the structural form of a excessive-upward push or excessive-upward push constructing might preferably best contain the association of the primary structural factors to correctly face up to the diverse combos of shear and gravity masses Internal making plans 1) The fabric and production 2) The kind and length of the horizontal load 3) The outside architectural remedy 4) The peak and proportions of the constructing and5) Planned region and set up of deliver structures The better and thinner a production, the greater critical its static aspect and the greater a appropriate production shape or a appropriate gadget ought to be decided on for the transverse load of the constructing. For tall homes designed for the equal motive and with the equal peak and materials, the performance of the shape may be as compared to its weight according to unit area.

II. LITERATURE REVIEW

Different experiments and studies works were done seeing that pretty some time anywhere at some stage in the world to know or to evaluate the impact of earth quake forces on current RC homes in numerous earth quake zones & in sloping territories. The idea of demonstrating and assessment techniques implemented due to this has likewise been getting more potent with improvement of engineering and era and furthermore with the past experience.

1. **Sandeep Gupta, Dr. Saleem Akhtar, Mr. Aslam Hussain:**
Therefore, the purpose of this have a look at is to analyze the affect of the placement of the shear wall at the seismic behavior, the usage of a ordinary and abnormal shape in comparison with the shear wall in exclusive positions, for the reason that axial forces, the moments of bending and displacements are parameters. To be performed on this thesis, thru a complete have a look at of the literature and an evaluation of 10-tale homes for the seismic zones of Zone II and Zone IV

2. **Ashish S. Agrawal, S.D.Charkha (2012**): This put up offers the observe of a 25-tale constructing in Zone V with a initial observe this is analyzed through converting exclusive positions of wall panels of various shapes to decide parameters together with ground flow, axial load and displacement. ETAB package. In this newsletter we've tested the have an effect on of the placement of the shear wall with absolutely exclusive shapes for decisive parameters together with the flow of the structure, the axial load and the displacement. It changed into concluded that because the eccentricity increases, the constructing well-knownshows choppy motion of the proper and left edges of the roof because of torsion and induces immoderate moments and forces withinside the bar.

3. **R.S.Mishrą, V.KUshwaha, S.Kumar (2015)**: This have a look at makes a speciality of the evaluation of the seismic conduct of the structure (Special Moment Resisting Frame, SMRF). The have a look at become finished the usage of the software program STAAD.PRO, IS 1893: 2002, IS 13920: 1993 and IS 456: 2000. The evaluation includes eleven flooring and has five bays in each guidelines with a span of four m each, the peak from ground to ground is three m, the peak from the floor ground to the primary ground is 2.eighty m. The constructing become to be placed in seismic area II (Bhilai, Chhattisgarh region) in India. When analyzed the usage of STAAD.PRO, smooth soil become found at the 1st and eleventh flooring. A evaluation become made via way of means of setting a bracing wall at distinctive factors of the constructing subjected to a seismic load. These positions include a shear wall positioned on the periphery, in an intermediate role and on the core.

III. OBJECTIVES OF THE STUDY

3.1 OBJECTIVES:

1. The important motive of the project is also to learn as a comparison of seismic response to G+25 Buildings for optimal location of shear walls, that we can choose the best possible path Construction in earthquake areas.

2. The present test is an example of multi-story RC structures placed G + 25 in seismic zone V and examining the behavior of the structure in seismic areas.

3. To analyze a multistorey building with different location of shear wall and to compare its important parameters like Base-shear, Time period, Displacement, Storey drift for seismic zone V.

3.2 SCOPE OF STUDY

This examination is an example of multi-storey structures in G + 25 reinforced concrete placed in seismic zone V and allowing the behavior of the structure to be studied in seismic zone. The actual point of consideration is to discover the execution level and compare the working with the assistant of limit and request of the working for composed earth quake force, in the end reasonable design of working to be utilized as a part of that region is recommended.

1. The analysis is carried considering the building is placed on isolated footings.
2. Using Etabs modeling of G+25 is done.
3. RC building is analysed using both Response spectrum method and Equivalent static method.
4. Seismic parameters are studied by providing shear wall at different location.
5. To check the impact of building with totally different position of shear wall.

IV. METHODOLOGY

The finite component analysis software system ETABS 2015 is employed for developing 3D model and run all analyses. The software is ready to search out the geometric nonlinear behavior of 3D frames underneath static or dynamic loadings, taking under consideration each geometric nonlinearity and material inelasticity. The software accepts static masses (either forces or displacements) further as dynamic (accelerations) actions and has the power to perform chemist values, nonlinear static pushover and nonlinear dynamic analyses.

In this project there is an attempt to investigate the seismic effect on G+25 multi storied RC framed buildings. The Modeling of 26 storied RC framed building is done in ETABS 2015 software. Models of RC building with different loction of sheaṛ-wall are made. Then the results are compared.

