International Journal of Advance Research in Science and Engineering
Vol. No.5, Issue No. 12, December 2016
www.ijarse.com
IJARSE
ISSN (O) 2319 - 8354
ISSN (P) 2319 - 8346

STUDY ON TIME HISTORY ANALYSIS METHOD USING STAAD PRO FOR MULTISTORYED BUILDING

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ABSTRACT

Dynamic analysis is carried out using STAAD Pro software. The Loads on structure were considered as per IS standards. The dynamic analysis may be Response spectrum method or time history analysis method. Response spectrum method uses rules laid down in IS 1893 (part 1) 2002 and time history analysis can be carried out using previous Earthquake data. In this paper El_Centro_earthquake occurred in 1940, data is used. The results in terms of lateral displacements with respect to each story are determined and compared story wise.

Keywords: Response Spectrum method; Time history method; El_Centro_earthquake; displacement; STAAD Pro software.

I INTRODUCTION

A dual design philosophy has been adopted for the design of building in earthquake prone regions due to nature of earthquake. The buildings which do not fulfill the requirements of seismic design, may suffer extensive damage or collapse if shaken by a severe ground motion. The seismic evaluation reflects the seismic capacity of earthquake vulnerable buildings for the future use. Therefore, it is necessary to study variation in seismic behavior of multistoried RC building in terms of various responses such as displacement and base shear. In this study the seismic behavior of concrete reinforced building and also, analysis of structure by using time history method is been carried out in this paper. The story displacement result has been obtained. The pertaining structure of 20 stories residential building has been modeled. The story mass is kept same in the different floors. The building has been analyzed by using the time history method spectrum based on IS codes; the results obtained are compared to determine the structural performance.

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In this study analysis is carried out using STAAD Pro software. The results in terms of lateral displacements for the different floors of building model were compared.

II MODELING OF THE STRUCTURE

One of the objectives of this model designing is to ensure that the model represent the characteristics of high rise buildings. Buildings with different number of stories with 20(G+19) storeys having same floor plan of 25m by 25m dimensions were considered for this study. The floor plans were divided into five by five bays in such a way that center to center distance between two grids is 5 meters by 5 meters respectively as shown in Figure 1. The floor height of the building was assumed as 3 meters for all floors and plinth height is 5 meters above from foundation base as shown in Figure 2.

