IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

A COMPARATIVE ANALYSIS PERFORMS WITH 10 STOREY STRUCTURE CONSIDER IRREGULARITIES WITH OR WITHOUT FLOATING COLUMNS WITH ETABS

Dinesh Kumar Mahala[1], Mahendra Saini[2]
M. Tech Scholar[1], Assistant Professor[2], Regional Engineering College, Jaipur (Rajasthan)
Rajasthan Technical University (Kota)

ABSTRACT: A significant portion of the existing building stock consists of irregular reinforced concrete RC structures. One sort of anomaly that frequently improves seismic resistance is discrete geometry of vertical parts. The seismic design standards' design requirements really only apply to public buildings, and even if other seismic design standards criteria are met, safety is still in doubt. In this study, the seismic failure capacity, resistance to collapse during earthquake peaks, and failure processes of reinforced concrete buildings with discontinuous columns designed in accordance with recent seismic standards are evaluated. The effectiveness of the seismic design requirements and its constraints are assessed for the building. In this research work prepares 10 storey models with various irregularities. With the help of ETABS M30 grade of concrete and HYSD 550 grade of steel used as material for modelling work. There are total 4 cases one is 10 floors building with bare frame, second is 10 Floor building with floating column on odd floor at corner, third is 10 floors building with floating column near outer corners on odd floor and last final model is 10 floors building with floating column corridor on odd alternate floor. To compare the story drift and nodal displacement for all models with and without floating columns collect their data and compare their graphs. A comparative analysis concluded that maximum value of displacement occurs in multi-storey building with floating column corridor on odd alternate floor and minimum value of displacement in Multistorey building with bare frame. Maximum value of displacement occurs in multi-storey building with floating column corridor on odd alternate floor and minimum value of displacement in multi-storey building with bare frame.

Keywords: Floating Column, Irregularities, Load combination, Response Spectrum, Seismic Analysis etc.

1. INTRODUCTION

Modern buildings, especially mixed-use buildings, are increasingly complex. Since each floor has a different purpose, it is difficult to follow the structural grid as the columns of each floor get in the way. Lower decks require pillar-free space to facilitate vehicle movement, even if giant cantilevers are used to gain more FSI. The use of thinness However, on the upper floors where there are more columns; the columns are designed based on the layout of the room. It is also widely used in buildings where houses are located on the upper floors and shops on the lowest floors. The floating columns above the structural beam elements are also called hanging columns or short columns, unlike normal columns.

1.1 Reinforced Concrete in Buildings

Reinforced concrete reinforcing bars is made by combining reinforcing bars with ordinary cement concrete. This combination simultaneously uses the tensile strength of steel and the compressive strength of concrete to withstand different types of loads. The word rebar is used because the steel reinforces the concrete and gives it additional reinforcement. Reinforced concrete offers creative and aesthetic design possibilities because it can be shaped and sculpted in ways that other materials cannot. Reinforced concrete is a widely used building material due to its high strength, ease of use, adaptability, adaptability, durability, and affordability. From building foundations to roofs, it is often used to construct prefabricated buildings, floating structures, hydroelectric tunnels, irrigation canals, sewers, and many other types of structures imaginable.

1.2 Floating Columns

A form of a column called a floating column is built on inter-floor beams or slabs of the structure. There are no bases or bases to support these columns. Another name for floating columns is suspended columns. Floating columns have a completely different load transfer method than conventional columns. Regular columns distribute the weight from the column to the foundation and then to the surrounding subsoil. However, floating columns do not transfer loads to the foundation in this way. Instead, they act as point loads by transferring the load to the beam or slab on which they are built. Construction of multi-story residential, commercial, or industrial buildings is now a common practice. These multi-story structures require parking or lots of empty spaces above the ground. Some high-rise columns create problems for multi-story residential buildings to account for the number of parking spaces and turning radius. In this situation, these columns are created as floating columns. There may be a demand for meeting and banquet rooms on the lower floors of your business structure. For this purpose, we want to have a bright and open area instead of queuing in between. In this situation, a floating column enters the scene. It is possible to change the plan of the upper floor with floating columns.

