International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 07 Issue: 04 | Apr 2020 www.irjet.net p-ISSN: 2395-0072

Dynamic Analysis of High Rise Building in Seismic Zone IV

Ratnesh Pathak[1], Shiv Sundar Kumar[2], Vishal Kumar[3]

[1]Assistant Professor, Seth Vishambhar Nath Institute of Engineering &Technology, Lucknow, Uttar Pradesh, India
[2]B.Tech, Civil Engineering, Seth Vishambhar Nath Institute of Engineering &Technology, Lucknow, Uttar Pradesh
[3]B.Tech, Civil Engineering, Seth Vishambhar Nath Institute of Engineering &Technology, Lucknow, Uttar Pradesh

---

Abstract - *In this paper we study the Dynamic analysis of the RCC high rise building in seismic zone iv. The main purpose of this paper to check the seismic parameter. The dynamic analysis is done with the help of the time history data. The analysis is done with the help of the Etabs software by using the IS Code 1893 part 1 2016. The parameter on which we analyze the structure is base shear, storey drift, storey displacement, storey stiffness, overturning moment. We take the value of the zone factor 0.24 which represent in zone four. Time history data is taken from the 2009 Andaman Islands earthquake data in which maximum magnitude is about 7.8 at the epicentre. In this model, we assume the frame is RC building with ordinary moment-resisting frame.*

Key Words: Etabs, Time History, RCC building, High rise building, Seismic Zone iv.

1. INTRODUCTION

Now a day we are constructing the RCC building with and without the shear wall to decrease the effect of the earthquake in the structure. But in the paper, we are just studying the effect of seismic on the high rise building. In this paper, there is one model and the total height of the building is 45m. According to the International code, the high rise building is those building which has more six-floor or storeeey. The parameter of the RCC building is taken from IS code 1893 part-1 2016 for the seismic analysis.

2. METHODOLOGY

The focus of that earthquake was about 3Km from the ground surface and this type of earthquake is known as the shallow earthquake because the depth of the focus of the earthquake is less than 75Km. The duration of record of the earthquake was about 184.720 Sec. and maximum acceleration was -6.550 cm/sec^2 of that earthquake. Dynamic analysis done in this model by using the "Time History Data" and data of the earthquake for time history analysis is taken from Region Andaman and magnitude was 7.8.

2.1 Modeling of Structure

This model is prepared in the Etabs software which is developed by CSI company and version of the software was 17 and analysis of the model done with the help of the IS code 1893 part-1 2016. This parameter of the building Such as the material parameter, Section parameter, load parameter, and seismic parameter which are given below:

2.1.1 Material Parameter

The parameter of the material which is used in the building is given below in table-1:-

Table -1: Material Parameter

S.No	Material Name	Grade
1	Concrete	M30 for beam & Column
2	Concrete	M30 for Slab
3	Steel	Mild Steel

2.1.2 Geometry and Seismic Parameter of the building

In this parameter, we take the following parameter for the RCC building which is shown in the following table-2:-

Table -2: Geometry and Seismic Parameter of building

S.No	Building Parameter	Dimension
1	Beam	360mm X 460mm, M30
2	Column	450mm X 550mm, M30
3	Slab	160mm, M30
4	The total height of the building	45m
5	Importance Factor (I)	1.2
6	(R)	3
7	Zone Factor (z)	0.24
8	Type of the Soil	2nd

2.1.3 Load Parameter

In the following table-3, the load value is given which act on the structure such as dead load, live load and live load on the beam:

Table -3: Load Parameter

S.No	Load parameter	Value
1	Dead load	7.0 KN/m
2	Live load on Beam	3 KN/m
3	Live load	3KN/m^2

2.1.4 Plan and 3D view of RCC building

The figure of the Model-01 is given below which represent Plan, Elevation and 3D view of the model:

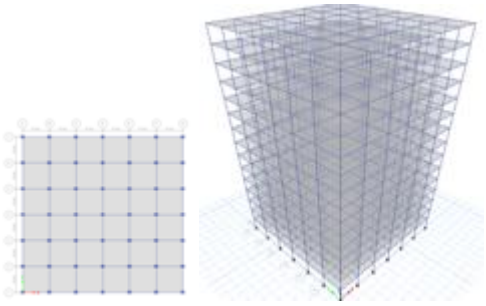

Fig -1: Plan and 3D View of Model-01

3. ANALYSIS

This model is analyzed with the help of the Etabs software by using Dynamic Analysis by defining time History data. We had taken the following parameter for comparing this model with each other:

i. Base Shear.

ii. Storey Drift.

iii. Storey Displacement.

iv. Storey Overturning Moment.

v. Natural period and Frequency.

