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Importance of Shear Wall in the High Rise Building

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Abstract—*When we are talking about mega structure, then high rise building, huge concrete structure and other giant structure comes in our mind. Developments of high rise building in present time takes new elevation day by day, but also create huge challenge for the structure engineering in present time. In present-day high-rise buildings, a system of shear walls often resists lateral loads induced by wind or earthquake. The stability of the structure becomes more important as the building rises in height. So importance of shear wall for high rise building becomes most significant. Stiffness is the property of the structure which absorbs the external forces. In the high-rise building the shear wall avoids absolutely collapse under seismic forces. Shear wall construction to protect the building usually experiences large-intensity or high-wind and earthquake. Shear walls are normally made of reinforced concrete, plywood (timber), unreinforced masonry. Generally, concrete used for construction of shear wall. Normally, shear walls include in stairwells between columns, lift well, toilets, utility shafts etc. Shear wall are designed structural walls integrated in building to resist lateral forces encouraged by wind, earthquake, and other forces in the wall plane. The primary aim of this paper is to review about 12 storey high-rise building with and without shear wall, located in seismic zone III. The importance of earthquake resistance structure style is that heightened earthquake instances resulting in severe loss of life and property. It is intended to define characteristics of the performance such as lateral displacement, base shear etc. Analysis of the response spectrum is performed on all mathematical 3D models using the ETABS software, and compares the results between With building of shear wall and without building of shear wall.*

Keywords: *High rise building, shear wall, earthquake, seismic, structure etc.*

Introduction

The shear wall is wall that is functionally built can carry on the load that works laterally (shear) in a building structure but also help support the building elements around it, such as pillars, girders ,beams, columns etc. that is connected to those elements. aShear walls take lateral loads, which are imposed on them by the building itself, and the lateral loads encountered when and when the wind hits the structure. rShear wall, a rigid vertical diaphragm capable of transmitting lateral forces from external walls, floors and roofs to the base of the ground in a parallel direction to their planes. Shear wall area unit generated lateral lopad results that function on a structure to region. In residential building, shear wall area units' straight external walls correcting normally a box that provides all and is properly built, Shear wall has become a very important part of middle and high-rise residential buildings over the past 20 years. As the art of building resistance to earthquake, these walls area unit position in buildings plans to minimize lateral displacement under hundreds of earthquakes. Shear wall frame structure unit area thus obtained.

Shear wall structure has very little resistance except to moderate lateral load as compared to slab with beams. Initially shear wall was used to reduce wind load in reinforced concrete structures. However, as recent studies have clearly confirmed the excellent performance of building with shear wall even under seismic forces, these walls are now commonly used for all earth quake resistant designs. Building survey after earthquake has continually shown that the loss of human life in buildings with any kind of reinforcement concrete shear wall due to a complete collapse was negligible. However, the most important feature of shear wall for seismic wind design is that under reversible and frequent overloads it should have decent ductility.

1. Literature Review

Prof. P. A. Nikamet .al (2018)-It is observed from all the above study that building with shear wall along a short middle span (model 2) in a 14-story building is effective in seismic resistance compared to building without shear wall. Joint displacement & joint drift of the structure is also observed to be minimized by providing shear wall.

Raju K JET. al (2017)- In this analysis, the contrast between the hollow core shear wall, the peripheral shear wall and the structural structure of the RC shear wall was considered and evaluated for different parameters for dynamic loading. RC shear wall model analyzed for the dynamic analysis, works well in contrast. Inside core shear wall performs well for the displacement parameter along Y direction, and performs well along X direction, Peripheral shear wall. In view of the Story Drift parameter, the values of the inner core shear wall are higher than the peripheral shear wall. The overturning moment for the RC shear wall is higher while the moment is lower for

the peripheral shear wall. The RC shear wall values for the Story shear parameter are lower, while the RC shear wall values for the inner core shear wall dominate the values in Y direction, and the peripheral shear wall in X direction do the same for the RC shear wall. Eventually, it can be summed up that the differences in values are due to the type of structure and stiffness of the same, RC shear wall system performs well in all the stru8ctural parameters considered, since the entire structure is composed of RC wall where the stiffness, strength and load bearing capacity is homogeneous across the structure. Whereas the stiffness, strength and load-bearing ability for peripheral shear wall and inner core shear wall is heterogeneous, that is to say, they have excellent stiffness, strength, and load-bearing ability in some parts and some parts do not. It is clear, therefore, by analyzing the variations in the values. RC shear wall is also recommended and performs better as paralleled to peripheral shear wall and inner core shear wall, and is the best for use in suspected high tremor areas.

M.Pavaniet.al(2015) -Building store drift is beyond the scope of clause IS-1893 no 7.11.1 (Part-1):2002. Storey Stiffness of building is within the scope of clause IS-1893 no 4.20 (Part-1):2002. Within this paper the damage that can occur due to the forces of wind and earthquake can be managed at all possible deflection positions due to the presence of the shear wall.

Mahdi Husseinet.al(2015) - For this paper, buildings with reinforced concrete shear walls were examined with the procedures set out in IS codes. The paper aimed at investigating the seismic behavior of building through shear walls at the center of the paper and center of the exterior limit with gaps on either side. A flexible framework can impact the overall structural stability by reducing the effective lateral rigidity. So the role of the soil structure should be taken into consideration in further analysis. During earthquakes the structure of the shear wall has been shown to work well, for which ductility is an important factor. Therefore, further analysis should be carried out taking into account the geometric and non-linear material behavior of the participants concerned.