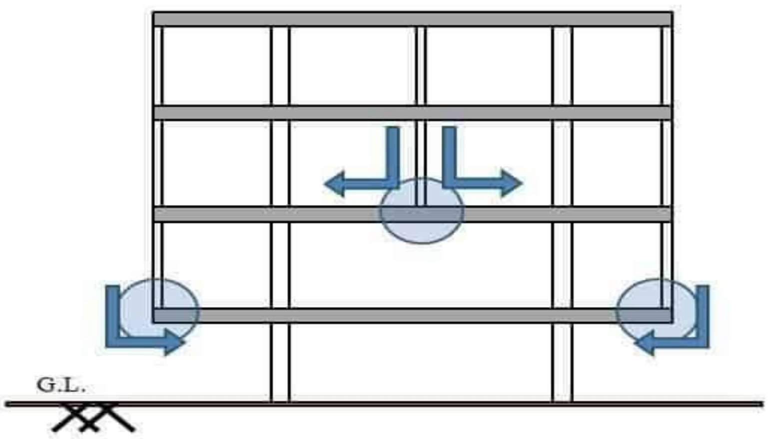


Figure 1 Floating Columns

Different Types of Irregularities in Building

1. Plan Irregularity

- Re-Entrant Corners
- Floor Slabs Having Excessive Cut-Outs Or Openings
- Out-of-plane offsets in vertical elements
- Non-Parallel lateral force system

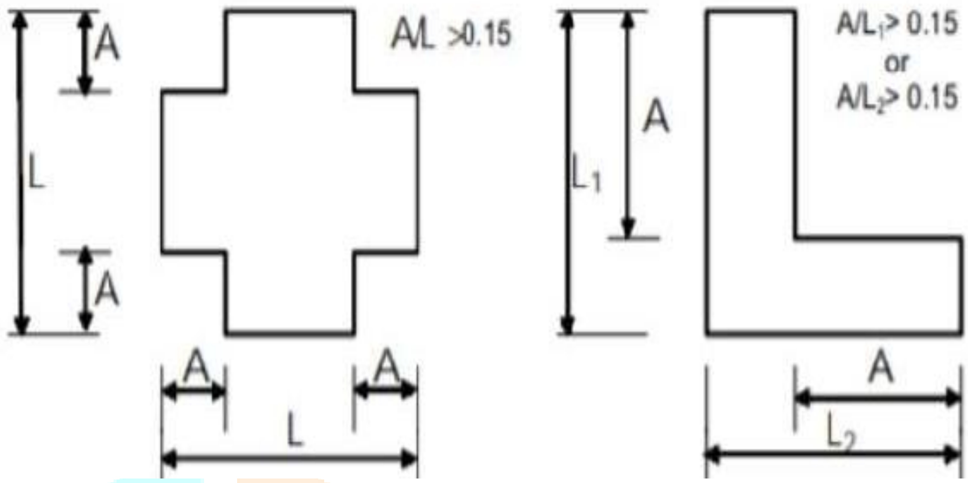


Fig. 2 Plan irregularity

2. Vertical Irregularity

- Stiffness Irregularity:
- Mass Irregularity
- Vertical Geometry Irregularity
- In-Plane Discontinuity
- In Vertical Elements Resisting Lateral Forces
- Strength Irregularity
- Floating or Stub Columns