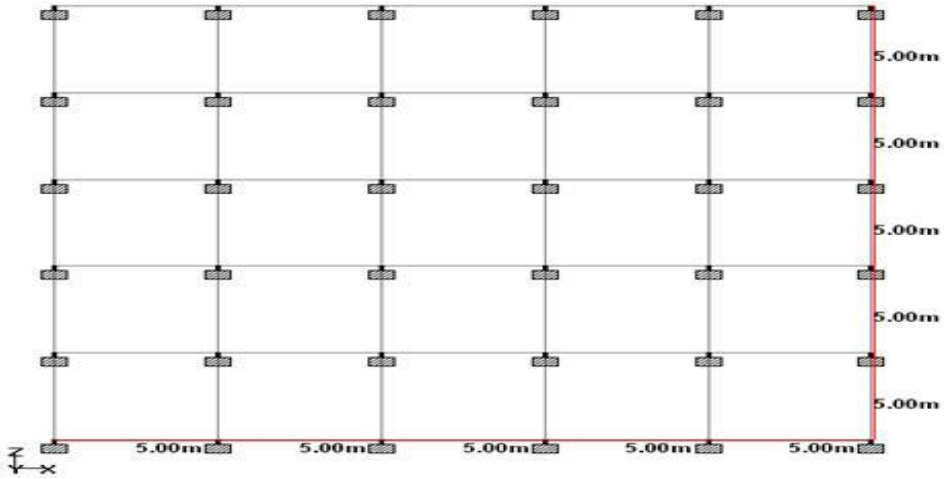

Fig. 1: Typical Floor Plan for all Buildings in STAAD Pro

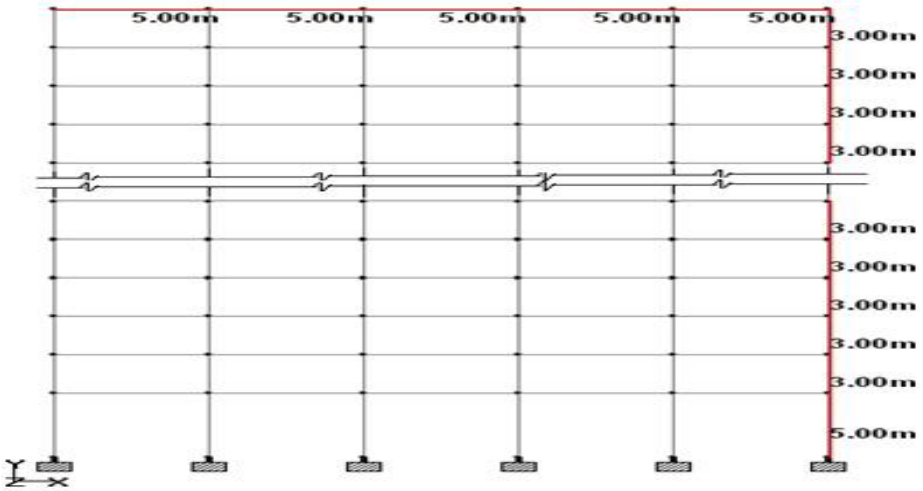

Fig. 2: Elevation of the building model

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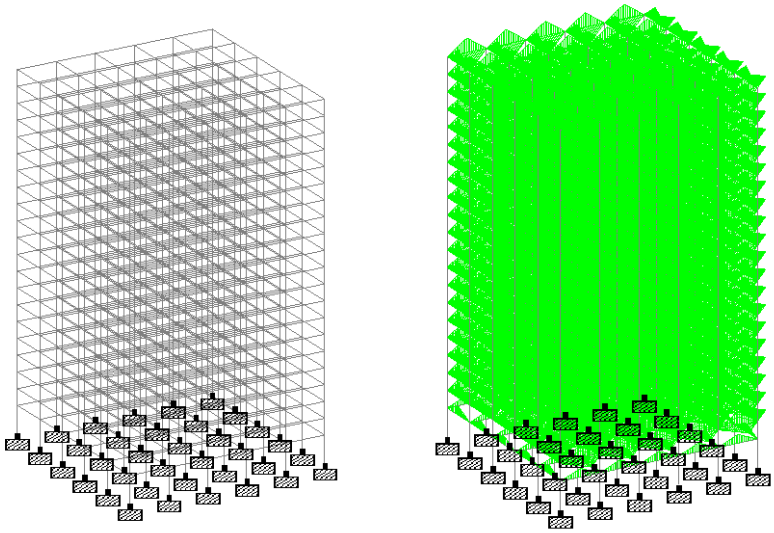

Fig. 3: 3D model in Staad-Pro

Self-weight of structure and dead load of 5kN/m^2 is applied. The live load of 3kN/m^2 is applied as per IS 875 (Part 2): 1987.

III PROBLEM STATEMENT

Time history is basically a method of seismic analysis for the simulation of an earthquake motion. It is an ultimate tool to study the dynamic response of a structure. This paper gives time history analysis by using time-acceleration data as input function and then performance of the structure is evaluated with various mode shapes and time-acceleration results.

IV DESCRIPTION OF BUILDING

Type of structure :High rise RC frame structure with shearwall

Occupancy :Office Building

Number of stories : 20

Foundation depth :5m

Intermediate storey height :3m

Type of soil :Soft soil

Zone :V (Bhuj, EQ magnitude of 7)

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Grade of Concrete :M30

Density of Concrete :25 kN/m^3

Modulus of Elasticity of concrete :5000$\sqrt{f_{ck}}$(As perIS456:2000,pp16).

V RESULT AND DISCUSSION

Following table shows displacement values for different floors at different time periods.

Table 1: Displacements values of different floors at different time periods.

