International Journal of Civil and Structural Engineering Research ISSN 2348-7607 (Online)
Vol. 5, Issue 1, pp: (51-56), Month: April - September 2017, Available at: www.researchpublish.com

Seismic Analysis of RCC Building with Shear Wall at Different Locations Using STAAD Pro

Kanchan Rana[1], Vikas Mehta[2]

[1,2]Post Graduate Student
[1,2] School of Mechanical and Civil Engineering, Shoolini University of Biotechnology and Management Sciences, Solan, India

Abstract: **The Shear walls are commonly used as a vertical structural element. They are used for resisting the lateral loads which are induced by the loads due to wind and earthquake. Besides shear walls also carry gravity loads. An attempt is made for seismic analysis of RCC building with shear wall at different locations using STAAD pro. A 6 storey building is taken under consideration. Four different Model of RCC building are used, one with no shear wall and other four models with different position of shear wall. Results will be obtained from analysis and plotted to compare and to have knowledge of behavior of RCC framed structures with shear walls using Response spectrum Analysis which is subjected to earthquake load in zone V. The parameters like storey drift, lateral displacement, and base shear will be studied and suitable location of shear wall will be determined among these models. This study also incorporates how the shear force, bending moment for beam and axial Force for column vary with change in the position of RC shear wall. The whole analysis is done on STAAD. Pro V8i software.**

Keywords**: Shear wall, response spectrum, Lateral loading, STAAD Pro V8i.**

I. INTRODUCTION

Earthquake may occur at any place on the surface of the earth. The possibility is where there is a major fault. In this work the main focus is to analyze an RCC building with shear wall at different locations using code IS 13920-1993 for ductile detailing. The code used for earthquake loadings is IS 1893- 2002. A shear wall is a structural system composed of braced panels (also known as shear panels) to counter the effects of lateral load acting on a structure. Wind and seismic loads are the most common loads that shear walls are designed to carry. Reinforced concrete multi-storeyed buildings in India, for the first time, have been subjected to a strong ground motion shaking in Bhuj earthquake (January 26, 2001). It has been observed that the principal reasons of failure of building are lack of stiffness, faulty construction practices, mass irregularity and floating columns etc. In this work shear wall is provided at different locations symmetrically and the building frame considered is also symmetrical.

II. LITERATURE REVIEW

1. Brief Review:

Yasushi Sanada, Toshimi Kabeyasawa and Yoshiaki Nakano (August 1-6, 2004) [1] analyzed reinforced concrete wall frame structural system considering shear softening of shear wall. Anshul Sud, Raghav Singh Shekhawat, Poonam Dhiman (29th March 2014) [2] gave notes on Best Placement of Shear Walls in an RCC Space Frame Based on Seismic Response. R.S.Mishra, V.Kushwaha and S.Kumar (Oct-2015)[3] presented a Comparative Study of Different

Configuration of Shear Wall Location in Soft Story Building Subjected to Seismic Load. P. Mary Williams and R. K. Tripathi (June 2016) [4] studied Effect of Shear Wall Location on the Linear and Nonlinear Behaviour of Eccentrically Loaded Buildings.

2. Design Parameters:

Loads acting on the structure are:

Dead Load (DL) and Live load (LL) : As per IS 875 (Part 1) (1987) and IS 875 (Part 2) (1987)

Seismic load (SL) : As per IS 1893 (Part 1) (2002) Approach

DL : Self weight of the structure, Floor load and Wall loads

LL : Live load 3.5 KN/sq.m is considered for floor weight

SL : Zone: V (Z=0.36)

Rock/ soil type : Medium

Rock and Soil site factor : 1

Response reduction factor : 5

Importance factor : 1

Damping : 0.05%

The preliminary data as is taken up for this study.

TABLE I: VARIOUS INPUT PARAMETERS

Number of storeys	G+5
Plan size	12m x 12m (Each grid of size 3m x 3m)
Size of columns	500mm x 500mm
Size of beams	500mm x 500mm
Shear wall thickness	200mm
Total height	18m
Floor to floor height	3.0m
Grade of concrete and steel	M25 and Fe415
Ductility design	IS: 13920-1993
Support condition	Fixed

The plan and elevations of the R.C. building with and without shear walls are shown in Figures given below.

