Effect Of Earthquake Forces on Different Aspect Ratio of Building

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ABSTRACT

The rapid increase of the urban population in developing countries such as India, has forced the revaluation of the importance of high rise buildings with different size and shape which leads to different aspect ratio of the buildings. The structural systems of high rise buildings are usually sensitive to the effects of earthquake, the earthquake-structure interactions and then determines the earthquake loads as equivalent static loads. It has been proved that the aspect ratio of building affects the effect of earthquake forces on building. These thesis study the different cases of aspect ratio of the building and effect of earthquake forces on building

Keyword : - *Aspect ratio, Earthquake forces, ETABS etc*

1. INTRODUCTION

Earthquakes are occasional forces on structures that may occur rarely during the lifetime of buildings. It is also likely that a structure may not be subjected to severe earthquake forces during its design lifetime. Reinforced Concrete Multi-Storied buildings (RCMS) are supposed to be of engineered construction in the sense that they might have been analyzed and designed to meet the provisions of the relevant codes of practice and building bye-laws; the construction might have been supervised by trained persons. In such cases, even if earthquake forces have not been considered precisely, the structures would have adequate in-built strength and ductility to withstand some level of earthquake intensity.

The 2002 version of IS 1893 has more clearly defined the irregularities (vertical and horizontal) in the configuration of buildings than the earlier version. The current specifications would imply that most of the RCMS buildings in the country have irregular configurations, and have to be analyzed as three-dimensional systems. There are a number of commercial software packages, which have the ability to analyze three-dimensional systems. However, the main problems are with modeling of the structure and member section properties. The Code provides no guidelines on these aspects leading to a wide variation in the results of the analyses

As per the Indian seismic code (IS: 1893-1984) The five seismic zones I, II, III, IV and V in correspond to areas that have potential for shaking intensity on the MMI scale of V or less, VI, VII, VIII and IX or more, respectively. Seismic zone map is revised with only four zones instead of five (IS: 1893-2002). Earthquake causes different shaking intensities at different locations and the damage induced in buildings at these locations is also different. Thus, there is necessary to construct a structure which is earthquake resistance at a particular level of intensity of shaking a structure. Analyzing the structure for various Indian seismic zones and checking for multiple criteria at each level has become an essential.

1.1 Need of Present Study

- From various experimental investigations, it is observed that dimensions of buildings significantly affect earthquake forces on different faces of the buildings.
- This study shows that certain shapes are and EQ Force phenomena which can generate high dynamic loads and govern the design.
- This study will ignite an interest on the use of Aspect ratio EQ Force.
- It would be useful in showing the importance of Aspect ratio to EQ Force on high rise Structure.

- **1.2 Scope of Present Study.**

  The scope of the present work included the study of EQ Forces on high rise Structure with Difference Aspect ratio for earthquake load as per IS 875: part 3-1987 and the analysis of the buildings will be done by using ETAB software and the performance will have analyzed by same building with different Aspect Ratio is to be consider. Analysis will be done by ETAB software.

  1. Height of the building considered was 28.8 m/9 story
  2. Same floor area of the building with different aspect ratio.

1.3 Scope of Present Study.

- To study the behaviour of tall structures when subjected to along Earthquake force.
- To study the effect of shape of the building in plan on the behaviour of the structure.
- To study Same floor area of the building with different Aspect ratio.
- To determine the effect of Earthquake force on various parameters like storey drifts, lateral displacements in the building.
- To define the most efficient Aspect ratio in high rise buildings which can provide sound . loading and Earthquake force by observing the comparative studies.
- To model high rise structure in ETAB Software.

2. LITRETURE REVIEW

2.1 Philip McKeen, Alan S. Fung. (2014) [6]studied the energy consumption of varying aspect ratio in multi-unit residential buildings in Canadian cities. The aspect ratio of a building is one of the most important determinants of energy efficiency. It defines the building surface area by which heat is transferred between the interior and exterior environment. It also defines the amount of building area that is subject to solar gain. The extent to which this can be beneficial or detrimental depends on the aspect ratio and climate. This paper evaluates the relationship between the geometry of buildings and location to identify a design vernacular for energy-efficient designs across Canada.

