

Lateral Load Resisting Capacity And Performance Assessment Of RC Building With Shear Wall

Akkineni lakshmi Sindhu¹, B J N Satish², Valeti Ravikumar³, Ganguluri Manideepthi⁴, Kakani Sravya⁵

¹ PG Student, Department of structural engineering, Vignan deemed to be university, Sindhu.akkineni558@gmail.com

² Assistant professor, Department of Civil engineering, Vignan deemed to be university, satishbjnvignan@gmail.com

³ PG Student, Department structural engineering, Vignan deemed to be university, valetiravi55@gmail.com

⁴ PG Student, Department structural engineering, Vignan deemed to be university, manideepthi.ganguluri@gmail.com

⁵ PG Student, Department structural engineering, Vignan deemed to be university, kakanisravya@gmail.com

Abstract— Tall structures are vital in urban zones because of high cost of land, lack of open space and shortage of grounds. The tall structures are by and large high helpless against sidelong powers emerging out of seismic tremors. Outlining these structures to withstand these periodic horizontal powers is exceptionally costly; subsequently it isn't generally attractive. Fortified cement surrounded structures are satisfactory for opposing both vertical and the level load following up on them. These viable troubles call for presentation of shear walls. Shear walls ended up basic from the perspective of economy and control of horizontal diversion. In private development, shear dividers are straight outer dividers that normally from a crate which gives the greater part of the horizontal help of the building. The present work expects to exhibit the execution of structures considering RC shear divider with various positions and diverse heights. The building examined in this work is 30 stories strengthened solid minute opposing casing intended for gravity and seismic stacking. These building models are examined, utilizing ETABS 2016 programming, to the activity of parallel powers utilizing straight static and direct unique methodologies according to IS 1893(part I): 2002. The consequences of the examination, regarding lateral deformations, time period, base shear and base moment are acquired and the conclusions are drawn thereof.

Keywords— RC shear wall, linear static analysis, dynamic analysis, ETABS, models.

I. INTRODUCTION

Vibrations which are caused under the world's surface create waves which disturb the earth surface named as seismic tremors. It was said that seismic tremors won't execute human however structures which are not built in considering the quake powers do.60% of India lying in seismic tremor inclined zone at which there is a need of building and creating quake safe structures. In basic designing shear walls is a basic framework made out of supported boards (otherwise called shear boards) to counter the impacts of lateral load following up on a structure. Shear walls are intended to convey the breeze and seismic burdens are most normal burdens. This kind of powers can be opposed by the utilization of shear divider framework which is a standout amongst the most effective strategies for guaranteeing the parallel dependability of tall structures. Shear dividers resemble vertically-arranged wide pillars that convey earthquake loads downwards to the establishment. Shear walls in high seismic areas require unique enumerating.

A. Objectives

- To study the RC frame building with different storey heights and different configuration of shear wall under seismic effects.
- To analyze the various buildings using linear static as well as dynamic procedure of IS 1893 part II.
- To find the performance of the building with the help of time period & mode shapes, lateral deformations, base moment & base shear.
- To compare the effect of various parameters (height of building, position of shear wall) under seismic conditions.

II. BUILDING MODELLING

This chapter explains the procedure utilized as a part of the investigation. It explains the methodology in detail, various assumptions made, and details of the structures used in the investigation.

A 30 storied reinforced concrete frame building studied in Zone II, is taken for the purpose of investigation. The arrangement zone of building is 6 x 6m with 3m as height of each typical storey. It consists of 6 bays in X-direction and 6 bays in Y-direction. The total heights of the building were 90m.

The different models are explained below:

Model 1- 30 storey floor plan of the duel system with full shear wall on corner

Model 2- 30 storey floor plan of the duel system with half shear wall on corner

Model 3- 30 storey floor plan of the duel system with two third shear wall on corner

III. PHYSICAL DETAILS

- No of stories: G+30
- Storey height: 3 m
- Beam size in all directions: 230x500mm
- Column size: (i) 750x750mm
(ii) 600x600mm
(iii) 500x500mm
- Thickness of the slab: 125mm
- Grade of concrete: M25
- Grade of steel: Fe-500
- Density of concrete: 25KN/m³
- Shear wall thickness: 250mm

