# Seismic Analysis of RCC Building with Vertical Irregularities: A Review

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***Abstract*** **- In last some years, it has been observed that, the high rise buildings are failed due to the various seismic and vertical failures in geometry. Hence, we need more investigation on the structures with vertical irregularities under seismic or wind load. The effect of lateral load on structure with vertical irregularities should be examined to reduce failure of structure. This study summarizes the studies done on the seismic analysis of RCC building structure with different vertical irregularities. From the study, it has been concluded that the structure with vertical irregularity failed under seismic loading and need to find specific code or special design for such structures.**

***Index Terms*** **- Irregularity, Mass Irregularity, R.C.C Structure, Seismic analysis, Vertical Irregularity.**

## I.INTRODUCTION

In last some years, it has been observed that, the high-rise buildings are failed due to the various seismic and vertical failures in geometry. Due to unavailability of land for the construction, the high-rise buildings are the only option. In the high raised buildings or Skyscrapers, it has been seen that the structure collapse rate of such types of building had increased up to 50%. For the failure of such structures, vertical irregularity was the main reason. In failure of many structures with vertical irregularity, seismic irregularity plays a vital role. There are different types of vertical irregularities given below-

1. Stiffness Irregularity (soft story)
2. Mass Irregularity
3. Vertical Geometric Irregularity
4. In Plane Discontinuity in vertical elements resisting lateral force
5. Strength Irregularity (weak story)
6. Floating or Stub column
7. Irregular modes of oscillation in two principal plan section

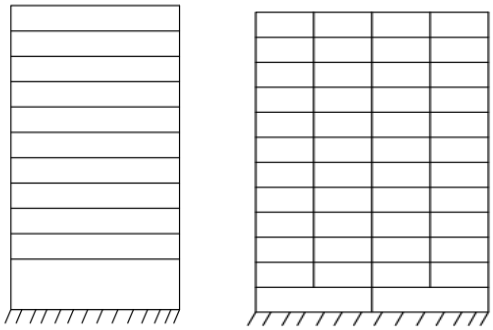

Fig.(a): Stiffness Irregularity

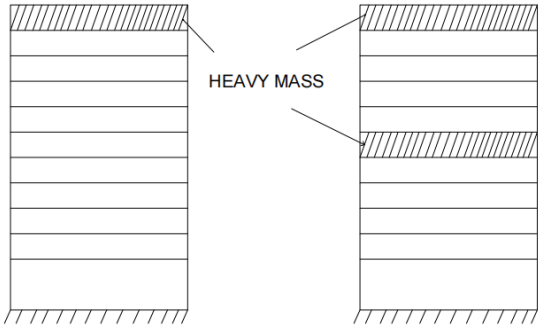


Fig.(b): Mass Irregularity

## II. LITERATURE REVIEW

H.M.S.C. Rathnasiri et.al [1] compared the performance of the existing methods on quantifying the degree of irregularity for the selected irregular buildings and they proposed index can easily quantify the degree of irregularity in vertically irregular RC moment-resisting frames compared to the existing irregularity quantification methods.

Vahid Mohseniana and Ali Nikkhoo[2] have considered seismically assess vulnerability of RC

tunnel-form buildings considering effects of irregular mass distribution. They found modal responses are not affected by building's height and patterns of mass distribution in elevation.

Rajkuwar Dubal et.al[3] worked on application of Performance based seismic design method for soft storey RC building frames(10 storey's) and did Push over analysis and found that significance of PBSD method in frames having soft story at lower floor level compared to higher ones. They have concluded that the time period for vertical irregular frame with soft story was less than the frame design by conventional methods.

R.Ismail et.al[4] was worked on the performances and behavior of regular and geometric irregular seven floors RCC framed structure under seismic motion. They have checked the building for the stress and displacement. From the result it has been seen that there was not much lateral movement in structure hence structure with vertical irregularity was good and safe.

Shaikh Abdul Aijaj Abdul Rahman & Ansari Ubaidurrahman Salik [5] has considered frame structure with mass irregularity. The heavy mass provided on 3rd and 7th floor. They have checked the structure for displacement and from result it has been concluded that the structure with vertical mass irregularity failed under seismic loading.

Panagiotis G. Asteris et.al [6] investigate the effect of the vertical geometric irregularities on the fundamental periods of masonry infilled structures, through a large set of infilled frame structure cases and found that an attempt to quantify the reduction of the fundamental period due to the vertical geometric irregularities has been made through a proposal of properly reduction factor.

A.S.Bhosle, Robin Davies and Pradip Sarkar[7] investigate seismic performance of building with vertical stiffness and mass irregularities.They have provided open ground and floa6]ting columns in the building. From the result it has been concluded that the building with floating column and open ground found to be more vulnerable and also need special design code for the structure with vertical irregularity.

Amy Coffield, Hojjat ADELI [8] has modeled structure and analyzed using the Applied Element Method, which allows the structure to be examined during and through structural failure. A plastic hinge analysis is performed as well as a comparative analysis observing roof deflection and acceleration to determine the effect of geometric irregularity under extreme blast loading conditions and concluded that concentrically braced frame provides somewhat of a higher level of resistance to blast loading for irregular structures and geometric irregularity has an impact on the response of a structure subjected to blast loading.

Mahsa Amiri, Masood Yakhchalian[9] have Intensity measures (IMs) are typically utilized to make connection between the prediction of engineering de-mand parameters and the results obtained from seismic hazard analysis. An optimal IM has four desired features including efficiency, sufficiency, scaling robustness and predictability.

S. Gerasimidis,C.D. Bisbos , C.C. Baniotopoulos[10] presented an extensive parametric study on the response of irregular steel frames in case of initial damage, expressed by the total removal of their columns, one in turn. Also, special attention is given to the influence of vertical geometric irregularity through comparative results.

## III. CONCLUSION

It has been seen that for the structure with vertical irregular frames with soft story has less time period (time period analysis) than the frames design by conventional method. The structure with mass irregularity failed under seismic loading. The frame with floating ground and open space needs special design code for such structures. Also, the geometrical irregularity has impact on structure under blast loading. Also from the above study, it has been observed that the structure with vertical stiffness, geometrical and mass irregularity affected under seismic loading.

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