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A Review of Dynamic Analysis of Building by Using Response Spectrum Method

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ABSTRACT

Reinforced Concrete Frames are the most commonly adopted buildings construction practices in India. With growing economy, urbanization and unavailability of horizontal space increasing cost of land and need for agricultural land, high-rise sprawling structures have become highly preferable in Indian buildings scenario, especially in urban. With high-rise structures, not only the building has to take up gravity loads, but as well as lateral forces. Many important Indian cities fall under high risk seismic zones, hence strengthening of buildings for lateral forces is a prerequisite. In this study the aim is to analyze the response of a high-rise structure to ground motion using Response Spectrum Analysis. Different models, that is, bare frame, brace frame and shear wall frame are considered in Staad Pro. and change in the time period, stiffness, base shear, storey drifts and top-storey deflection of the building is observed and compared.

Keywords : Reinforced Concrete Frames, , High-Rise Sprawling, Response Spectrum, Staad Pro, Shear Wall.

I. INTRODUCTION

An earthquake (also known as a quake, tremor or temblor) is the shaking of the surface of the Earth, resulting from the sudden release of energy in the Earth's lithosphere that creates seismic waves. Earthquakes can range in size from those that are so weak that they cannot be felt to those violent enough to toss people around and destroy whole cities. The seismicity, or seismic activity, of an area is the frequency, type and size of earthquakes experienced over a period of time. The word tremor is also used for non-earthquake seismic rumbling. At the Earth's surface, earthquakes manifest themselves by shaking and displacing or disrupting the ground. When the epicenter of a large earthquake is located offshore, the seabed may be displaced sufficiently to cause a tsunami. Earthquakes can also trigger landslides, and occasionally volcanic activity

OBJECTIVE OF PAPER

- ✓ To analyze the building with different ground motions, namely, IS code compatible ground motion, Imperial Valley ground motion and San Francisco ground motion.
- ✓ To perform dynamic analysis of the building using response spectrum method.
- ✓ To model building with different lateral stiffness systems and study the change in response of the building

II. METHODS AND MATERIAL

To accumulate different sorts of work on seismic examination of skyscraper structures and expanding horizontal solidness of the framework different papers, proposition and research articles were contemplated completely and alluded. The thought behind doing writing audit was to gather information and have

understanding on various strategies and methodologies that can be utilized, to clear comprehend the product prerequisite of the undertaking. Writing survey was done to have an exhaustive rules amid the whole task work. Different Indian standard codes were gathered from the net The tremor information's were gotten from the site Peer.berkeley.edu. The quakes considered in this work are time history of ground movement according to IS 1893:2002 (Part-I), Imperial Valley and San Francisco.

III. METHODOLOGY ADOPTED

As discussed in the scope of the work, the entire work is divided into three parts:

- ✓ Analysis of bare frame in all the above three mentioned ground motions
- ✓ Analysis of the braced frames.
- ✓ Analysis of the frame with shear wall

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Table 1. Specifications of the building

Specifications	Data
Storey Height	3.5m
No. of bays along X direction	3
No. of bays along X direction	4
Bay Length along X direction	5m
Bay Length along Z direction	5m
Concrete grade used	M 30
Columns	0.45m X 0.25m
Longitudinal Beams	0.40m X 0.25m
Transverse Beams	0.35m X 0.25m
Slab Thickness	0.1m
nit Weight of Concrete	25 kN/m3
Live Load	3.5 kN/m3
Zone	IV
Soil Conditions	Hard Soil
Damping Ratio	5%

IV. RESULTS AND DISCUSSION

The outcome depends on the reactions of the uncovered casing model and the adjustments in the reactions subsequent to utilizing bracings and shear divider. The outcomes incorporate changes in eras, base shear, between story floats and best story avoidances for ground movements along X and Z course thought about exclusively. The consequences of era, base shear, between story floats and best story diversion for exposed casing, propped casing and shear divider outline were then contrasted and one another and an end was then drawn.

Table 2 : demonstrates the base shear for ground movement in X-bearing

Cases	Base Shear (kN)
Bare Frame	568.86
Case A	688.48
Case B	568.32
Case AB	686.95
Case C	750.62
Shear Wall A	916.7
Shear Wall B	658.36
Shear Wall AB	990.91
Shear Wall C	1227.99

V. CONCLUSION

This project work was a small effort towards perceiving the how introducing bracing or a shear wall in a building can make in difference in protecting the building in earthquakes. Almost all the buildings in India are RC frame, and earthquake tremors are felt every now a then in some or the other part of the country. Hence through this project it was tried to appreciate the effectiveness and role of this small extra structural elements that can save both life and property, at least for most of the earthquakes.

The accompanying ends were drawn toward the finish of the examination:

- ✓ There is a gradual reduction in time periods of the bracing and shear wall systems from the time period of bare frame, indicating increase in stiffness.
- ✓ Time Period in case of Shear Wall C is the highest, hence is the most stiff and better option for strengthening the structure.
- ✓ Base Shear produced in the Bare Frame is maximum for Imperial Valley Earthquake.
- ✓ In case of bracing system, Bracing System C (with braces at the corners) are the most effective one than other bracing systems, effectively reducing top-storey drift and inter storey drifts in both X- and Z- directions.
- ✓ There is hardly any reduction in drift along Z-direction due to Bracing B, for all the ground motions.
- ✓ Shear Wall A is effective in reducing drifts along X- direction only, and Shear Wall B is effective in reducing drifts along Z- direction only, for all the ground motions.

VI.FUTURE SCOPE

This study considers a theoretical 12 storey building with normal floor loading and no infill walls.

The comparison of fundamental period, base shear, inter-storey drift and top-storey deflection is done by using Response Spectrum analysis, which is a linear elastic analysis.

VII. REFERENCES

[1]. Google images for Steel Bracing in RC building.
[2]. Google images for Steel Bracing in RC building.[3] Google images for Shear Wall.
[3]. IS 1893 (Part 1) : 2002 Indian Standard Criteria for Earthquake Resistant Design Structures, Part 1 General Provisions and Buildings, (Fifth Revision).
[4]. Anil K. Chopra [2003] “Dynamics of Structures, Theory and Applications to Earthquake Engineering” (Prentice Hall of India Private Limited).
[5]. Chandurkar P. P, Dr. Pajgade P. S. (2013). “Seismic Analysis of RCC Building with and Without Shear Wall.” , International Journal of Modern Engineering Research (IJMER) (2249-6645).
[6]. Chavan Krishnaraj R. ,Jadhav H.S. (2014). “Seismic Response of RC Building With Different Arrangement of Steel Bracing System.”, International Journal of engineering Research and Applications (2248-9622).
[7]. Esmaili O. et al. (2008). “Study of Structural

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