Seismic Analysis of Framed Structure in Different Seismic Zones with Different Shear Wall Positions

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Abstract— With the increase in natural disasters there is a need for safe design of multi-storey buildings. Particularly in developing countries there is no scope for shortfalls in design. In this context it is a necessity to understand the response of the structure for different loading conditions. The present study deals with the response of space frames under different seismic zone conditions.

Key words: Multi-Storey Buildings, Seismic Analysis, Shear Wall Positions

I. INTRODUCTION

With the increase of urbanisation the number of structures in urban areas are increasing every day. It is very important that these structures are resistant to the natural disasters like earthquakes, floods, cyclones etc., Here comes the role of a structural engineer in designing the structures resistant to all these natural calamities.

In order to design a building it is very important to analyse the structure to the expected loads in its lifetime. As the design and analysis parts are interrelated emphasis is given to analysis.

With the increase in the capacity of computers the need to analyse a structure manually decreased considerably. Modern software packages ease the work of analysis and design. Many software packages like STAAD Pro, ETABS, ANSYS, ABAQUS etc., are used for the analysis of structures for different types of loading.

The main reason for the increase in the importance for the analysis part is the safety of the people who live in it or who utilise it.

The present study involves the analysis of a framed structure under seismic loading. STAAD. Pro was used for the analysis part. The three dimensional framed structure used for the analysis was exposed to different seismic zones as per IS Codes.

A. Response spectrum:

The concept of response spectrum is characterizing ground motions and their effect on framed structures. Response spectrum gives a best way to measure the peak responses of all SDOF systems to a particular ground motion.

It also gives an approach to apply the concepts of structural dynamics to the analysis and design of structures. The plot of peak values of a response quantity like displacement, velocity and acceleration. etc., as a function of period of time. This system is called the response spectrum of the structure.

II. METHODOLOGY

1) Go to new project, then go to commands in staad pro and then to run structural wizard.
2) Go for bay frame in frame models and select parameters.
3) Model the multi-storey frames in for G+5, G+10 and G+15 buildings.
4) Save and translate the frames in three dimensions.
5) Develop the frame of the building and give support, properties of columns and beams.
6) Define the seismic loads in the definitions.
7) Apply the seismic loads in different zones 2,3,4,5.
8) Apply loads as per IS codes (dead load, live load, seismic load).
9) Apply response spectrum analysis in load case details.
10) Analyse the maximum or peak shear forces in G+5, G+10, G+15 storey buildings in different zones.
11) Analyse the graphs of the different zones.