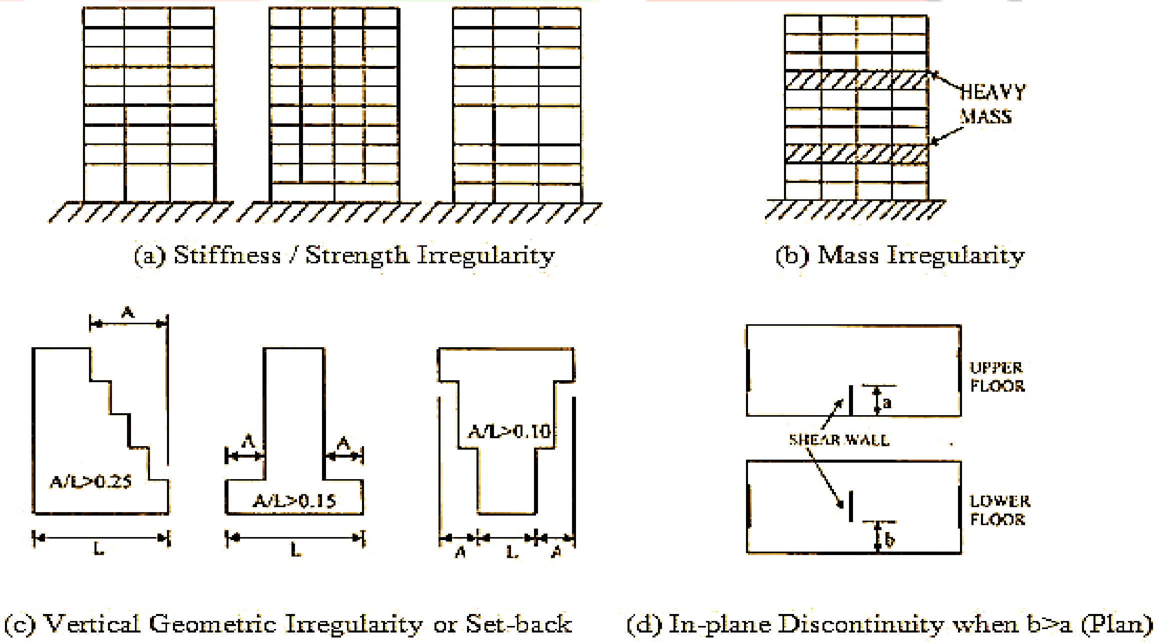


Figure 3 Different types of Vertical Irregularity

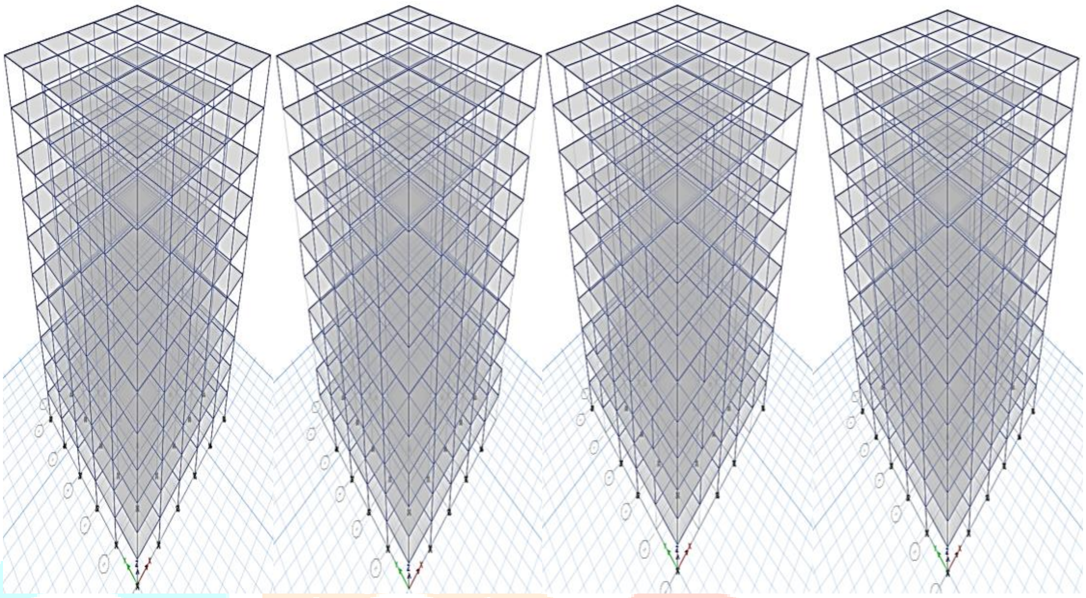
2. OBJECTIVES

- To research how floating column constructions behave.
- To compare the Story drift and Nodal displacement for all models with and without floating columns.

