

COMPARATIVE STUDY & SEISMIC ANALYSIS OF REGULAR AND IRREGULAR GEOMETRICAL SHAPES OF HIGH RISE BUILDING.

Prakash Dewaji Madavi¹, Prof. Sanjay K. Bhadke²

¹P.G. Student, Civil Engineering Department, Tulsiramji Gaikwad-Patil College of engineering and technology, Mohgaon, Nagpur, India

²Assistant Professor, Civil Engineering Department, Tulsiramji Gaikwad-Patil College of engineering and technology, Mohgaon, Nagpur, India

Abstract – This Study Focuses on the need to understand the effect of earthquake in different zone i.e. zone 2, zone 3, zone 4, zone 5 of Indian Standard code (IS 1893-2002) on high rise building. The Study will be done on Regular and also on Irregular geometric shape Building. All the other required parameters will be taken into consideration and we will compare the results in terms of deflection, Axial force and Moments on both directions.

Key Words: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)...

1. INTRODUCTION

Millions of lives have been lost in the past due to natural calamities such as earthquakes, flood, drought, tornadoes, hurricanes and volcanic eruption occur of all natural disasters, of which Earthquake is one of the most Destructive calamity. An earthquake 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 refers to the frequency, type and size of earthquakes experienced over a period of time. As a civil Engineer, we cover the investigation and solution of the problems created by damaging earthquakes, and consequently the work involved in the practical application of these solutions, i.e. in planning, designing, constructing and managing earthquake-resistant structures and facilities.

The latest version of seismic zoning map of India given in the earthquake resistant design code of India [IS 1893 (Part 1) 2002] assigns four levels of seismicity for India in terms of zone factors. In other words, the earthquake zoning map of India divides India into 4 seismic zones (Zone 2, 3, 4 and 5). According to the present zoning map, Zone 5 expects the highest level of seismicity whereas Zone 2 is associated with the lowest level of seismicity.

To avoid this damage due to Earthquake there are options which are available to designers when developing the structural system of a building. For that, Study of different zone of earthquake is very important. The Effect of different seismic zone on High Rise Building should be clear,

which will help in Structural Design of the Building to Counteract the effect of earthquake.

Need for present Study is to understand the effect of earthquake in different zone on high rise Regular building and also on Irregular Building. And we will compare the results in terms of deflection, Axial force and Moments on both directions.

2. BRIEF LITERATURE SURVEY

The research paper collected on the various topics is listed below.

- 1) Mohammed Affan, Md.Imtiyaz Qureshi, Syed Farrukh Anwar, "Comparative Study of Static and Dynamic Seismic Analysis of High Rise Building in different seismic zones of India and different soil types by ETABS".

Analysis of buildings for static forces is a routine affair these days because of availability of affordable computers and specialized programs which can be used for the analysis. On the other hand, dynamic analysis is a time consuming process and requires additional input related to mass of the structure, and an understanding of structural dynamic for interpretation of analytical results. Reinforced Concrete (RC) frame buildings are most common type of constructions in urban India, which are subjected to several types of forces during their lifetime, such as static forces due to dead and live loads and dynamic forces due to earthquake.

Here the present study describes the effect of earthquake load which is one of the most important dynamic loads along with its consideration during the analysis of the structure. In the present study a high rise framed structure is selected. Linear seismic analysis is done for the building by static method (Equivalent Static Analysis Method) and dynamic method (Response Spectrum Method) using ETABS as per the IS-1893-2002-Part1 for earthquake forces in different seismic zones of India. And the soil types are also compared. A comparison is done between the static and dynamic analysis for a high rise RCC building for various parameters like lateral force, lateral displacement, storey shear, storey drift, absolute maximum bending moment, and absolute maximum shear force.

- 2) Imranullah khan, Shri Satya Eswar Sanyasi Rao, **“Seismic Analysis of Irregular L-Shape Building in Various Zones”**.

Irregular structures pose particular design challenges for structural engineers, especially if situated in seismically active regions. It depends on mass, stiffness of structure. From the previous earthquake data it is observed that buildings having certain vertical configuration are more prone to damage in earthquake than others. It does not depend on which construction material or material systems used. The main intension of this study is to understand irregularity and to analyze l-shape building under earthquake forces. The irregular high rise buildings which the plan is l-shape are carried on response spectrum through the e-tabs analysis software. In the present study it is proposed to study a thirty two meter height storey reinforced concrete building using response spectrum method for different zones and there by comparing results..

- 3) Y Wensheng LU, And Xilin LU, **“Seismic Model Test And Analysis Of Multi-Tower High-Rise Buildings”**.

This paper summarizes tests of several scaled multi-tower high-rise building models on the shaking table. The assumption of rigid floor is obviously unsuitable for the analysis of multitower buildings. A new analytic model considering the effect of flexible transfer floor is put forward. The theoretical dynamic behavior is compared with the test results. The conjunction floors between towers at higher levels, and the stiffness of foundation contribution to structural dynamic behavior is also discussed in this paper. Several suggestions and conceptual guidelines are concluded.

