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Dynamic Analysis of RC Multi-Storied Building for Various Irregular Conditions

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A B S T R A C T

It is impossible to stop earthquake but loss or damage to the structure can be minimized through proper design. It is highly impossible to prevent an earth quake from occurring, but the damage to the buildings can be controlled through proper design. Analysis and design of Complicated and multi-storied structure by using the conventional method are not effective because it consumes more time and precision of results are very poor. In such a situation, the performance of the structure under seismic loads can be determined by using software's (like STAAD Pro, ETABs, Tekla structures, etc).

The present study of this project is to study the performance different irregular structures. For this study i considered (G+19) RC building. The structure was modeled and analyzed for gravity, live loads and earthquake forces in different seismic zones of India as per IS 1893:2002 and analyzed by using STAAD Pro. After analysis the results of story displacement of each structure at each floor was observed and after that all cases results are compared and i concluded different worst irregular conditions

Keywords: Irregular Structure, Earthquake, STAAD Pro.

1. INTRODUCTION

An Earthquake is characterized as the sudden movement of Earth's crust. Earthquakes are caused by the release of build-up stress within rocks along geological faults or by the movement of magma in volcanic territories. Recent earthquakes showed that many RC framed structures have been collapsed, which focuses on the requirement to concentrate on the seismic resistance of structure .

Experience in the past earthquake has shown that the buildings with simple and uniform configurations are subjected to less damage. A building with discontinuity is subjected to concentration of forces and deformations at the point of discontinuity which may leads to the failure of members at the junction and collapse of building. The analysis procedure quantifying the earthquake forces and its demand depending on the importance and cost, the method of analyzing the structure varies from linear to nonlinear.

The behavior of a building during an earthquake depends on several factors, stiffness, and adequate lateral strength, and ductility, simple and regular configurations. The buildings with regular geometry and uniformly distributed mass and stiffness in plan as well as in elevation suffer much less damage compared to ir-regular configurations. But nowadays need and demand of the latest generation and growing population has made the architects or engineers inevitable towards planning of irregular configurations.

1.1. *Objectives Of Study*

1) Determination of the maximum lateral nodal displacements, bending moments, shear forces of structural members and story drift for various irregular conditions.
2) Computation of maximum worst irregular condition.
3) To compare the results such as bending moments, shear forces of structural members and story drift for various irregular conditions.

1.2. *Scope of study*

The present work is focused on the study of seismic demand of different irregular RC buildings. The configuration involves plan irregularities The performance is studied in terms of, base shear, lateral displacements, performance point and hinge status in Non linear analysis using STAAD-PRO Also in this paper an attempt is made to identify the performance levels. Extension of this work needs to consider the different geometries, soils and seismic zones. Dynamic analysis of irregular structure with various structural systems.

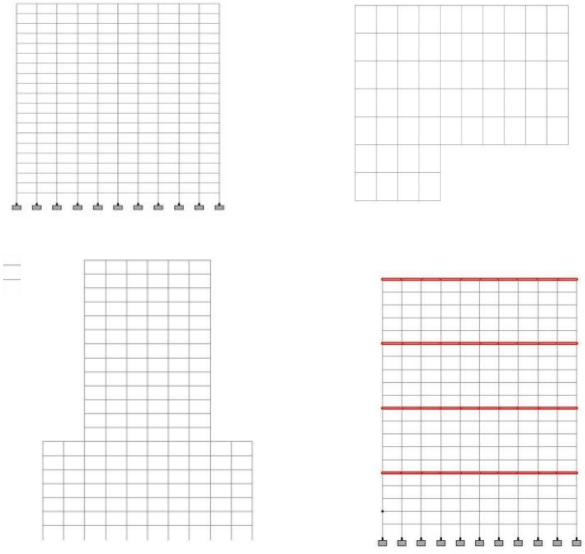
2. Modeling and Analysis of Building

In this paper, for analytical study re-entrant corner buildings are considered of L shape with G+5, G+10, G+15 storied having 40%, 60% and 80% irregularities in X direction and 25% in Y direction. The buildings are modeled using finite element software SAP2000 version 14.4.2 and non-linear static pushover analysis is performed on all building models.

1.3. *Building Description*

The study is carried out on reinforced concrete moment resisting buildings. The plan of building is of regular shape and irregular shape.

Number of stories (except for Case 2,6, &10): G+19
Story height: 3.0m
Grade of concrete (for beams and slabs):M30
Grade of steel: Fe500
Unit weight of concrete: 25 KN/m3
Unit weight of brick masonry: 20 KN/m3
Floor Finish+ unknown force: 2 KN/m2
Live load: 3 KN/m2
Beam size: 0.45m x 0.45m
Column size: 0.6m x 0.45m
Slab1: 125mm
Slab2: 150mm
Zone: II
Response reduction factor: 3
Importance factor:1
Soil type: I



1.4 *Building Modeling*

Footnotes should be avoided if possible. Necessary footnotes should be denoted in the text by consecutive superscript letters[11]. The footnotes should be typed single spaced, and in smaller type size (7pt), at the foot of the page in which they are mentioned, and separated from the main text by a one line space extending at the foot of the column. The Els-footnote style is available in the MS Word for the text of the footnote.

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3. Analysis Methods:-

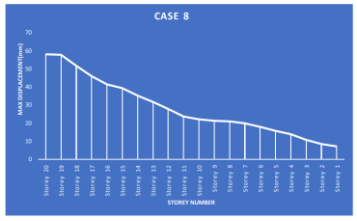
Response Spectrum Analysis

Response spectrum analysis is a method to estimate the structural response to short, nondeterministic, transient dynamic events.

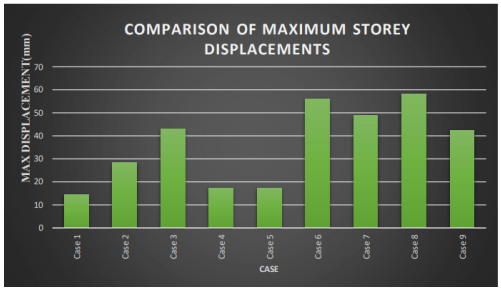
- The definition of a response spectrum Generation of a response spectrum from a given time history
- The use of a given response spectrum in a structural analysis
- In most cases, the engineer performing a response spectrum analysis is presented with a given design response spectrum, in which case the two first parts can be considered as background material.

Response Spectrum analysis was performed on various irregular buildings using STAAD Pro. The storey displacement was calculated for floors on which irregularity is considered and the behaviour is plotted. Maximum deformations due to irregularity are considered and compared with regular structures.

4. Results and Discussion : Graphical representation of Displacement of Structures



Case Number	Building B
Case 1	14.56
Case 2	28.33
Case 3	42.89
Case 4	17.23
Case 5	17.31
Case 6	55.93
Case 7	49.01
Case 8	58.03
Case 9	42.31



5. Conclusion

Structural irregularities affect the performance of the building. It was seen that introduction of plan irregularity resulted considerable degradation in the seismic performance of RC framed structures. It was also found that increase in the amount of plan irregularity resulted in increases in the storey displacement. Irregularities in upper stories has very little influence on the floor Displacements. Displacement increases as the amount of irregularity present in the building increases.

REFERENCES

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[3] IS 1893 (Part 1): 2002 Indian Standard Criteria for Earthquake Resistant Design of Structures, Part 1 General Provisions and Buildings, (Fifth Revision)
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