3. METHODOLOGY

In this section, we study a 10-story building model with a bare frame, a floating column on the floor at the corner, a floating column near the outer corners on an odd floor, and a floating column corridor on an odd alternate floor using Etabs 2016 software.

Model Geometry



cases 1 **cases 2** **cases 3** **cases 4**

Fig.4. 3D view of 10 floor building in different cases

4. RESULTS AND MODELLING

In this section we make 10 storey building models with 4 different cases like Floor building with bare frame, 10 Floor building with floating column on odd floor at corner, Floor building with floating column near outer corners on odd floor, and Floor building with floating column corridor on odd alternate floor. And variable results of joint displacement, storey drift, shear force, stiffness and base reaction with various load combinations.

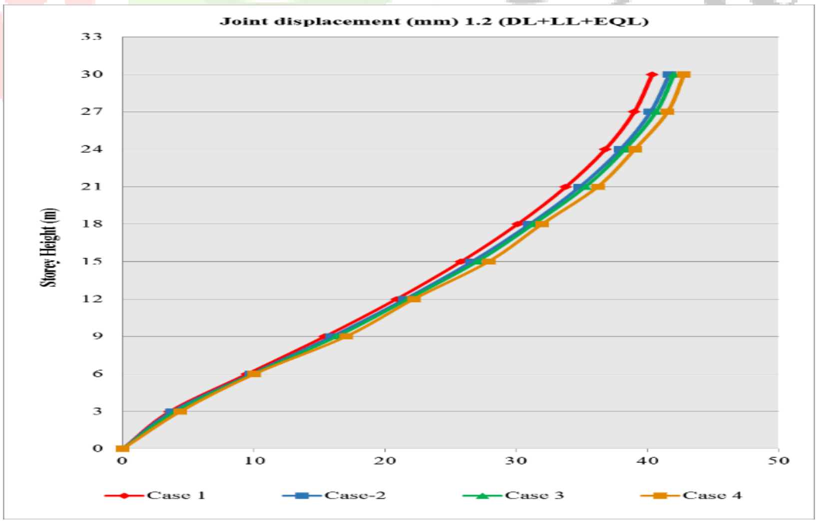


Figure 5 Joint displacement on different cases due to load combination 1.2 (DL+LL+EQL)