Floor No	Time Period (seconds)	Displacement in X-Direction (mm)
Ground Floor	7.02	1.57
1	7.02	3.54
2	7.03	5.98
3	7.03	8.7
4	7.04	11.6
5	7.05	14.6
6	7.06	17.7
7	7.07	20.8
8	7.08	23.9
9	7.1	27
10	7.12	30.1
11	7.14	33.2
12	7.17	36.2
13	7.18	39.1
14	7.19	41.7
15	7.2	44.1
17	7.21	47.8
16	7.21	46.1
18	7.21	49.3
19	7.22	50.6
20	7.22	51.7

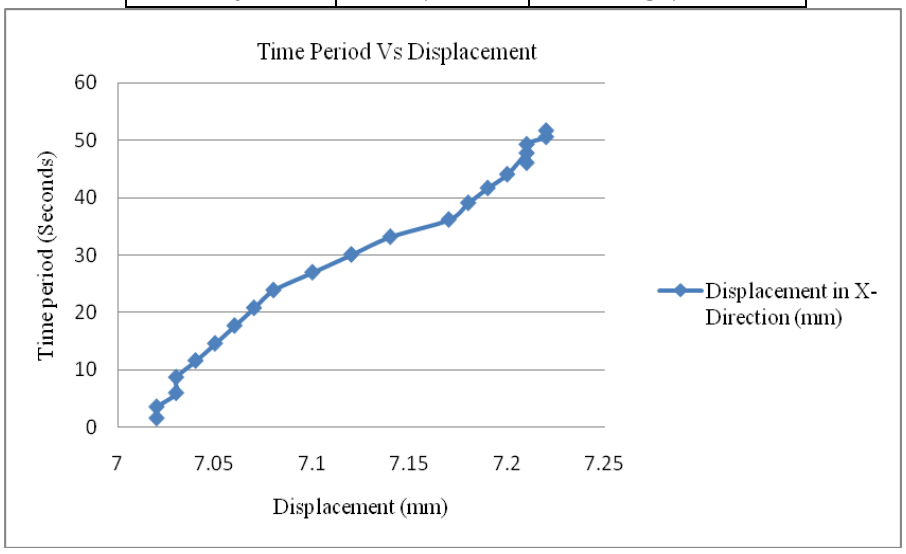

Fig. 4: Comparison of Base shear for Box type shear wall without openings and with openings

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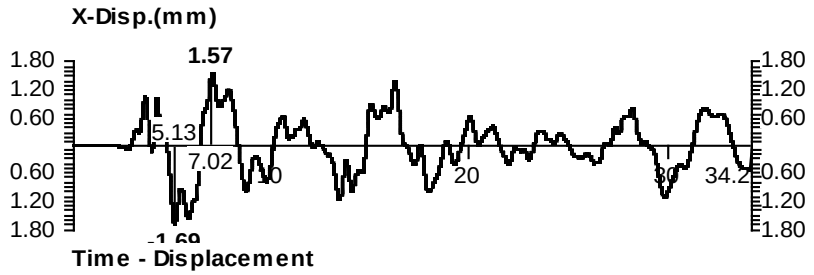