The seismal zones thought of are Zone V whereas soil sort taken as Medium. In these structures, loading adore DL, LL and seismic or earthquake load is finished conferring to IS 875 half I, IS 875 part II, IS1893-2002, respectively. Analysis is meted out by Equivalent methodology and Response Spectrum Method. Results like deformation/Displacement, story drift and base shears, period of time are determined. once analysis, results are obtained within the style of graphs that are successively discovered to make conclusions.

ANALYTICAL MODELLING

Some information of the model

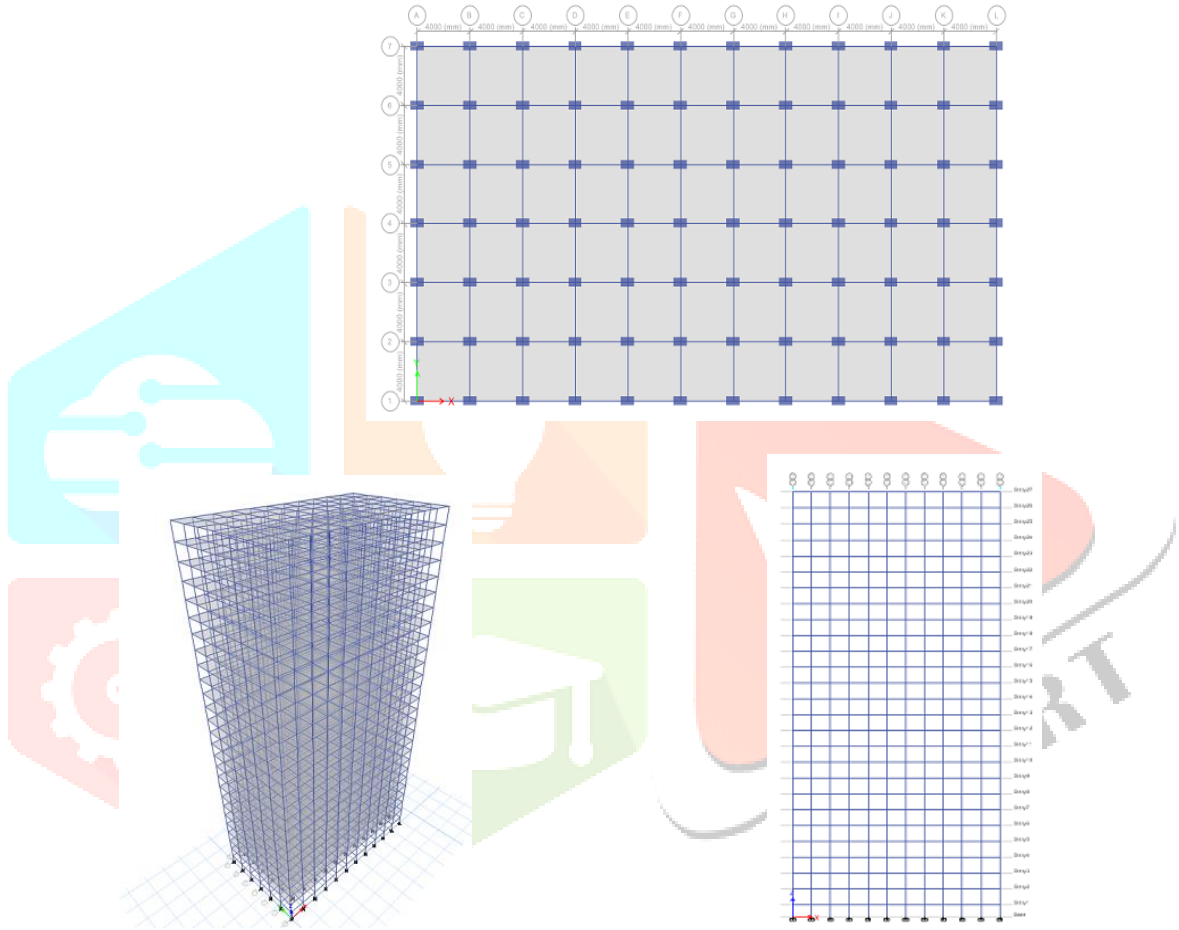
1. The present overview attempts to investigate the seismic effects on the delimited structure of RC multistoried.
2. The investigation of G+25 RC **outlined** structure is done utilizing Etabs programming.
3. Analysis was carried out by applying lateral load on different type of structures.
4. Analysis is carried out in Zone-V.
5. Medium soil was taken up for analyzing the structures.
6. After analyzing various models in the Etabs software, parameters such as soil displacement, basic shear, soil drift and time period are noted.
7. last the values got from output for various models are compared.