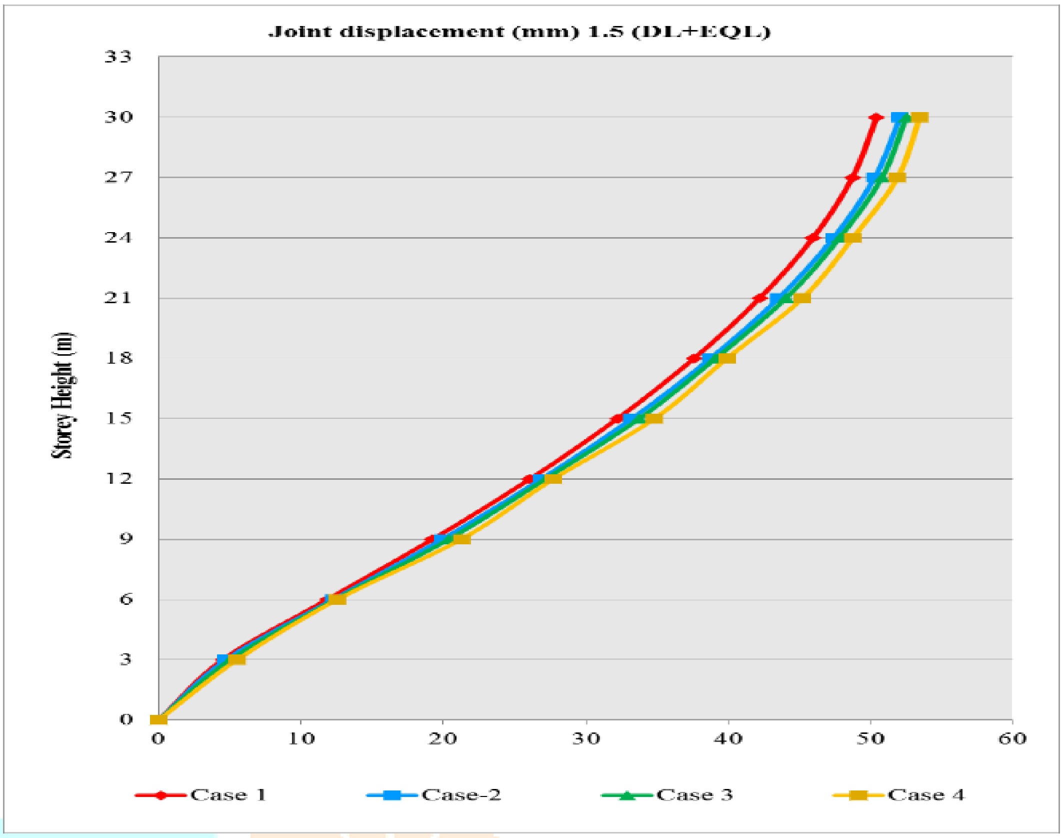


Figure .6 Joint displacement on different cases due to load combination 1.5 (DL+EQL)

