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# Seismic Analysis Of High Rise Rc Structures With Shear Wall System

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**ABSTRACT:** Reinforced concrete framing is the most common construction method in india.population and economic growth ,urbanization and lack of horizontal space , rising land values and the need for farmland have made towering structures very popular in indian architectural scenarios especially in cities. Buildings with tall structures must absorb lateral forces as well as gravity .many important cities in india are located in seismic zones so strengthening building against lateral forces is a must . the purpose of this study is to analyze the response of the high rise building to ground movement using response spectrum analysis . In ETABS where stud walls are cut , and various models are considered. Changes over time in stiffness , foundation shear ,level deviation and deformation of the top floor of the buildind were observed and compared

**Keywords:**-shear wall, seismic response , storeydisplacement,storeydrift,storeyshear

## I. INTRODUCTION

India is also the one fast growing or development economy that requires more demand to infrastructure facilities with the growing population and hence the demand for a land is getting increases day by day and also one imperative thing is that land available for agriculture and farming should remains intact as such to cater these verical development of the building is the only priority to cater these situation and also this type of structure must withstand with additional lateral wind and earthquake loads . an implementation to counter these requires changes to the existing structural systems . A number of studied have been carried out to explain the suitability of various side load resistance system for deformation and shear due to seismic and wind forces

Ground movement during an earthquake causes structural vibration and causes structural deformation in the building two different parameters associated with it are vibration frequency duration and amplitude and determine the overall response of the structure this overall response also depends on distribution of seismic forces within the structure which inturn depends on method used to calculate this distribution .various structural seismic analysis methods are effective in execiuting the above.

## II. OBJECTIVES

The main aim of the project isto study the seismic behavior of high rise RC structures subjected to seismic action as perIndianStandard codes.

1) To Analyze the seismic performance of the building with or without shear wall[case-1]

2) To Analyze the seismic performance of the building with different shapes of shear wall such as L , C , F Shapes
[case-2]
3) To Analyze the seismic performance of the building by placing the shear wall in the different location [case-3]

## III. METHODOLOGY

- LITERATUREREVIEW:A detailed literature review is made and searching the desired design codes ,
methods,and techniques Which will be used for the analysis
- DEFINIINGOBJECTIVESOFTHESTUDYAND MODEL GENERATION : 15 storey of the regular building is considered and it is analyzed with or without shear wall[case-1], with different shapes of shear wall[case-2], ,with different location of shearwall[case-3], in ETABS in which the building is subjected to seismic loads and Response spectrum method

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have been used and seismic zone v is considered for the analysis

- APPLYINGLINK(SHEARWALL)
- APPLYINGLOADS(TYP)ANDANALYSISO F MODELSTO OBTAIN THERESULTS
- COMPARISIONOFTHERESULTS WITH GRAPH ANDCONCLUDINGTHEWORK

## IV. MODELLING

The 15-storey building is having 30m x 30m plan dimension and 45m total height of building. The storey height is 3m. The typicalplanand 3d elevationareshowninthe following figures.Therearemainly 3 different cases ofmodelsforcomparativestudy,oneisformodel with/ without shear wall [case-1] andmodel with different shapes of shear wall[case-2] and model with different location of shear wall[case-3]..the same plan details are used for all the cases

TABLEI

| Buildingconsiderations | Details |
|---|---|
| Type of building | Residentialbuilding |
| No. of storeys | G+15 |
| Plandimension | 30mx30m |
| Floor to floorheight | 3.m |
| Slab thickness | 150mm |
| Sizeof thecolumn | 300x500mm |
| Size of thebeam | 500x600mm |
| Liveload | 3kN/m$^2$ |
| floorload | 1.5kN/m$^2$ |
| Gradeofconcrete | M30 |
| Gradeofsteel | Fe550 |
| Windspeed | 44m/s |
| Structure type | Specialmomentresistingframe |
| Seismiczone | V |
| Type of soil | Softsoil |
| Importancefactor | 1.2 |
| Responsereductionfactor | 5 |
| Dampngratio | 5% |