- 4) Vinay Agrawal, Rajesh Gupta, Manish Goyal, **“A Study on Seismic Analysis of High-Rise Irregular Floor Plan Building with Different Position of Shear Walls”**.

The primary objective of any structural system is to support various types of loads acting either vertically or Horizontal or acting jointly with adequate safety. Any structural system should be designed in such a way that each and every element of the system should have ample rigidity, stiffness and strength against the anticipated loads. Any structural frame system with a provision of RC shear wall shows a desirable safety and stability up to 30 stories building height in lateral loads resistance. A RC framed shear wall is a combination of beams, columns interacting with reinforced concrete shear wall. Shear wall provide lateral stiffness to the building by cantilever action.

In this study a G+19 story unsymmetrical [Floor plans] commercial building [L>3.6 least lateral dimension of building], H> 3.3 least lateral dimension of building and is modeled with different position of shear walls and analysis conducted for joint displacement, Storey drift, Storey stiffness and Base shear force. These models are modeled with ETABS for static analysis as per IS 1893 -2002. The analysis results

for different models are plotted to compare and to know the behavior of RCC frame structure with different position of shear walls.

- 5) Bhalchandra p. Alone, Dr. Ganesh Awchat, **“Study on seismic analysis of high-rise building by using software”**.

This paper addresses the Case study on seismic analysis of high rise building system (Ground + 3 Basements + 50) storey RCC by STAAD pro v8i with application of Indian standard provisions. One of the most frightening and destructive phenomena of a nature is a severe earthquake and it terrible after effect. It is highly impossible to prevent an earth quake from occurring, but the damage to the buildings can be controlled through proper design and detailing. Hence it is mandatory to do the seismic analysis and design to structures against collapse. Designing a structure in such a way that reducing damage during an earthquake makes the structure quite uneconomical, as the earth quake might or might not occur in its life time and is a rare phenomenon. This study mainly on to understanding the results from STAAD Pro v8i software under gravity loads provision made in IS 456:2000, Results shall satisfy the general criteria from being a failure after analysis Results to improve The accuracy as per IS code 1893 : 2002.

3. OBJECTIVES

The primary objectives of this study can be summarized as follows:

- 1) To study seismic analysis method.
- 2) To study the clauses in IS code 1893-2002.
- 3) To Study the clauses 875 Part-II –Dead Load And 875 Part III-Live Load (Impact Load)
- 4) To analyse the building as per IS code 1893-2002 part I criteria for earthquake resistant structure.
- 5) To study the effect of Earthquake on G + 10 storey building with regular and irregular geometric shape.
- 6) To study the effect on building under zone II, III, IV and zone V using Staad Pro V-8 Software.
- 7) To compare the results between all the models made graphically and in tabular form.

4. CONCLUSION

As it is important to understand the effect of earthquake in different zone on high rise Regular building and also on Irregular Building. Different types of modelling will be done with different parameters. G + 10 Structure will be considered. A Regular modelling will be done with different seismic zone. In the same way Irregular models will be made. These models will be analyzed and will be compared for the effect of different earthquake zone on them. We will

compare the results in terms of deflection, Axial force and Moments on both directions.

REFERENCES

- [1] Mohammed Affan, Md.Imtiyaz Qureshi, Syed Farrukh Anwar, " Comparative Study of Static and Dynamic Seismic Analysis of High Rise Building in different seismic zones of India and different soil types by ETABS".
- [2] Imranullah khan, Shri Satya Eswar Sanyasi Rao, "Seismic Analysis of Irregular L-Shape Building in Various Zones".
- [3] Wensheng LU, And Xilin LU, "Seismic Model Test And Analysis Of Multi-Tower High-Rise Buildings".
- [4] Vinay Agrawal, Rajesh Gupta, Manish Goyal, "A Study on Seismic Analysis of High-Rise Irregular Floor Plan Building with Different Position of Shear Walls".
- [5] Bhalchandra p. Alone, Dr. Ganesh Awchat, "Study on seismic analysis of high-rise building by using software".
- [6] Arun Babu M, Ajisha R, "Analysis of Multistoried Building in Different Seismic Zones with Different Soil Conditions"
- [7] B.Ajitha and M.Naveen Naik, "The Wind and Seismic Analysis on Different Heights of Building by Using ETABS"
- [8] E. RaviKumar, "Seismic Analysis of Tall Building for Different Earthquake Zones"
- [9] IS 1893 (Part 1): (2002), "Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions and Buildings", Bureau of Indian Standards.

BIOGRAPHIES



Prakash D. Madavi
P.G. Student, TULASIRAMJI
GAIKWAD-PATIL College Of
Engineering & Technology,
Mohgaon, Wardha Road, Nagpur-
441108



Prof. Sanjay K. Bhadke
Asst. Profesor, TULASIRAMJI
GAIKWAD-PATIL College Of
Engineering & Technology
Mohgaon, Wardha Road, Nagpur-
441108