2.2 Marco D. Boscardin and Edward J. Cording. (2012) [22]studied Analytic models and field data are used to develop procedures to evaluate the tolerance of brick-bearing-wall and small frame structures to the ground displacements that develop during open cutting and tunneling. The role of horizontal and vertical ground displacements are discussed and the effects of grade beams, building orientation and building location relative to excavation are examined. Case studies of structures adjacent to open cuts and tunnels are used to verify procedures for estimating potential for structures adjacent to excavations to sustain damage.

3. METHODOLOGY

At the starting of any project some preliminary study is required. These preliminary studies are required to know the exact behavior of the structure, to know the property of the structure and various load conditions of the structure. Analyzing the small structure concern to respective project study does these types of studies. In this chapter software modeling, of high rise Structure for analysis of Earthquake load will be done as per IS 1893-Part 2 2002 has been used. Then application to calculated Earthquake load to software models and analysis will be studied.

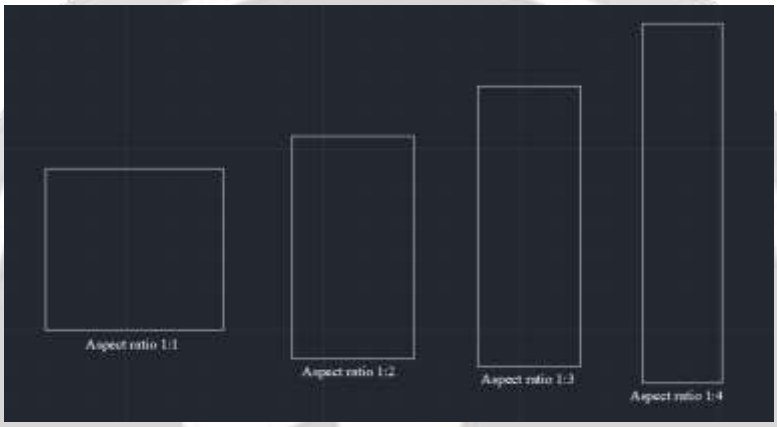
3.1 Description of Models

For the analysis we have considered G+9 Storey Building with same floor area. Following modals are use for the analysis.

Table No 3.1 : Description Of Modals

Modal No	Size of Building(in Meters)	Aspect Ratio	Floor area
1	45 X 45	1:1	Approx 2000 Sq.M
2	31 X 62	1:2	
3	26 X 78	1:3	
4	20 X 100	1:4	

Fig 3.1: Models



4. RESULTS

Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work Conclusion related your research work

Table no 4.1 Deflection in M1

Story	Elevation	M1	
	m	X	Y
Story9	28.8	137.9	137.9
Story8	25.8	132	132
Story7	22.8	122.1	122.1
Story6	19.8	108.9	108.9
Story5	16.8	93	93
Story4	13.8	75.2	75.2
Story3	10.8	56.2	56.2
Story2	7.8	36.6	36.6
Story1	4.8	17.4	17.4
GL	1.8	1.9	1.9
Base	0.6	0	0

Graph no.4.1 Deflection In M1

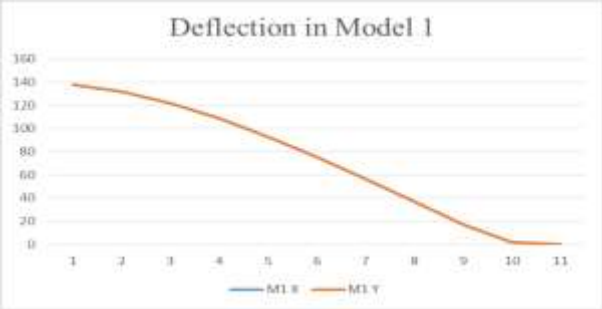


Table no 4.2 Deflection in M2

Story	Elevation	M2	
	m	X	Y
Story9	28.8	114.7	173.9
Story8	25.8	109.7	166.4
Story7	22.8	101.4	154
Story6	19.8	90.3	137.3
Story5	16.8	77.2	117.2
Story4	13.8	62.5	94.6
Story3	10.8	47	70.5
Story2	7.8	31	45.7
Story1	4.8	15	21.4
GL	1.8	1.6	2.3
Base	0.6	0	0