3.1 Base Shear

The base shear is defined as the maximum lateral force act on each floor due to vibrating the ground surface on which the structure stabilized.

The graph of the base shear of this model is given below due to an earthquake in the X-direction. The value of the base shear is same due to earthquake in the Y direction because the building is symmetric.

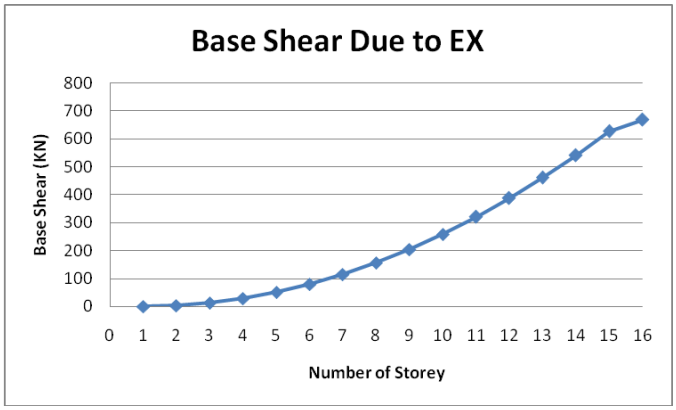

Chart -1: Base Shear Due to EX

3.2 Storey Drift

Storey drift is defined from clause 4.21 from IS code 1893 part-1 2016; it is the relative displacement between the floor above or below storey under the consideration. The graph of the storey drift of this model is given below due to earthquake in X and Y direction (X and Y direction represent the horizontal directions) the value of the storey drift is given at that load combination where the value of the storey drift is maximum.

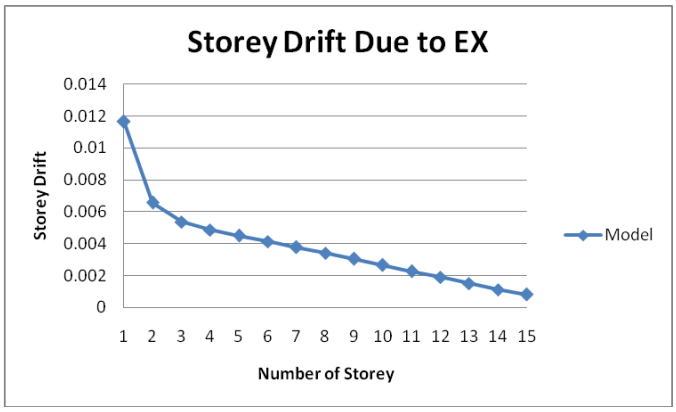

Chart -2: Storey Drift Due to EX

3.3 Storey Displacement

Storey displacement is defined as a measurement of the displacement of the floor from the ground surface which is displaced due to the effect of the earthquake. The graph of the storey displacement of this model is given below, which represent the maximum storey displacement.

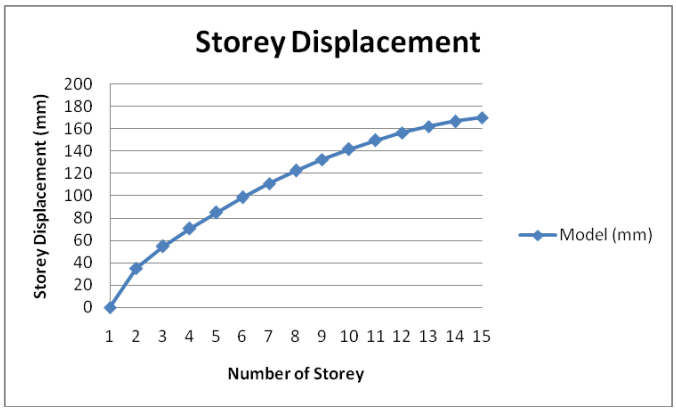

Chart -3: Maximum Storey Displacement

From the above graph, the value of the storey displacement is maximum in the RCC model is increasing with the increase in height of the floor

3.4 Storey Stiffness

The storey stiffness is defined as the ratio of the storey shear to storey drift.