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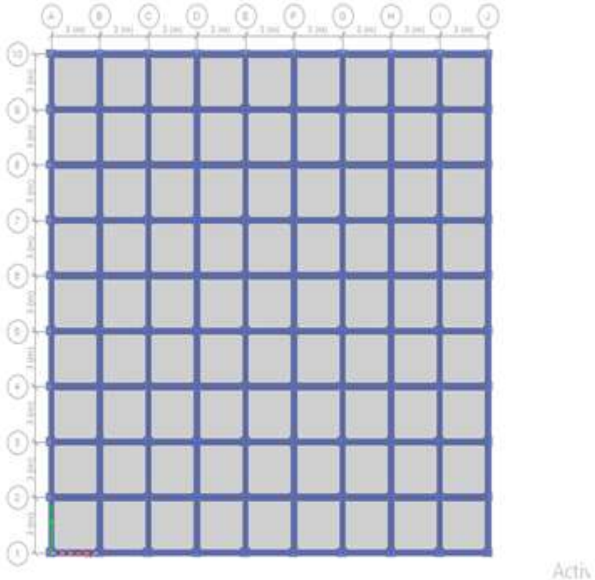
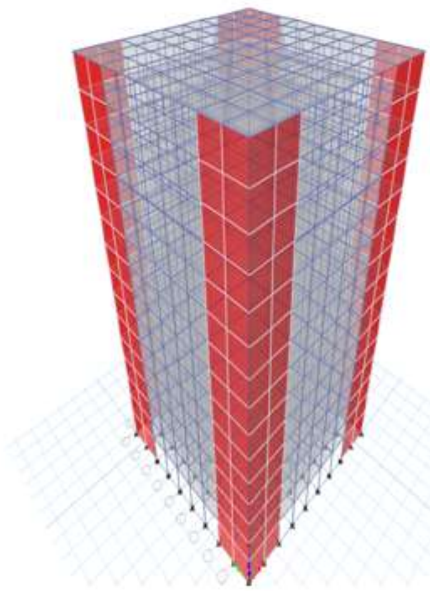
Case-1
M1-MODEL WITHOUT SHEAR WALL[CONVENTIONAL]
M2-MODEL WITH SHEAR WALL

