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Analysis and Design of shear wall

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Abstract

Earthquake is caused when. The tectonic plates are always When, an earthquake is caused. Although the tectonic plates are constantly moving slowly, friction causes them to become impermeable at their borders. An earthquake occurs when the stress on the edge exceeds the friction, releasing energy in waves that flow through the earth's crust and produce the shaking we experience. Earthquakes force the ground to move in any direction. The horizontal vibration is more harmful and predominate. Any structure's motion amplitude typically increases over time in a few cycles. In other words, the structure will deflect more and sustain greater damage if the earthquake lasts longer.

The Indian Code of Practice for Seismic Resistant has been taken into consideration when designing and building these structures. High rise buildings have a variety of lateral restraint systems installed for seismic performance, including bracing, shear walls, core walls, etc.

It has been investigated how different joints, flooring, and drifts deflect. for this reason. The performance of high rise buildings with design shear walls in various seismic zone IV positions has been tested in the current study. To compare the outcomes, static and dynamic analysis are both used. using ETAB v 2019 Software.

Keywords: Shear walls, ETAB v 2019 Software, Locations, Muti-storey

1.INTRODUCTION

The nonlinear response of reinforced concrete walls that are flexible is proposed to be modelled analytically in a more straightforward manner utilising common structural analysis software. The ETAB programme is used to bring the suggested method for analysing nonlinear response history to evaluate structural response into practise. The model can be used to carry out realistic nonlinear static or nonlinear dynamic procedures. The walls are modelled using a thin mesh of linear-response shell elements and uniaxial line elements. It is feasible to use the normal nonlinear response parameters provided by line elements when employing them. To withstand the effects of earthquakes, shear walls are widely used in high-rise buildings. Because of the significant displacement, vibration, and pressures caused by earthquake forces, buildings are hazardous and uncomfortable for occupants. The shear walls made of reinforced concrete are very rigid in their own plane. To comprehend the effects of the site, shear wall frame buildings with varied numbers of stories are taken into consideration. When a structure has a shear wall, the foundation receives lateral stresses from the diaphragm and passes them to the seismic force.

Shear walled frame buildings were chosen for the study because they are a reliable way to strengthen the structure. The forces operating on these walls are largely shear forces, though a thin wall will also experience significant bending. Ground motion of the structure produces inertial forces that cause the floor diaphragms to move. This movement is stopped by the shear walls, and the forces are returned to the foundation.

If the building were to rotate, it would spread out horizontally.

1.1 General

The analytical methods for RC high-height structures have specialised needs that are different from those for low-to-mid rise buildings, especially for the typical structural system that consists of slender components in frames and more RC stocky structural walls. The nuances of concrete features, wall-frame interaction, and three-dimensional effects must be taken into account in structural modelling. Shear walls are structural walls designed to withstand lateral strains produced in the wall's plane by wind, earthquakes, and other forces. They are incorporated into buildings. They are used in tall buildings to prevent structural collapse brought on by seismic forces. Concrete or masonry are commonly used to build shear walls.

1.2 Objectives

1. To with and without SSI construction, the seismic analysis of the structure is carried outusing static and dynamic methods.

2. To find all the ground motions along X Y and Z direction in shear wall.
3. To find the drift and horizontal deflection in shear wall.
4. To find the location of shear wall and brace member.
5. To find the total weight of existing structure and steel bracing as an alternative source for strengthening or retrofitting procedures.
6. To analyse the reliability and relevance of displacement-based, forced-based and plastic character components for the non-liner static finite element or RC structure.
7. To analyse the behavior of self-compacting concrete structure.
8. To study and analyse story drift, shear, and displacement and base shear of structure.
9. To design the shear wall for residential building.

1.3 Advantages

1.Etabs enables user input and alteration of graphics for the purpose of creating models for any sort of structure quickly

2.The creation of 3D models is simple when plan views and elevations are used. This is true for any form of complicated construction and easily.

3.Using the snap command, which includes end, perpendicular, and centre options, draw an object as accurately as possible.

4. Simple window switching between several views with this functions, you can simply design or change your model while viewing it in real time.

1.4 Necessity

Buildings typically have two basic styles of construction: framed construction and load-bearing wall construction. In a building with load-bearing walls, vertical walls are built continuously to support floor slabs at various levels. In a building with load-bearing walls, vertical walls are built continuously to support floor slabs at various levels.

1.5. Types of shear wall

1. Simple rectangular types and flanged walls
2. Coupled shear walls
3. Rigid frame shear wall
4. Framed walls with infilled frames
5. Column supported shear wall

2. Literature

1. Mr. Archin A Shah , Ms. Megha Thomas , Dr. V. R. Patel Volume 4, Issue 5, May -2017: This paper worked on Wall-type precast reinforced concrete (WPC) residential buildings, which are assembled using prefabricated concrete panels for the slabs and walls, were widely constructed during the 1960-70s in Japan.

2. Viraj Baile Dr. A.A. Bage Vol. 7, Issue 7, (Part -2) July 2017: This paper deals with the statistical quantification of peak floor acceleration(PFA) demands and peak component acceleration (PCA) demands for acceleration sensitive nonstructural components attached to or suspended from shear-wall structures with fundamental periods from 0.15 to 1.5s.