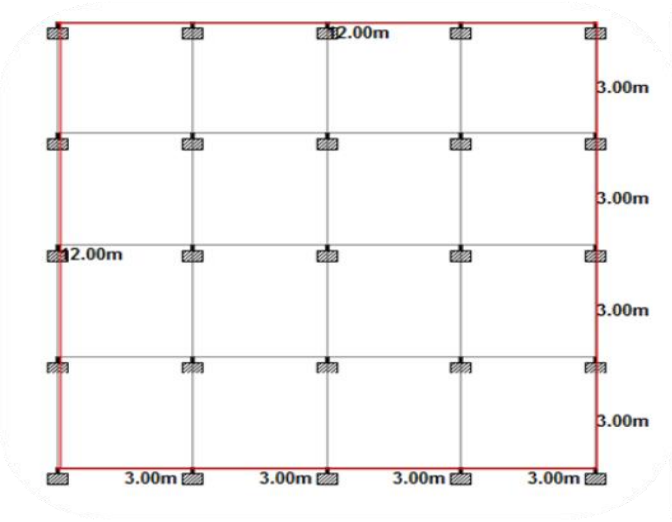

Fig. 1. Plan of Building

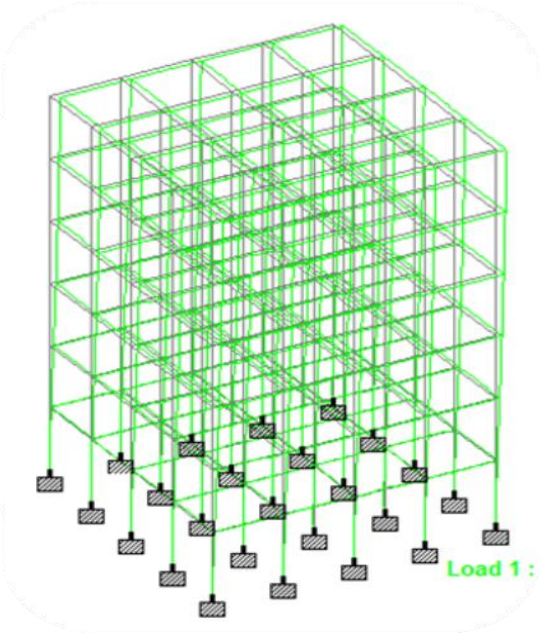

Fig. 2. Model-1 having no shear wall

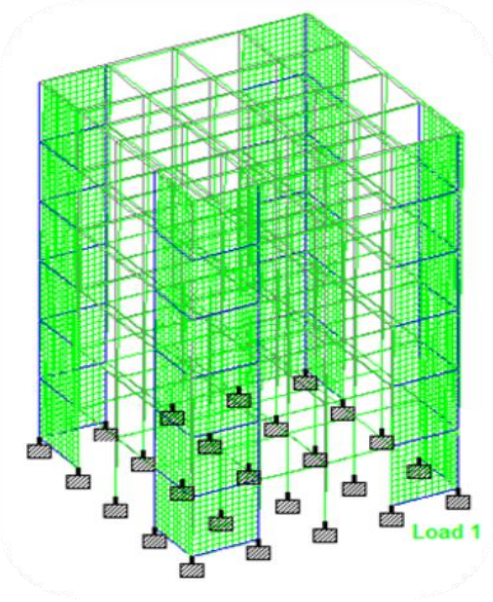

Fig. 3. Model-2 having shear wall at the edges

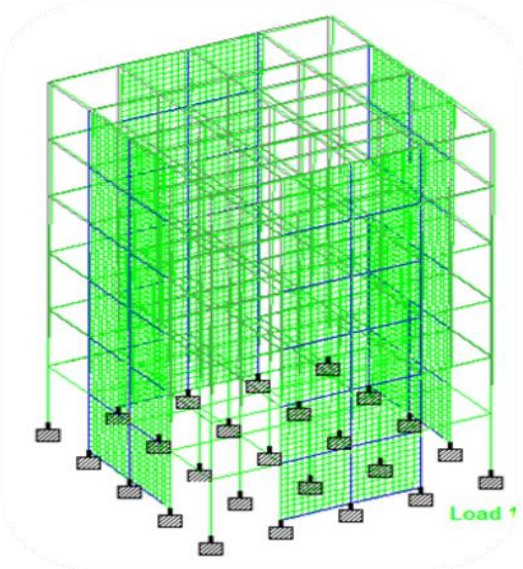

Fig. 4. Model-3 having shear wall at the centre of sides

III. METHODOLOGY

The method used for the analysis is Response Spectrum. The steps to model and analyze the R.C.C. building frame are given below.

Firstly, go to run structure wizard and select bay frame. Then follow the following steps given below. It consists of 2 steps which are:

1) Modelling

- General
- Design
- Analysis

2) Post- processing

- Design of member
- Results
- Report

IV. RESULT AND GRAPHS

1. Storey Drift along x-direction:

TABLE II. VARIATION OF STOREY DRIFT WITH STOREY NUMBER

STOREY DRIFT (mm)			
Storey Number	**Model-1**	**Model-2**	**Model-3**
6	21.725	22.856	16.065
5	36.375	24.952	18.028
4	49.275	25.733	18.718
3	58.925	24.719	18.195
2	63.450	21.280	16.146
1	46.482	15.772	12.969
Base	0.000	0.000	0.000

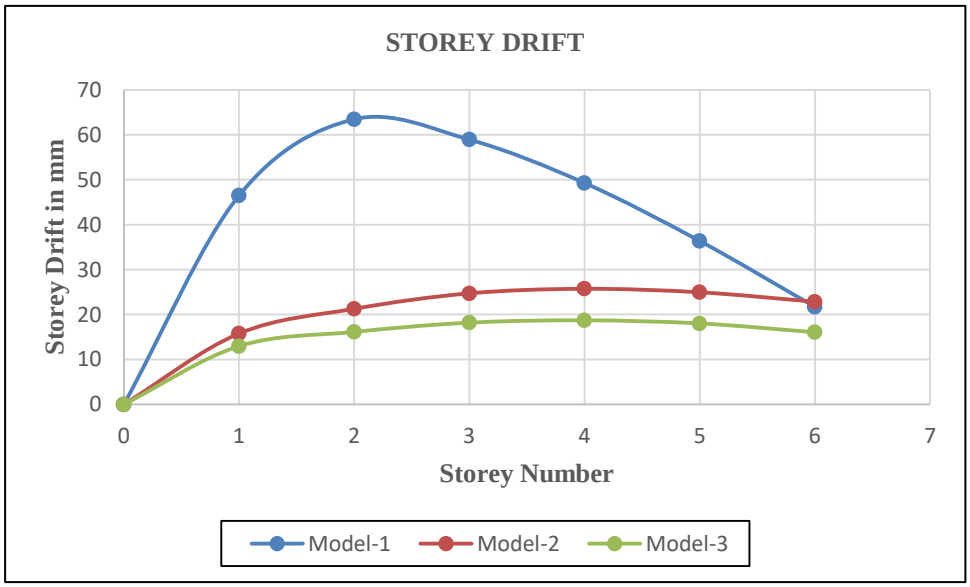

Fig. 5.