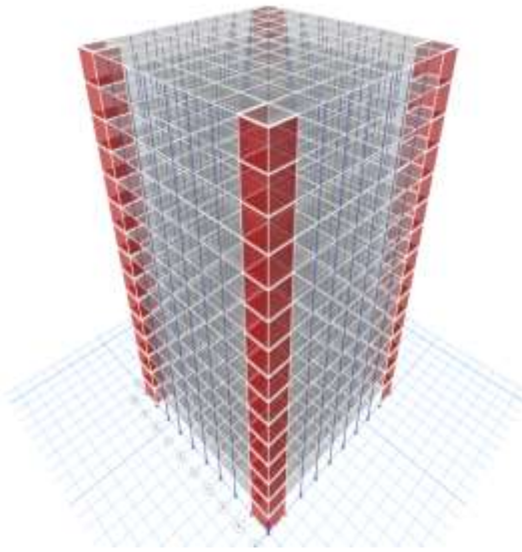


M1-MODEL WITHOUT SHEAR WALL
Fig;1BuildingPlan

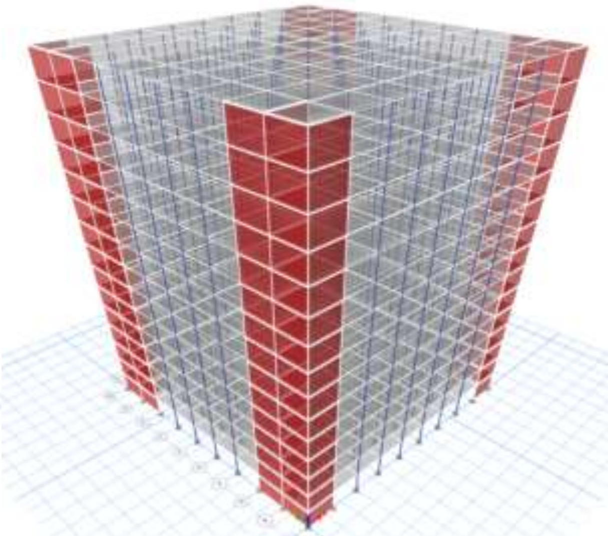


M2/M3-MODEL WITH SHEAR WALL[L shaped]
Fig;2 Building3DModel with Shearwall

Case-2
M3-MODEL WITHL SHAPED SHEAR WALL[M2]
M4-MODEL WITH C SHAPED WALL
M5-MODEL WITH F SHAPED SHEAR WALL



Fig;3 Building3DModel with C shaped Shearwall



Fig;4 Building3DModel with f shaped Shearwall

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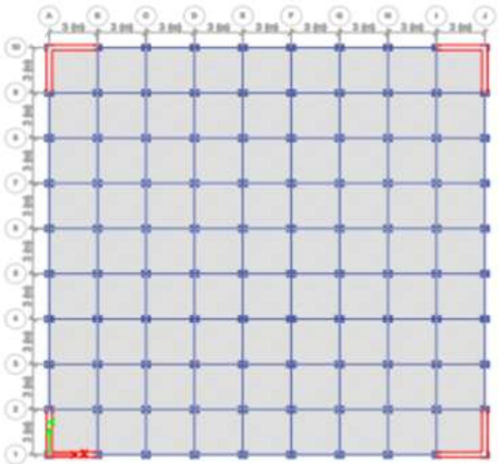
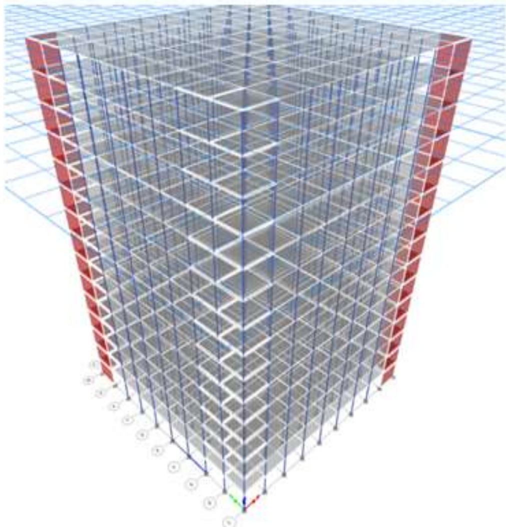
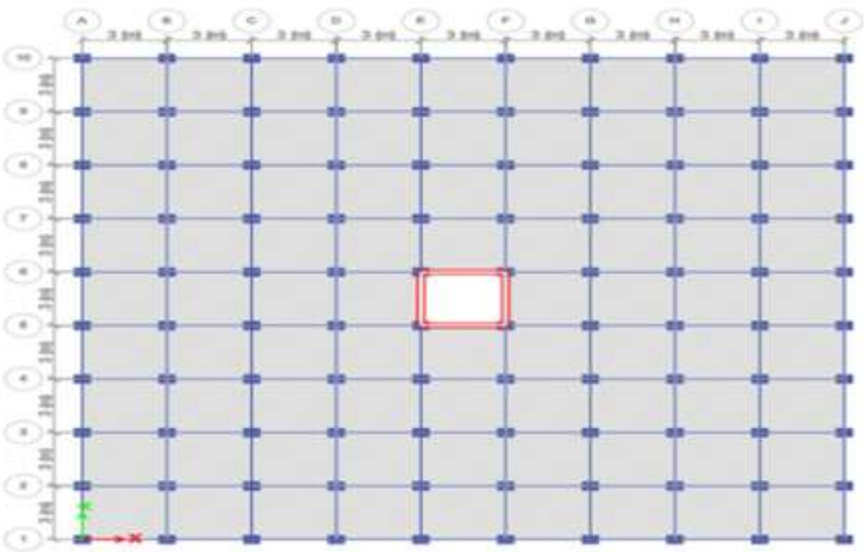
M4-MODEL WITH C SHAPED SHEAR WALL
M5-MODEL WITH F SHAPED SHEAR WALL

Case-3
M6-Model with 4 corner L shapedshear wall
M7-Model with 2 corner L shaped shear wall
M8-Model with core shear wall

Fig;5 Building3DModel with C shaped Shearwall Fig;6 Building3DModel with C shaped Shearwall