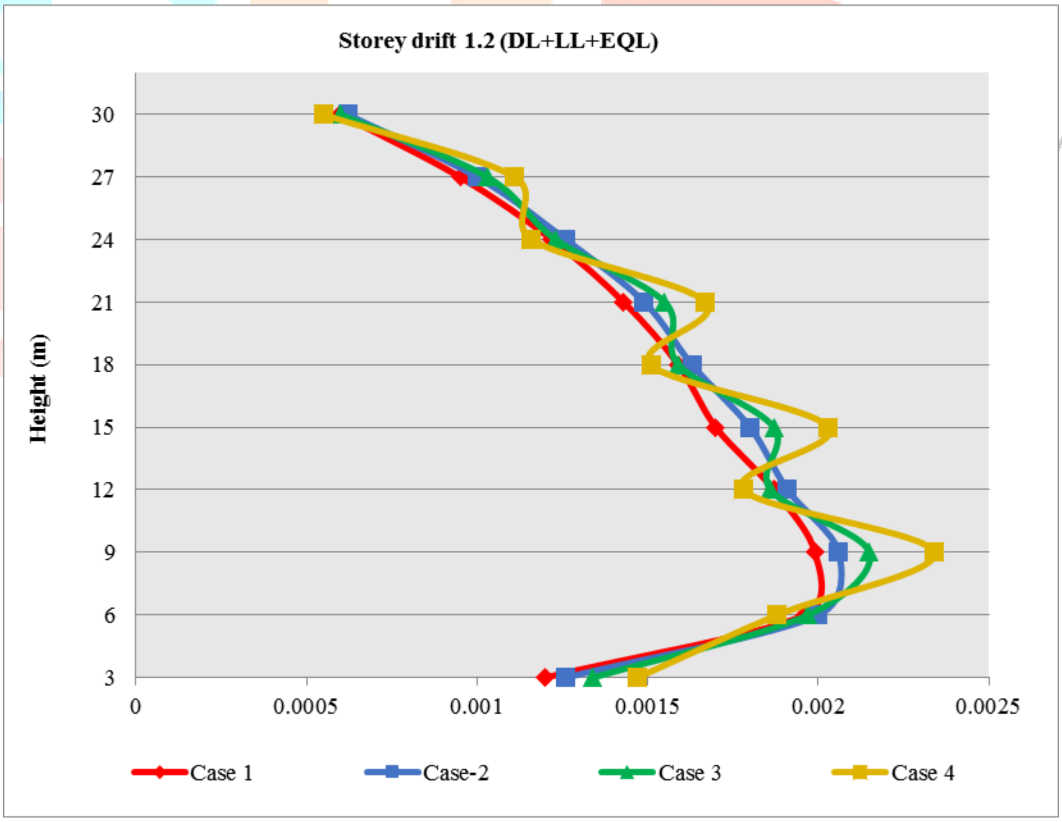


Figure .7 Storey drift on different cases due to load combination 1.2 (DL+LL+EQL)

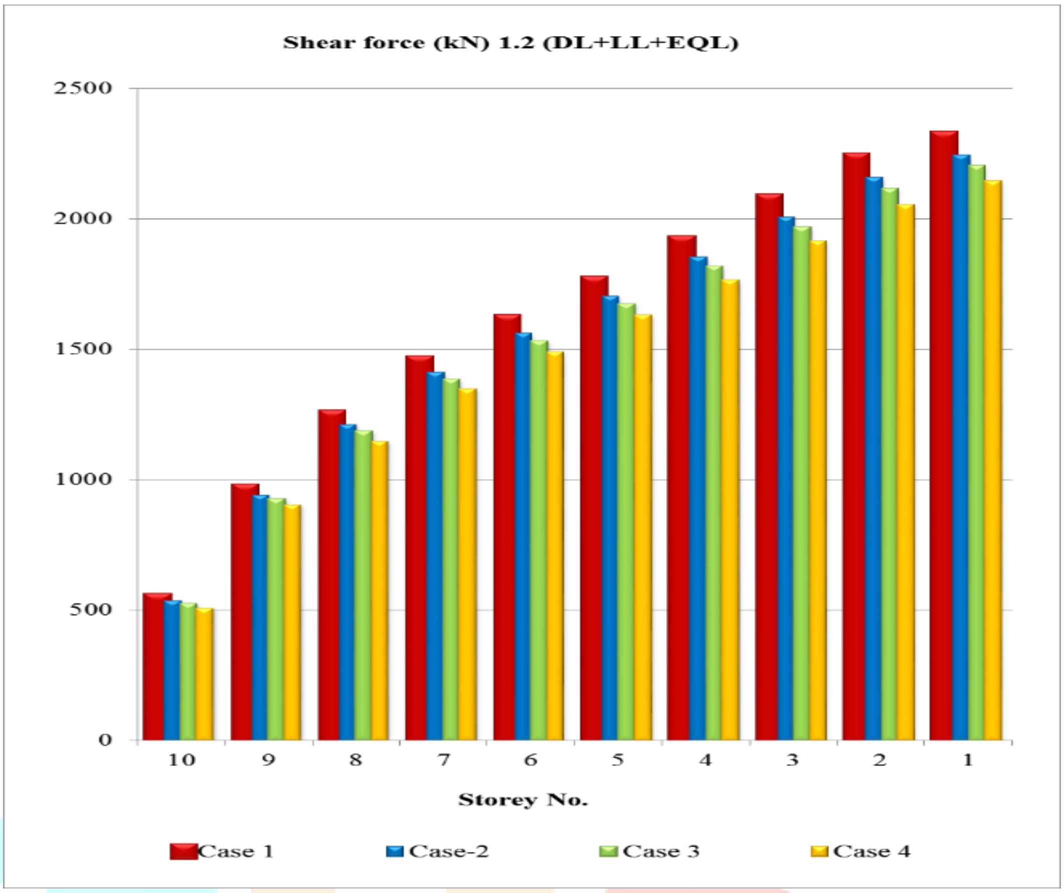


Figure 8 Shear force on different cases due to load combination 1.2 (DL+LL+EQL)

5. CONCLUSION

Maximum value of joint displacement occurs on top floor due to load combination 1.2 (DL+LL+EQL) and on base joint displacement due to fixed support value of joint displacement is zero. A comparative analysis concluded that maximum value of displacement occurs in Multistory building with floating column corridor on odd alternate floor (case-4) and minimum value of displacement in Multistory building with bare frame (case-1).