Models Description:

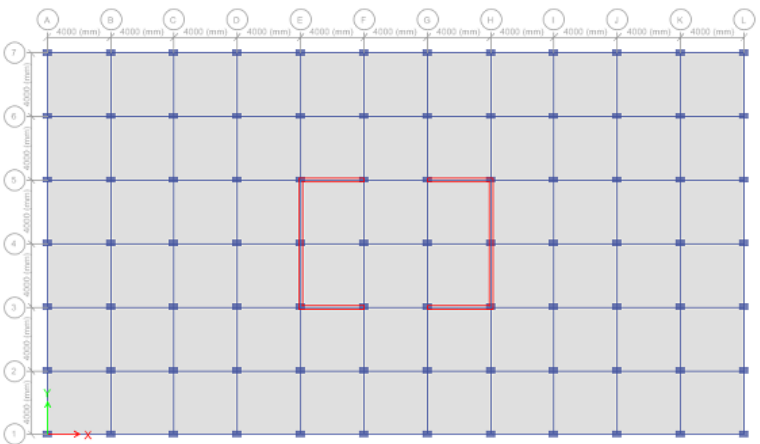
A Total of ten models were prepared for seismic analysis and Response spectrum analysis, and results were compared.

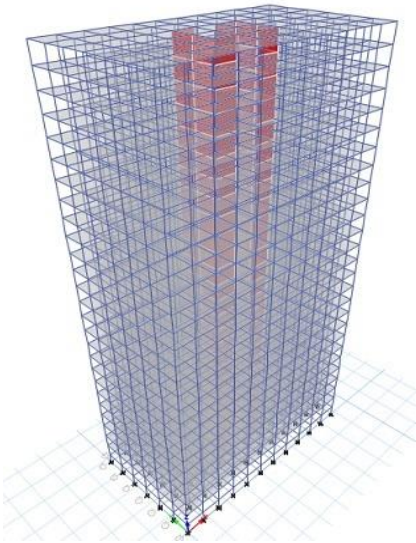
1. Model-1: Bare Frame model
2. Model-2: Model 1 with shear wall at position 1-1-1-1
3. Model-3: Model 1 with shear wall at position 2-2-2-2
4. Model-4: Model 1 with shear wall at position 3-3-3-3
5. Model-5: Model 1 with shear wall at position 4-4-4-4
6. Model-6: Model 1 with shear wall at position 5-5-5-5
7. Model-7: Model 1 with shear wall at position 6-6-6-6
8. Model-8: Model 1 with shear wall at position 7-7-7-7
9. Model-9: Model 1 with shear wall at position 8-8-8-8
10. Model-10: Model 1 with shear wall at position 9-9-9-9

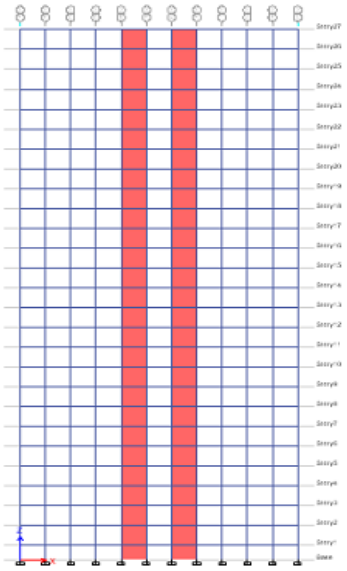
Model-1: Bare Frame model



Model-10: Model 1 with shear wall at position 9-9-9-9







Details of Structures:

Building type	Commercial Building
Frame type	Reinforced Concrete moment resisting frame
Total number of storey	G+25
Each storey Height	3.35m
Bottom storey Height	2.5m
Full height of building	89.60m
Plan of building	44mx22m
wall Thickness	230mm
LL	3.0 KN/sqm (As per IS-875-Part-II) 1.5 KN/sqm on Roof
FF	1.o KN/sqm
Concrete Grade	M30
Steel Grade	Fe-500N/mm^2
Unit weight of masonry	20-KN/cum
Column size	C1-0.6x1.0m C2-0.4x0.7m C3-0.4x0.6m
Beam size	0.3x0.45m
Thickness of slab	150mm
Shear wall thickness	230mm
Earth quake Zone	V
Soil	medium
Response Reduction Factor	5 (SMRF)
Importance factor	1.5
Damping ratio	5%

METHODS OF SEISMIC ANALYSIS

5.1 GENERAL

These days, the constructions are intended to oppose in a tremor as indicated by horizontal power plan. Seismic create waves which move from the beginning of its area with speeds relying upon the force and greatness of the tremor. The effect of seismic on the designs relies upon the firmness of the construction, solidness of the dirt media, stature and area of the construction, and so forth the quake powers are endorsed in IS 1893:2016 (part-I).