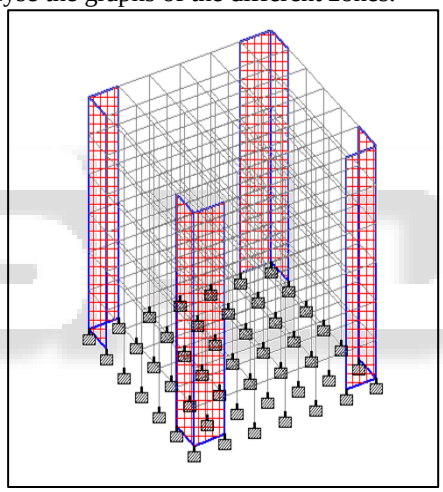

Fig. 2.1: Shear wall at corner of a 5 storey building

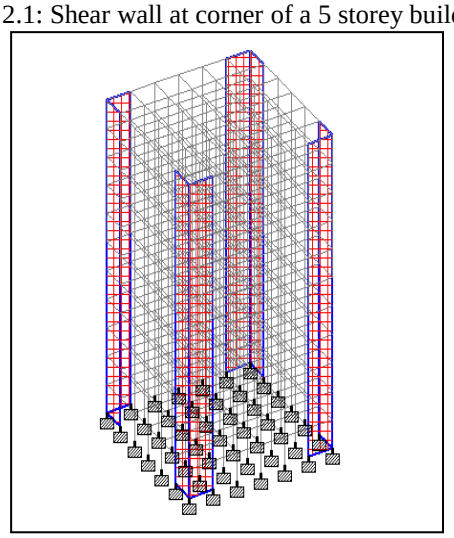

Fig. 2.2: Shear wall at corner of a 10 storey building

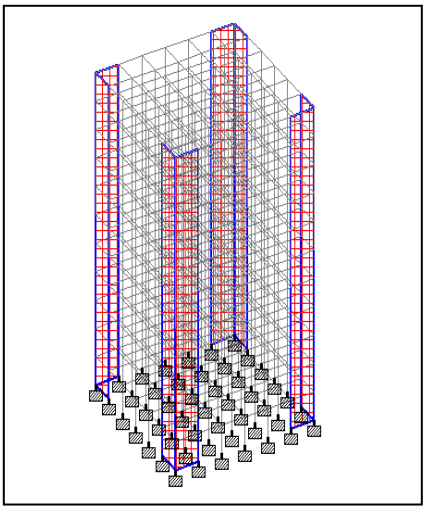

Fig. 2.3: Shear wall at corner of a 15 storey building

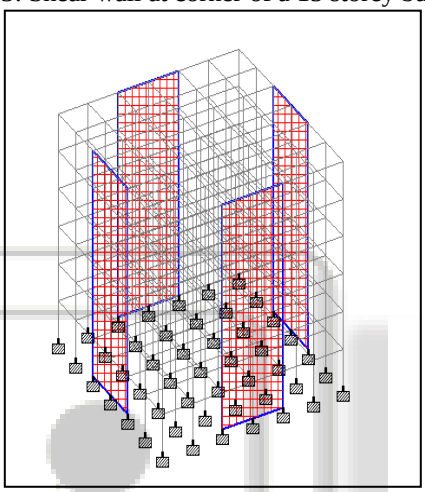

Fig. 2.4: Shear wall at middle of a 5 storey building

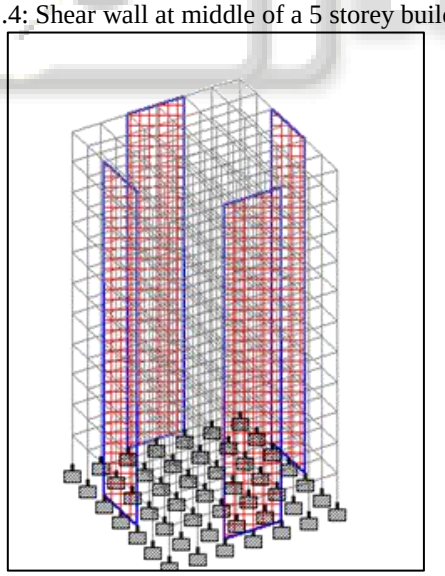

Fig. 2.5: Shear wall at middle of 10 storey building

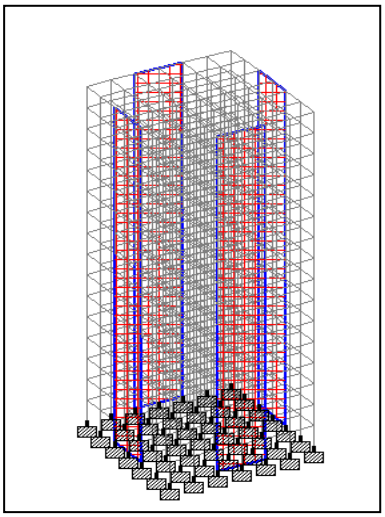

Fig. 2.6: Shear wall at middle of 15 storey building

III. LITERATURE REVIEW

Patil, Ghadge, Konapure, Ghadge studied in seismic analysis of high-rise building by response spectrum method. Which was identified seismic analysis of high rise building, lateral deflection, and response spectrum method in presence of shear wall.

It can describe seismic analysis of high-rise building using program in STAAD Pro with various conditions of lateral stiffness system. Some models are prepared that is bare frame and shear wall frame. Analysis is done with response spectrum method. In large portion of India is susceptible to damaging levels of seismic hazards. Hence, it is necessary to take in to account the seismic load for the design of high-rise structure.

IV. CONCLUSIONS

1) In zone 2 for 5 a storey building maximum shear force is observed in the corner position of shear wall.
2) For a 10 storey building the force is maximum at the middle position of shear wall in zone 2.
3) For the 15 storey building the corner position of a shear wall the force is maximum in zone 2.
4) In zone 3 for 5 a storey building maximum shear force is observed is the corner position of shear wall.
5) For a 10 storey building the force is maximum at the middle position of shear wall in zone 3.
6) For a 15 storey building the corner position of a shear wall the force is maximum zone 3.
7) In zone 4 for 5 a storey building maximum shear force is observed is the corner position of shear wall.
8) For a 10 storey building the force is maximum at the middle position of shear wall in zone 4.
9) For a 15 storey building the corner position of a shear wall the force is maximum zone 4.
10) In zone 5 for 5 a storey building maximum shear force is observed is the corner position of shear wall.
11) For a 10 storey building the force is maximum at the middle position of shear wall in zone 5.
12) For a 15 storey building the corner position of a shear wall the force is maximum zone 5.