A. Building plans

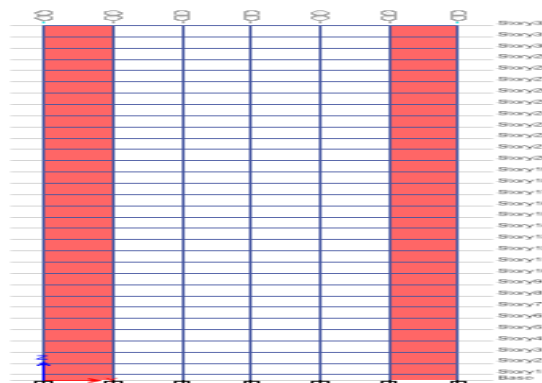


Fig: 3.1 elevation view of model 1

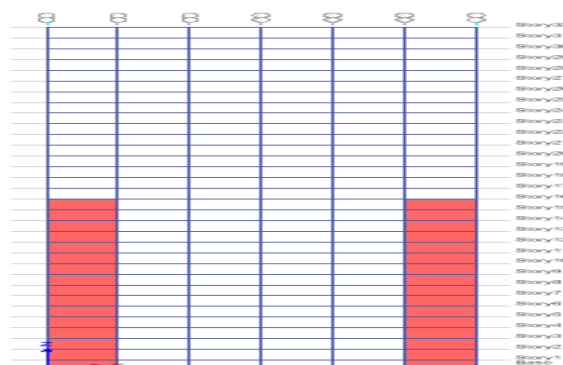


Fig: 3.2 elevation view of model 2

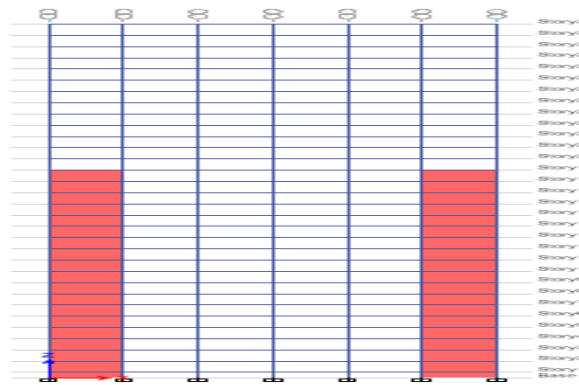


Fig: 3.3 elevation view of model 3

IV. METHODOLOGY

The stacking of building is subjected to dead load and live load according to IS 875 (section 1) (part2)1: 1987 separately. According to Indian code of training IS 1893 (section 1): 2002, IS 875 (section 3):1987, plan the multistorey private working against earthquake and wind loads. The member forces are computed with stack mixes given in IS 456: 2000. Seismic arrangements for the building:

- Seismic zone: II
- Response reduction factor(R): 5
- Importance factor(I): 1.0
- Soil type: medium soil
- Damping ratio: 5%

V. ANALYSIS AND RESULTS

The basic examination of all models has been done by using ETABS 2016. The comparison of various parameters such as maximum lateral displacement, time period, base shear & base moment by using non linear dynamic time history analysis by applying bhuj earthquake seismic record in both X & Y directions are studied.

A. Maximum Lateral Displacement

As per the height wise comparison lateral displacement for both X&Y directions of all models as follows:

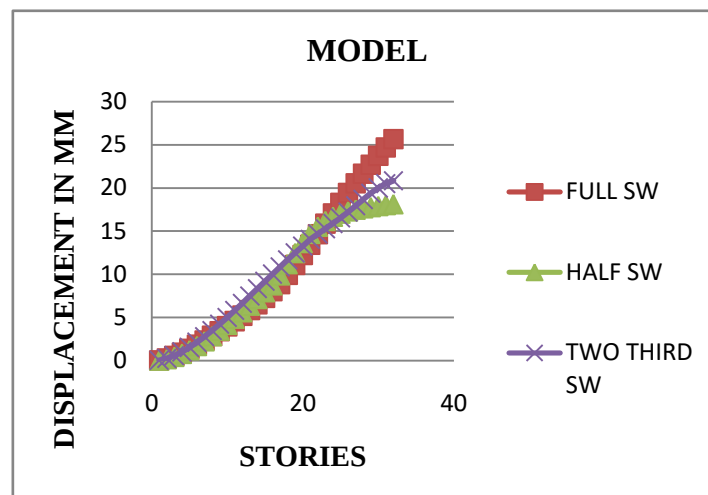


Fig: 5.1 lateral displacement of model (X direction)

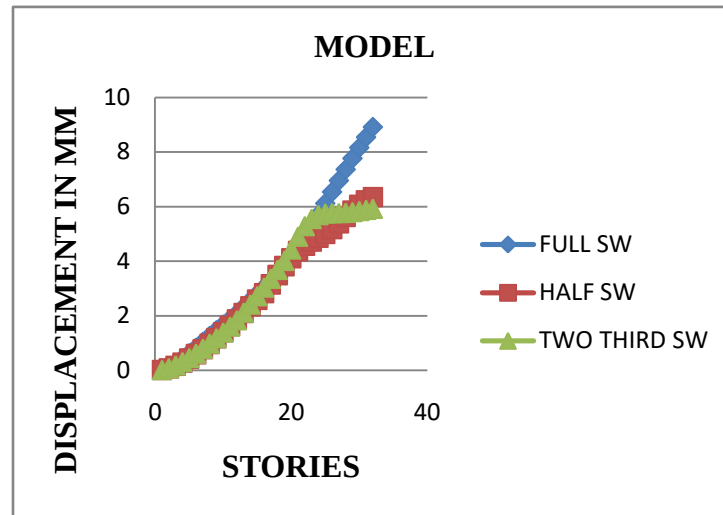


Fig: 5.2 lateral displacement of model (Y direction)