3. Satpute S G ,D B Kulkarni Vol. 2, No. 3, August 2013: This paper presents detailed analyses of experimental results pertaining to the cyclic behavior of a reduced-scale reinforced masonry (RM) asymmetric building with walls aligned in two orthogonal directions.

4. Shahzad Jamil Sardar Umesh. N. Karadi Vol. 2, Issue 9, September 2013: This paper mainly focused on Multi-storeyed structures is gaining wide popularity now days. Generally any structure which has height more than 35 metres is considered as a high rise structure.

5.M R Suresh, Ananth Shayana Yadav Volume 04 Issue-06, June-2015: In this study, a two-story reinforced concrete block scaled building was tested to failure under fully reversed displacement-controlled loading.

6. Mingke Deng and Xingwen Liang October 12-17, 2008: This paper analysis that Shear wall are one of the excellent means of providing earthquake resistance to multi-storey reinforced concrete building. They are usually provided in tall buildings and have been found to be immense use to avoid total collapse of building under seismic forces

7. G.S Hiremath, Md Saddam Hussain Volume 3 Issue 10, October 2014: This paper focuses on Shear wall systems are one of the most commonly used lateral load resisting systems in high-rise buildings. Shear walls have very high in plane stiffness and strength, which can be used to simultaneously resist large horizontal loads and support gravity loads, making them quite advantageous in many structural engineering applications.

8. Prutha Vyas Volume 3, Issue 4, 2016: This paper investigated that Shear walls are normally preferred in RC

buildings and other important structures to resist the lateral forces due to earthquakes, wind storms, or impact loads

9. P. P. Chandurkar, Dr. P. S. Pajgade Vol. 3, Issue. 3, May - June 2013 :This paper discusses the design and experimental evaluation of a novel seismic resistant reinforced concrete (RC) coupled shear wall system. In this system, the widely-used un bonded post-tensioned floor slab construction method is adapted to couple two RC wall piers, providing significant performance and construction benefits over conventional RC coupling beams in high seismic regions

10. Yasushi Sanaada, Toshimi kabeyasawa and Yoshiaki nakano August 1-6, 2004: The main objective of this paper is that The reinforced concrete shear wall is one of the most commonly used lateral load resisting in high rise building. The reinforced concrete shear wall building is high in plane stiffness and strength which can be used to simultaneously resist large horizontal load and support gravity load.

11. Shahabodin Zaregarezi Oct 12-17 2008: The main objective of the seismic design of buildings, reinforced concrete structural walls, or shear walls, act as major earthquake resisting members.

12. Dr. Suresh Borra, P.M. B.Raj Kiran Nanduri, Sk. Naga Raju3 (AJER) e-ISSN : 2320-0847 p-ISSN : 2320-0936 Volume-4: This paper analyses that Concrete shear walls or structural walls are often used in multistory buildings to resist lateral loads such as wind, seismic and blast loads.

2.1. Review

In the above papers we studied that the most reinforced concrete (RC) multistore buildings, shear wall are provided to resist lateral load arising from wind and earthquakes of moderate to high magnitude and they designed that seismic effectiveness of high-rise buildings different system of lateral restraints are provided and we studied that the deflection of various joints stores and also the drifts.

The deflection analysis carried out to compare the relative effectiveness of shear wall and core wall at different locations of the multistory building. These papers concluded the influence of slope topography soil stratigraphy and the dynamic interaction between nearby shear wall buildings in typical commercial projects.

3. Methodology

The characteristics of the ground motion, the surrounding soil, and the structure itself all affect how the structure reacts during an earthquake. When compared to a similar structure supported on very stiff soil or rock, a structure supported on soft soil may exhibit very different dynamic responses in terms of amplitude and frequency. Shear wall designed to be earthquake-resistant in accordance with IS 13920:1993

3.1 Design Consideration

Any location on the earth's surface with a large fault can experience earthquakes, both on land and in the water. When an earthquake strikes on land, the surrounding man-made structures are impacted, which causes human casualties. When a large earthquake happens beneath the ocean or sea, it not only damages the nearby structures but also generates massive tidal waves known as tsunamis, which have an impact on locations far from the earthquake's origin. To ensure that sufficient vertical and lateral strength and stiffness are achieved to satisfy the structural concert and permissible deformation levels outlined in the governing building code, all structures are designed for the combined impact of gravity loads and seismic loads.

In this case, the structure might be harmed. Earthquake-Relating Factors Structure design, the building's natural frequency, and the structure's damping factor

- The building's foundation type
- Relevance of the structure
- The building's ductility

3.2. Required Indian Standard Codes, Section 3.

- Clause 32.4 of IS456:2000's design for walls provides specifics on how shear walls must be built in relation to horizontal shear.
- The estimate of earth quake loads and the IS1893-2016(Part-1) Criteria of Earthquake Resistant Buildings Part.
- IS13920:2016 It provides the ductile details of a shear wall in accordance with clause 9, which is divided into the following clauses: 9.1 General Requirements, 9.2 Shear Strength Requirement, 9.3 Flexural Strength Requirement, and 9.4 Boundary Elements.

4. CONCLUSIONS

From above we will having following conclusions:

1. We will finding the ground motions along x, y and z direction of shear wall.
2. We will finding drift and horizontal deflection in shear wall.

3. We will finding the location of shear wall.
4. We will studing and analysis story drift, shear and displacement as well as base shear of structure of structure.
5. We will design the shear wall for residential building.

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