5.2 LINEAR STATIC ANALYSIS (Equivalent Static Method)

This procedure is initially a simple procedure, as it requires less computational effort and concentrates on the formulas according to the leaflet: First the design basic thrust for the entire given ceiling and then the resulting basic thrust is calculated. Distributed over the height of the building.

VI. RESULTS AND DISCUSSION

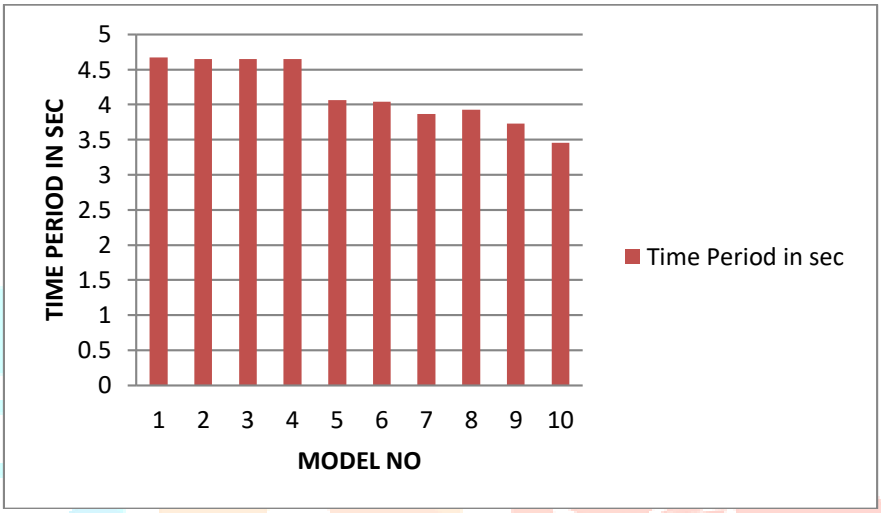
6.1 GENERAL

Seismic loads are applied to the analysis of the ten construction models. The analysis of all different construction models takes place with the software ETABs 2015. The results of the analysis are shown as displacements, ground displacements and period, basic thrust of all construction models and compared.

6.2 Time period: It's nothing however time needed for finishing one cycle of vibration to pass during a given point.

Table 6.2.1: below table gives time period for all models.

Model No	Time Period in Sec
1	**4.675**
2	**4.651**
3	**4.65**
4	**4.651**
5	**4.068**
6	**4.043**
7	**3.869**
8	**3.928**
9	**3.728**
10	**3.458**



VII OBSERVATION AND CONCLUSION

The present analysis study attempts that the, G+25 building which is situated in the earth quake zone 5 is analyzed and the level of performance of a RC building. The important component of the multistory building which affects the stiffness, mass, strength & deflection of structure are studied in this analytical model. For the investigation, the wall disk is located in several places in the eccentricity of the building. The drift of every model and the maximum deflections of every model at the different level are compared with the linear dynamic analysis. The following conclusions are drawn from the study.

1. The value of seismic response such as Time period for model 1 to model 10 gets decreases, Base shear for models increases, and Displacement for model decreases.
2. It is seen that due to equivalent static method the base shear from model-1 to mpdel-10 increases by 17.5% and 24.95% along X and Y direction respectively.
3. It is seen that due to response spectrum method the base shear for models 1 to model-10 increases by 17.515% and 24.87% along X and Y direction respectively.
4. It was noticed that the timeperiod from model 1 to model 10 decreases by 26.03%.
5. Due to equivalent static method, a building with shear wall having max. displacement 11.84% less in x direction & 29.53% less in y-direction compare to building not having shear wall.
6. Using the response spectrum method, a building with a bracing/shear wall is 19.83% less in the X direction and 48.36% less in the Y direction than a building without a bracing wall.
7. It's discovered that the floor drift values for all models in each directions are at intervals the permissible limit.
8. It is observed that the structural wall should be provided, throughout the height of building for best earth quake performance.
9. Provision of shear wall is most effective in multi storey building.
10. The strength and stiffness of building increases by providing shear wall.
11. By placing the SW towards centre of structure leads to lesser value of deflection compare to placing of shear wall at other location.
12. A building must have higher lateral stiffness. Due to this deformation in the building is minimum.
13. Hence we can say that a building with shear wall reduces maximum displacement.

7.1 SCOPE FOR FURTHER STUDY:

1. The current work was taken up for G+25 storeys. The study may be extended for higher stories.
2. The current work was taken up with earthquake load in zóne V, next investigation may be carried with wind load of separate speed intensity.
3. This project is carried out for the regular construction; More work can be done on uneven structures.
4. The current work is accomplished for linear analysis, the work may extend for non linear analysis.

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