B. Time period

As per height wise comparative study the height with zero represents the model without shear wall based on time history analysis various time periods is:

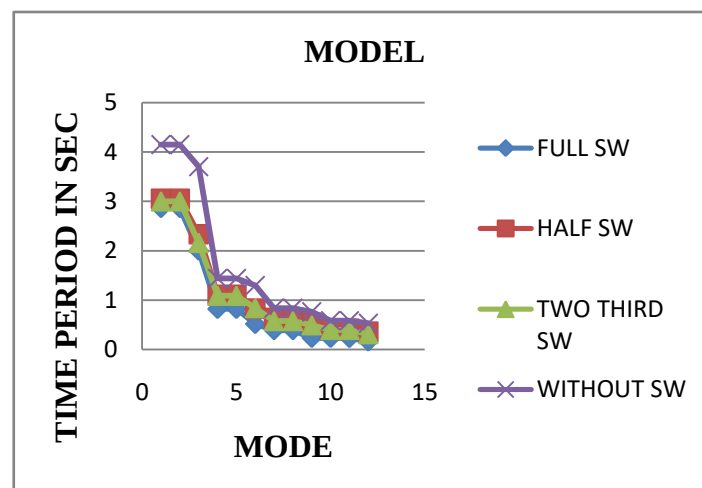


Fig: 5.3 Time period variation

C. Base Shear & Base Moment

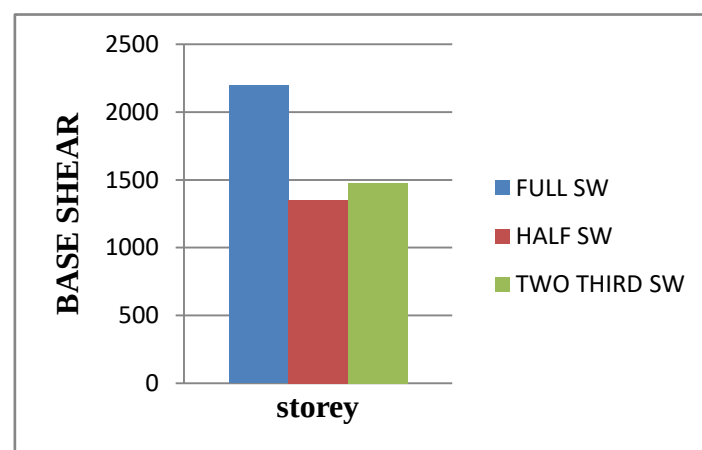


Fig: 4.4 base shear

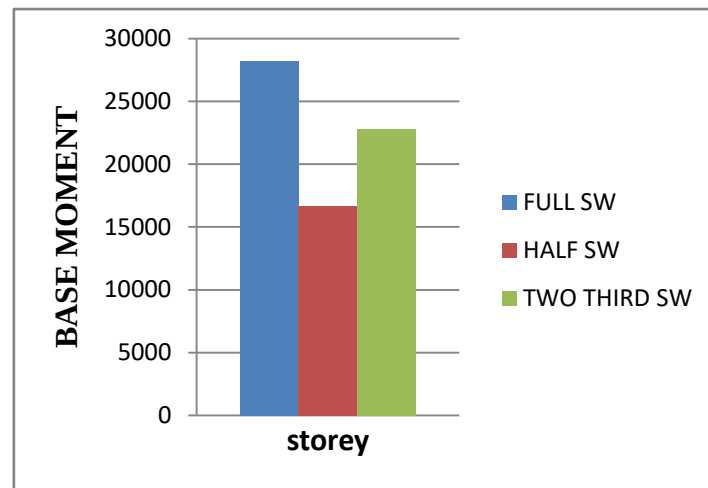


Fig: 4.5 base moment

VI. CONCLUSUIONS

- From the results of time history analysis it is evident that the displacement due to both gravity and lateral loads increased with storey height.
- The variation of displacement for full, two-third and shear wall has been observed and there is not much variation of displacements for the three configurations. Hence, the half shear wall can be economical to use in buildings to oppose parallel powers.
- From the time history analysis the base shear has decreased with increasing the shear wall height
- The usage of half shear wall may be economical and effective in the buildings for resisting seismic forces

REFERENCES

1. Anuj Chandiwalla, "Earthquake analysis of building configuration with different position of shear wall" ISSN 2250-2459, ISO 9001:2008 certified journal, volume 2, issue 12, December 2012.
2. Anshuman. S, Dipendu Bhunia, Bhavin Ramjiyani, "Solution of Shear Wall Location in Multi-Storey Building" international journal of civil and structural engineering, volume 2, no 2, 2011.
3. Romy Mohan, "Dynamic Analysis of RCC Buildings with Shear Wall" International Journal of Earth Sciences and Engineering ISSN 0974-5904, Volume 04, No 06 SPL, October 2011, pp 659-662
4. Bungale S. T, Wind and Earthquake Resistant Buildings Structural Analysis and Design, Monticello, New York 12701, U.S.A, 2005.