Graph no.4.2 Deflection in M2

Table no 4.3 Deflection in M3

Story	Elevation	M3	
	m	X	Y
Story9	28.8	72.5	85.8
Story8	25.8	69.3	82.2
Story7	22.8	64	76.2
Story6	19.8	57	68
Story5	16.8	48.7	58.1
Story4	13.8	39.4	47.1
Story3	10.8	29.5	35.3
Story2	7.8	19.4	23
Story1	4.8	9.4	11
GL	1.8	1	1.2
Base	0.6	0	0

Graph no.4.3 Deflection in M3

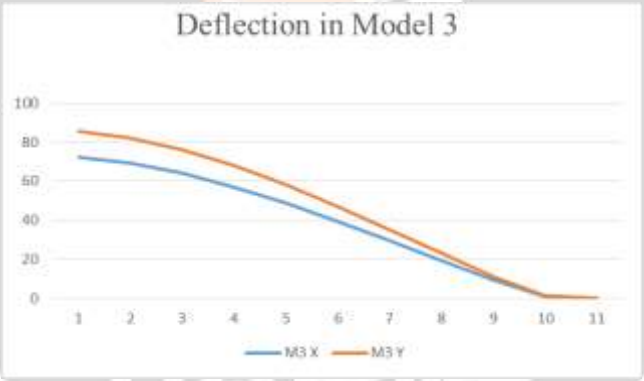
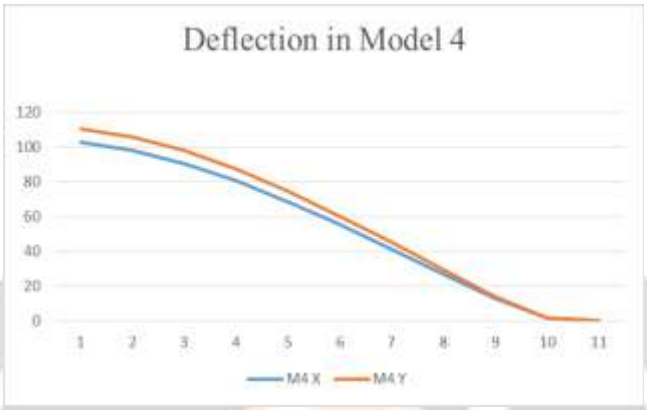


Table no 4.4 Deflection in M4

Story	Elevation	M4	
	m	X	Y
Story9	28.8	102.7	110.4
Story8	25.8	98	105.7
Story7	22.8	90.4	97.9
Story6	19.8	80.4	87.3
Story5	16.8	68.5	74.6
Story4	13.8	55.3	60.3
Story3	10.8	41.3	45.1
Story2	7.8	26.9	29.4
Story1	4.8	12.7	13.9

GL	1.8	1.4	1.5
Base	0.6	0	0

Graph no.4.4 Deflection in M4



5. CONCLUSION

This chapter deals with the concluding remarks drawn from the results of all the analysis and design made for the G+9 storey building with the different type of aspect ratio having same floor area (2000 Sq. m) is considered for analysis. The results have been presented in tabular form along with the graphical mode in previous chapter. This chapter contains only the conclusions drawn on the basis of results drawn in previous chapter. The conclusions are valid under the consideration of different aspect ratio of building and analysis is static.

As the aspect ratio increases, the storey displacement also increases. The displacement in x-direction is much more than than displacement in y- direction. From the results we can say that the displacement in model 4 is much more than model 1 with respect to Earthquake loads.

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