2. Storey Drift along z-direction:

TABLE III. VARIATION OF STOREY DRIFT WITH STOREY NUMBER

STOREY DRIFT (mm)			
Storey Number	**Model-1**	**Model-2**	**Model-3**
6	21.722	19.117	12.232
5	36.375	25.212	18.795
4	49.278	28.361	21.770
3	58.924	28.909	22.913

2	63.447	27.613	22.951
1	46.484	19.244	17.194
Base	0.000	0.000	0.000

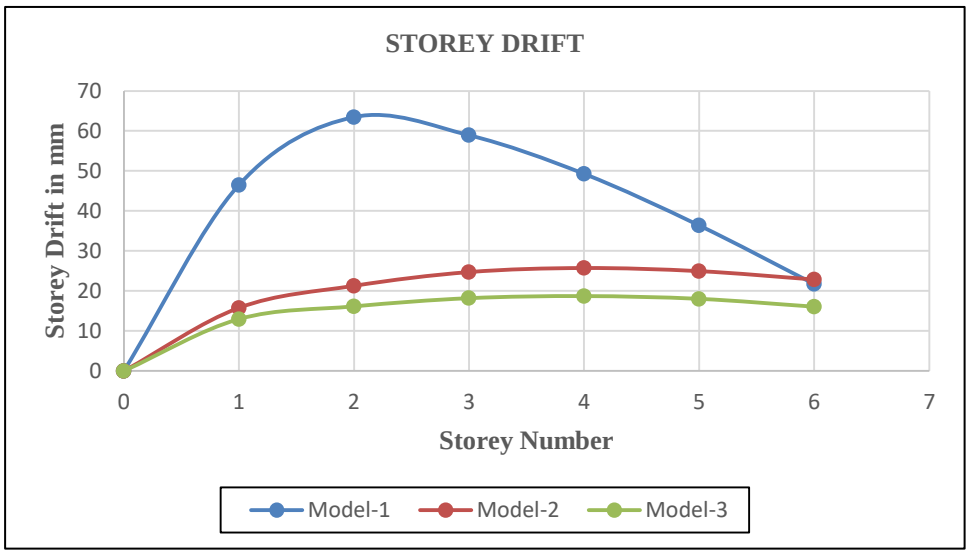

Fig. 6.

3. Peak storey shear:

TABLE IV. VARIATION OF PEAK STOREY SHEAR WITH STOREY NUMBER

PEAK STOREY SHEAR (KN)			
Storey Number	**Model-1**	**Model-2**	**Model-3**
6	8937.79	10681.15	10366.75
5	16994.80	21102.78	20768.82
4	23565.79	29174.97	29013.63
3	28707.94	35088.61	35158.78
2	32301.68	39003.57	39284.46
1	34044.48	40848.72	41275.75
Base	34044.48	40907.95	41351.70

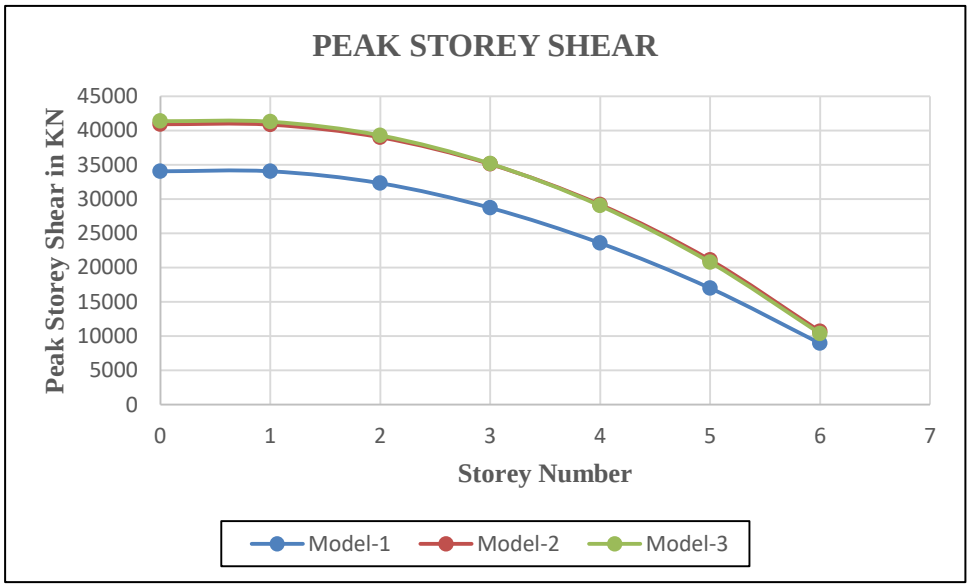

Fig. 7.