2. Objectives

1. To study various structural structures and their conduct under lateral loading.
2. To obtain various Structural Parameters of various Structural Systems, and to obtain the tables and graphs.
3. High-rise structure analysis for lateral loads is performed using the Response Spectrum Method.
4. To research the shear base, storey displacement, storey drifts, acceleration storage and time period in both shear wall and without shear wall.

3. Methodology

3.1. Model Description:

1. The detailed analysis of the processes followed for the modeling of the buildings needed for the present research is indicated.
2. 3D models of two different forms of structural systems are being modeled in the present research in seismic zone III and compare the performance with shear wall and without shear wall structures subjected to Earthquake structural forces.
3. Form of building support is a fixed assist.
4. All versions have dimensions of the same structural plan.
5. The concrete grade for the shear wall, pillars, columns and slabs considered for M30
6. The planned structure for this plan is a 12-floor high-rise building which is used for residential construction.
7. The building is designed using RC shear wall, inner center and without shear wall.

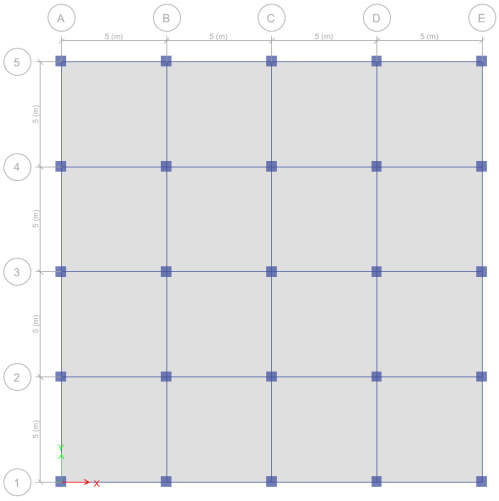
3.2. Structural Data of the Building:

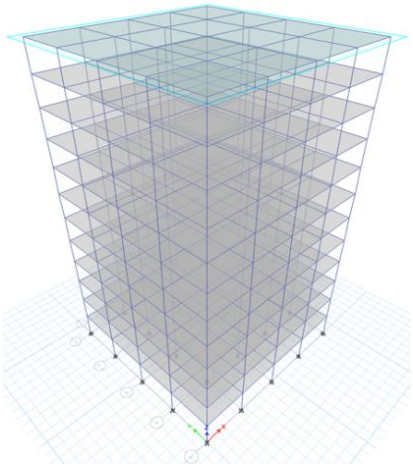
Model description

S. No.	Structural Part	Dimension
1.	Location	Lucknow
2.	No of storey	(G+11)
3.	Bays	5 x 5
4.	Floor height	3m
5.	Thickness of shear wall	150mm
6.	Thickness of slab	200mm
7.	Grade of beam ,column ,wall and slab	M30
8.	Opening	2m×2m
9.	Column	500mm*500mm
10.	Beam	400mm*4000mm
11.	Live load	2kN/m2
12.	Floor finish	Typical floor 1KN/m2 , Top floor 3KN/m2
12.	Seismic zone	III
13.	Zone factor (Z)	0.16 (Table 3, clause 6.4.2)
14.	Type of soil	Medium
15	Important Factor(I)	1 (Table 8, clause 7.2.3)

3.3. Models:

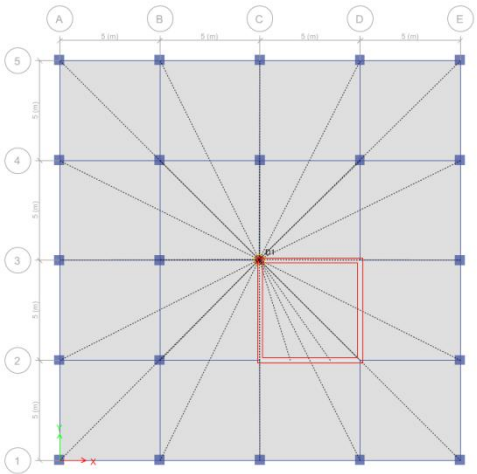
(a) Building without shear wall

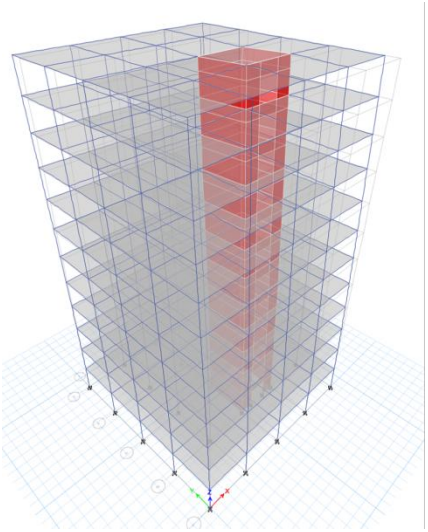




Grid view 3D view

(B) Building with shear wall





4. Conclusion

In India, seismic analysis of buildings still requires adequate attention given the fact that buildings collapse is the single most significant factor contributing maximum damage to a casualty in past earthquake. In India, seismic analysis of buildings still requires adequate attention given the fact that buildings collapse is the single most significant factor contributing maximum damage to a casualty in past earthquake.

In study we can compare the shear wall and without shear wall building, then analysis the better result which one more efficient.

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