Fig. 5: Displacement Vs Time at 20th Floor

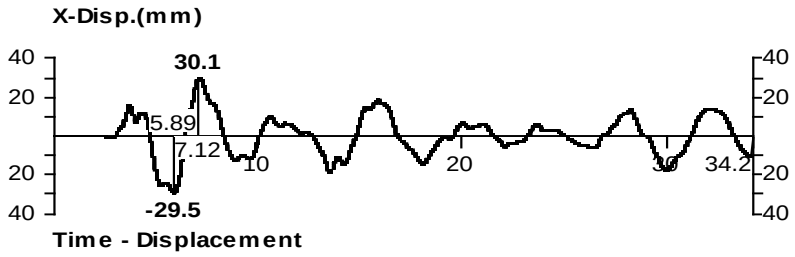

Fig. 6: Displacement Vs Time at 10th Floor

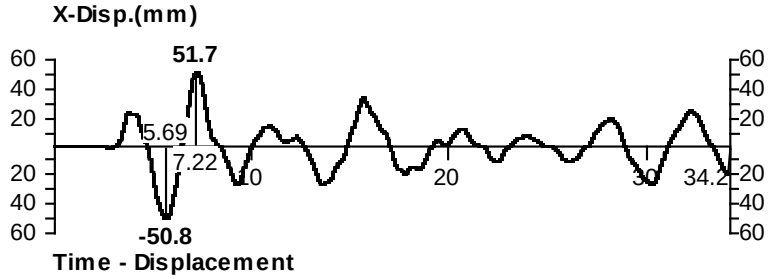

Fig. 7: Displacement Vs Time at Ground Floor

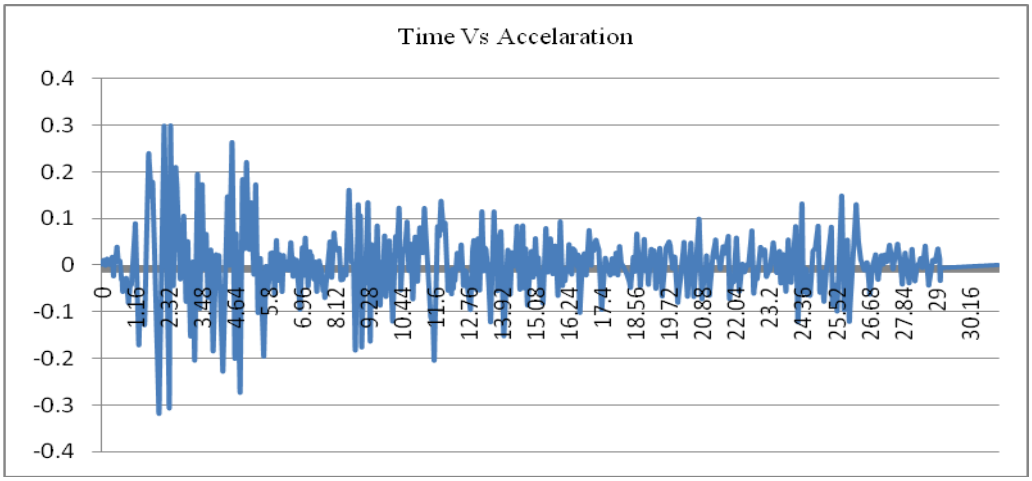

Fig. 8: Time Vs Accelaration graph obtained from El_Centro_earthquake data.

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VI DISCUSSION AND CONCLUSIONS

It is observed that the time period Vs displacement graphs obtained were similar to that of Time Vs acceleration graph obtained from earthquake data. As the time period increases displacement of each floor also increases. As the height of structure increases time period increases which is in accordance with IS: 1893(Part 1): 2002

REFERENCES

1. Aarti Baburao Rampure, Madhuri Nilesh Mangulkar "Comparison between Response Spectrum and Time History Method of Dynamic Analysis of Concrete Gravity Dam" *Open Journal of Civil Engineering, 2016, 6, 329-334.*
2. Dr. S.K. Dubey, Prakash Sangamnerkar , Ankit Agrawal "Dynamics Analysis Of Structures Subjected To Earthquake Load"*International Journal Of Advance Engineering And Research Development September -2015 Volume 2,Issue 9, pp.11-19.*
3. Anirudh Gottala, Kintali Sai Nanda Kishore, Dr. Shaik Yajdhani "Comparative Study of Static and Dynamic Seismic Analysis of a Multistoried Building" *IJSTE - International Journal of Science Technology & Engineering | Volume 2 | Issue 01 | July 2015, pp.173-183.*
4. Vinayak Kulkarni, Swapni Cholekar, Hemant Sonwadekar "*Effect of openings of shear wall in high rise buildings" InternationalJournal of Applied Scienceand Engineering Research, Vol. 3.Issue 4, June 2014, pp.776-781.*
5. IS 875:1987 (Part 2) *Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures*, Part 2 Imposed Loads, Second Revision, Bureau of Indian Standard, New Delhi, India.
6. IS: 456:2000, "Code of Practice for Plain and Reinforced Concrete", *Bureau of Indian Standard, New Delhi, India.*