V. CONCLUSION

The behaviour of a RC building was analysed with shear wall at different locations and conclusion may be drawn from this study.

1) The least storey drift in each, x & z direction is to be found for Model-3and the maximum storey drift for Model-1 is found at storey 2nd.

2) The peak storey shear is maximum forModel-2 and minimum for Model-1

3) Analysis using software makes the structure as designer likes.

4) Structure can be compared and designed easily by using staad pro. and can be used to investigate the structure for strength & economy points of profit.

Therefore, the overall conclusion is shedding light toward the Model-3 that it is the most effective location among all other locations.

REFERENCES

[1] Ashish B. U. and Harshalata R. R., "Effect of Steel Plate Shear Wall on Behavior of Structure" (IJCER) Volume 5, Number 3, (2014), ISSN 2278-3652, pp. 295-300

[2] Atif M., Vairagade L. and Nair V., "Comparative study on seismic analysis of multistorey building stiffened with bracing and shear wall" (IRJET) Volume 02, Issue: 05, (Aug-2015), e-ISSN: 2395-0056, p-ISSN: 2395-0072

[3] Chouhan M. and Makode R.K., "Dynamic Analysis of Multi-Storeyed Frame-Shear Wall Building Considering SSI" (IJERA) Vol. 6, Issue 8, (August 2016), ISSN: 2248-9622, pp.31-35

[4] Gaurav S. and Jain R., "Shear Wall Position on Parameters of R. C. Multistorey Frame" (IJSTE) Volume 2,Issue 4, (October 2015),ISSN (online): 2349-784X

[5] Harne R. V., "Comparative Study of Strength of RC Shear Wall at Different Location on Multi-storied Residential Building"(IJCER)Volume 5, Number 4, (2014), ISSN 2278-3652, pp. 391-400

[6] Karnale A. B. and Shinde B. N., "Seismic Analysis of RCC Building with Shear Wall at Different Locations" (JCEET) Volume 2,Number 15, (July-September, 2015), ISSN: 2349-8404, e-ISSN: 2349-879X

[7] Mishra R.S., Kushwaha V. and Kumar S., "A Comparative Study of Different Configuration of Shear Wall Location in Soft Story Building Subjected to Seismic Load." (IRJET) Volume 02, Issue 07, (Oct-2015), e-ISSN: 2395 -0056, p-ISSN: 2395-0072

[8] Kumar R., Singh S. S., Sidhu S. and Gill H. S., "Seismic Behavior of Shear Wall Framed Buildings" (IJETMAS) Volume 2, Issue 1, (July 2014),ISSN 2349-4476

[9] Raju K. L. and Balaji K.V.G.D., "Effective location of shear wall on performance of building frame subjected to earthquake load" (IARJSET) Vol. 2, Issue 1, (Jan. 2015), ISSN (Online) 2393-8021, ISSN (Print) 2394-1588

[10] Sanada Y., Kabeyasawa T. and Nakano Y., "Analyses of reinforced concrete wall frame structural system considering shear softening of shear wall" (WCEE) Paper No. 3036, August 1-6, 2004

[11] Sud A., Shekhawat R.S. and Dhiman P., "Best Placement of Shear Walls in an RCC Space Frame Based on Seismic Response" (IJERA) March 2014, ISSN 2248-9622

[12] VenkateswarluM. and Basha S.K.Y., "Seismic Analysis of RC-Framed Building for Different Position of Shear Wall" (IJMETMR) Volume 3, No 4, (April 2016), ISSN 2348-4845

[13] Williams P.M. and Tripathi R. K., "Effect of Shear Wall Location on the Linear and Nonlinear Behavior of Eccentrically Loaded Buildings"(IJST)Vol 9(22), (June 2016), ISSN (Print) 0974-6846, ISSN (Online): 0974-5645