REFERENCES

[1] Varsha R. Harne "Comparative Study of Strength of RC Shear Wall at Different Location on Multi-storied Residential Building", International Journal of Civil Engineering Research. ISSN 2278-3652 Volume 5, Number 4 (2014),
[2] S.K. Ahirwar1, S.K. Jain and M. M. Pande "Earthquake loads on multistorey buildings as per is: 1893-1984 and is: 1893-2002: a comparative study", World Conference on Earthquake Engineering October 12-17, 2008
[3] Himalee Rahangdale, S.R.Satone, "Design And Analysis of Multi-storeyed Building with Effect of Shear Wall", International Journal of Engineering Research and Applications (IJERA) ISSN: 2248-9622 www.ijera.com Vol. 3, Issue 3, May-Jun 2013.
[4] E. Pavan Kumar, A. Naresh, M. Nagajyothi, M. Rajasekhar, E. Pavan Kumar, "Earthquake Analysis of Multi Storied Residential Building - A Case Study" Int. Journal of Engineering Research and Applications Vol. 4, Issue 11(Version 1), November 2014.
[5] Divyashree M, Gopi Siddappa, "Seismic Behaviour of RC Buildings with Re-entrant Corners and Strengthening", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE) e-ISSN: 2278-1684.
[6] Husaiba N, Elsa Paul "Structural Analysis of Reinforced Concrete Slit Shear Walls", International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2013): 6.14 | Impact Factor (2014.
[7] A.Sai Theja, D.Srikanth, "Earthquake resistance design-impact on cost of reinforced concrete builidings", Vol.03 Issue-10, (October, 2015) ISSN: 2321-1776,International Journal in IT and Engineering.
[8] S.S. Patil, S.A. Ghadge, C.G. Konapure, C.A. Ghadge "Seismic Analysis of High-Rise Building by Response Spectrum Method ", International Journal Of Computational Engineering Research (Ijceronline.Com) Vol. 3 Issue. 3.
[9] Kasliwal N, Rajguru R., "Effect of Numbers and Positions of Shear Walls on Seismic Behaviour of Multi-storeyed Structure" International Journal of Science, Engineering and Technology Research (IJSETR) Volume 5, Issue 6, June 2016.
[10] Mahdi Hosseini, Ahmed Najm Abdullah Al-Askari, N.V. Ramana Rao, "Seismic Behaviour of RC Shear Walls", International journal of scientific engineering and technology research ISSN 2319-8885 Vol.03,Issue.18 August-2014.
[11] Anoop Singh, Vikas Srivastava, N.N.Harry, "Seismic Analysis and Design of Building Structures in STAAD Pro "International Journal of Innovative Research in Science, Engineering and Technology Vol. 5, Issue 7, July 2016.
[12] Sourabh Rajoriya, Uttam, "Study of the Effect of Shape of the Structure and the Position of Shear Wall in a High Rise Building under Wind Load" International Journal of Innovative Research in Science, Engineering and Technology Vol. 5, Issue 10, October 2016.
[13] Suchi Nag Choudhary, Dr. P.S. Bokare, "Dynamic Analysis of Multistorey Building using Response Spectrum Method and Seismic Coefficient Method – A Comparison" International Journal for Research in Applied Science & Engineering Volume 5 Issue III, March 2017.
[14] Hingkam Dada, Zuhail Bin Basheer T.P,Bullo Apo, "Study of seismic effect on buildings modified with shear wall" International Research Journal of Engineering and Technology Volume: 03 Issue: 04 | April-2016 .
[15] Mahdi Hosseini, N.V. Ramana Rao, "Earthquakes Analysis of High-rise Buildings with Shear Walls at the Centre Core and Centre of Each Side of the External Perimeter with Opening " , International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064 Index Copernicus Value (2015): 78.96 | Impact Factor (2015).
[16] Girum Mindaye1, Dr. Shaik Yajdani, "Seismic Analysis of a Multistorey RC Frame Building in Different Seismic Zones", International Journal of Innovative Research in Science, Engineering and Technology Vol. 5, Issue 9, September 2016 .
[17] Anuj Chandiwala, "Earthquake Analysis of Building Configuration with Different Position of Shear Wall", International Journal of Emerging Technology and Advanced Engineering Website: www.ijetae.com (ISSN 2250-2459, ISO 9001:2008 Certified Journal, Volume 2, Issue 12, December 2012).