Maximum value of joint displacement occurs on top floor due to load combination 1.5 (DL+EQL) and on base joint displacement due to fixed support value of joint displacement is zero. A comparative analysis concluded that maximum value of displacement occurs in Multistory building with floating column corridor on odd alternate floor (case-4) and minimum value of displacement in Multistory building with bare frame (case-1).

This is also noticed that due to load combination 1.2 (DL+LL+EQL) maximum value of joint displacement is 42.80mm and maximum value occurs due to load combination 1.5 (DL+ EQL) is 53.50mm.

Maximum value of storey drift occurs on 3rd floor due to load combination 1.2 (DL+LL+EQL) and minimum value at top floor. A comparative analysis concluded that maximum value of Storey drift occurs in Multistory building with floating column corridor on odd alternate floor (case-4) and minimum value of storey drift in Multistory building with bare frame (case-1). This is also noticed that due to load combination 1.2 (DL+LL+EQL) maximum value of storey drift is 0.00234.

Maximum value of shear force occurs on 1st floor due to load combination 1.2 (DL+LL+EQL) and minimum value at top floor. A comparative analysis concluded that maximum value of shear force in Multistory building with bare frame (case-1).minimum value of shear force occurs in Multistory building with floating column corridor on odd alternate floor (case-4). This is also noticed that due to load combination 1.2 (DL+LL+EQL) maximum value of shear force is 2324.69kN.

FURTHER FUTURE SCOPE

- In a different investigation, various damper types can be used to analyses the same model structures.
- The performances of various base isolators can be compared using floating column architectures.
- Pushover analysis can also be done for isolated floating column and base structures.

REFERENCES

1. Shashikant, Salunke Abhijeet, and K. S. Upase. "Annalysis of Dynamic and Wind Response of Tall Building with Vertical Irregularity." (2022)
2. Andra, Pavan Sai Kumar, and K. Rambabu. "Performance of Symmetric and Un-symmetric R.C Framed Buildings Subjected To Surface Explosion." (2021).
3. Gaikwad, Hemant S., et al. "Dynamic behaviour of various structural systems for tall buildings subjected to wind load." (2020).
4. Rizwan, Mohammed Zahid, and S. M. Hashmi. "Effect of Bracing on Regular and Irregular RCC (G+ 10) Frame Structure with Different Types of Bracings under Dynamic Loading." (2020)
5. Kanthama, Yelisetti, and Mr M. Venkata Narasaiah. "Analasis of a Shear Wall of a Building by Linear and Nonlinear Analasis by Using E-Tabs." (2020).
6. Jeelani, M. "Seismic Analysis and Design of Regular and Irregular Framed Commercial Buildings." (2019).
7. Achari, Balachandra G., and Ravi Kiran. "Comparative Study on Vertical Irregular Composite Structure with RCC Structure." (2018).
8. Subash, Lakshmi, and Sruthi K. Chandran. "Influence of P-Delta Effect on reinforced concrete buildings with vertical irregularity-A review." Internation Research Journal Engineering and Technology 4.2 (2017): 709-713.
9. Manasa, B. R., and M. R. Suresh. "Study On Dynamic Behaviour Of High Riser Dual System With In-Plane Discontinuity In Vertical Elements Resisting Lateral Loads." (2017).
10. Darshale, S. D., and N. L. Shelke. "Seismic response control of vertically irregular RCC Structure using base isolation." Int. J. Eng. Res 5.2 (2016): 683-9.