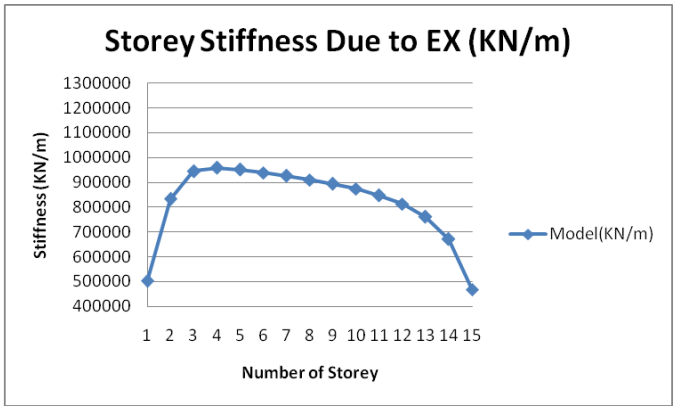

Chart -4: Storey Stiffness Due to EX

3.5 Natural Time and Frequency

Clause 3.18 from is code 1893 part-2016, the natural period is defined as the time taken by the structure to complete one cycle of the oscillation in its natural mode (k) of oscillation. The graph of the natural periods of this model is given below:

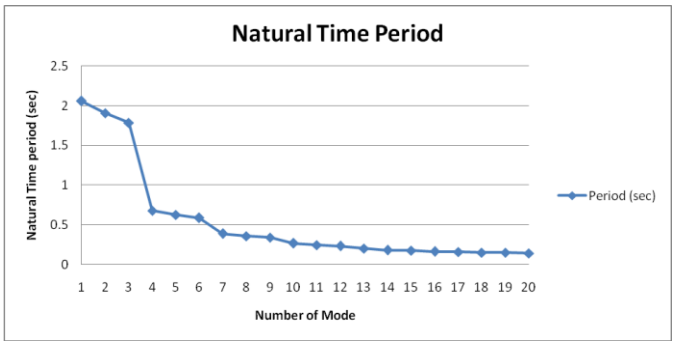

Chart -5: Natural TimePeriod

4. CONCLUSIONS

After analyzing the above parameter of the analysis of this model in which model is RCC building The following conclusion comes out after analysis:

i. The value of the base shear in the RCC building is increasing concerning the height of the building increasing

ii. The value of the storey drift is found accurate according to the IS code 1893 part-01: 2016.

iii. The value of the storey displacement is maximum at the maximum height of the building. According to the Code, the value of the storey displacement is increasing with height.

REFERENCES

[1]. Gauri G. Kakpure, Ashok R. Mundhada," Comparative study of static and dynamic seismic analysis of multi-storied RCC building by Etab: a review" International Journal of Emerging Research in Management &Technology Volume-5, Issue-12, Dec2016,

[2]. S. Mahesh1, Mr Dr.B.Panduranga Rao," Comparisonofanalysisanddesignofregular and irregular configuration of multi-story buildinginIOSRJournalofMechanicalandCivil Engineering (IOSR-JMCE) e-ISSN: 22781684,p- ISSN:2320-

[3]. V. Rajendra Kumar, Ranga Rao.V," Comparative study on regular & irregular structures using equivalent static and response spectrum methods", International Journal of Civil Engineering and Technology (IJCIET) Volume8, Issue1, January 2017, pp.615–622

[4]. Ravi Kiran, Sridhar.R, "Comparative study of a regular and vertically irregular building under seismic loading", IJRET: International Journal of Research in Engineering and TechnologyeISSN:2319-1163|pISSN:2321- 7308

[5]Review of 1893:2016 with 1893:2002 with plan irregularity", International Journal of Scientific Engineering and Research (IJSER), ISSN(Online):2347-3878.

[6]NarayanMalviya, SumitPahwa, Seismic analysis of high rise building with IS code 1893- 2002 and IS code 1893-2016", International Research Journal of Engineering and Technology(IRJET)e-ISSN:2395-0056Volume:

[7] Akhil R, Aswathy S Kumar, "Seismic analysis of regular and irregular buildings with vertical irregularity using Staad.pro" InternationalResearchJournalofEngineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 04 Issue: 06 | June -2017

[8] Arun Babu M, Ajisha R, Analysis of the multistoried building in different seismic zones with different soil conditions", International Research Journal of Engineering and Technology(IRJET)