M6-Model with 4 corner L shapedshear wall
M7 -Model with 2 corner L shapedshear wall



Fig;7 BuildingplanModel with Core Shearwall

M6-Model with core shapedshear wall

## V. RESULTS AND CONCLUSION

All the models is done with reference to IS Codes and load analysis and response spectrum method has been used for the analysis and results are tabulated interms of displacement , drift , base shear and the same is compared by plotting the

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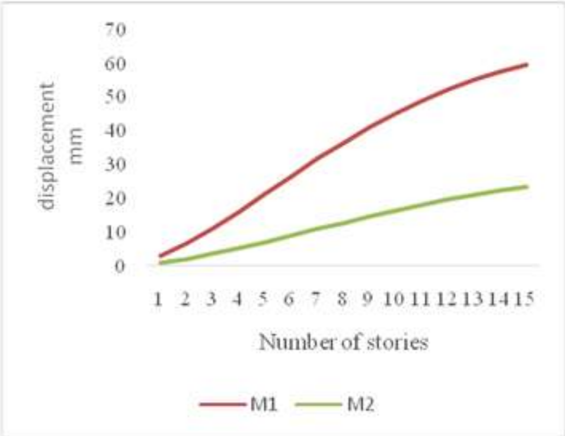
graph that is shown in the following figures

**A)Storey displacement**



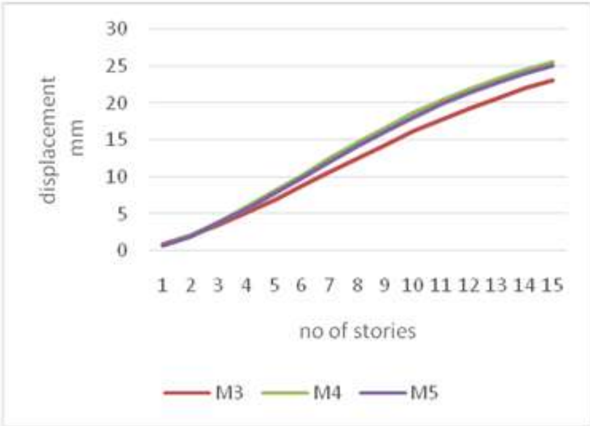
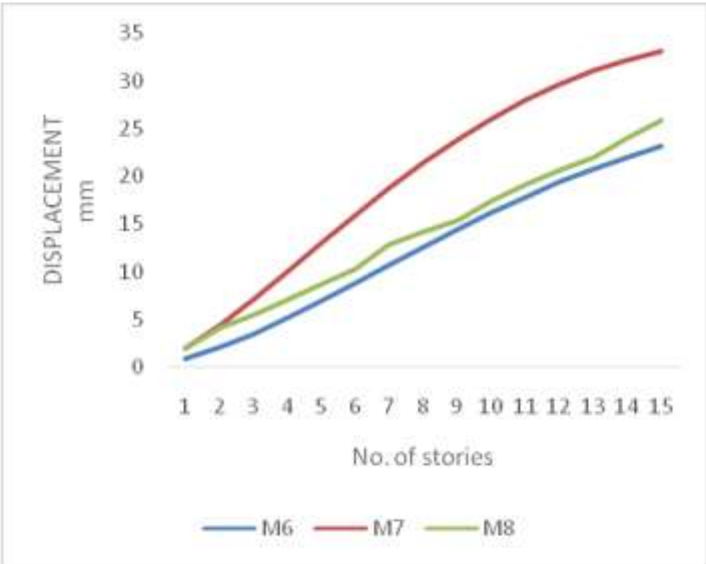




Fig8:StoreyDriftplotofmodel with and without shear wall




M1-MODEL WITHOUT SHEAR WALL
M2-MODEL WITH SHEAR WALL
M3, M4,M5 - MODEL WITH L ,C ,F SHAPED SHEAR WALL
M6 – MODEL WITH 4 CORNER L SHAPED SHEAR WALL
M7 - MODEL WITH 2 CORNER L SHAPED SHEAR WALL
M8 - MODEL WITH CORE SHAPED SHEAR WALL

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**B)Storeydrift**

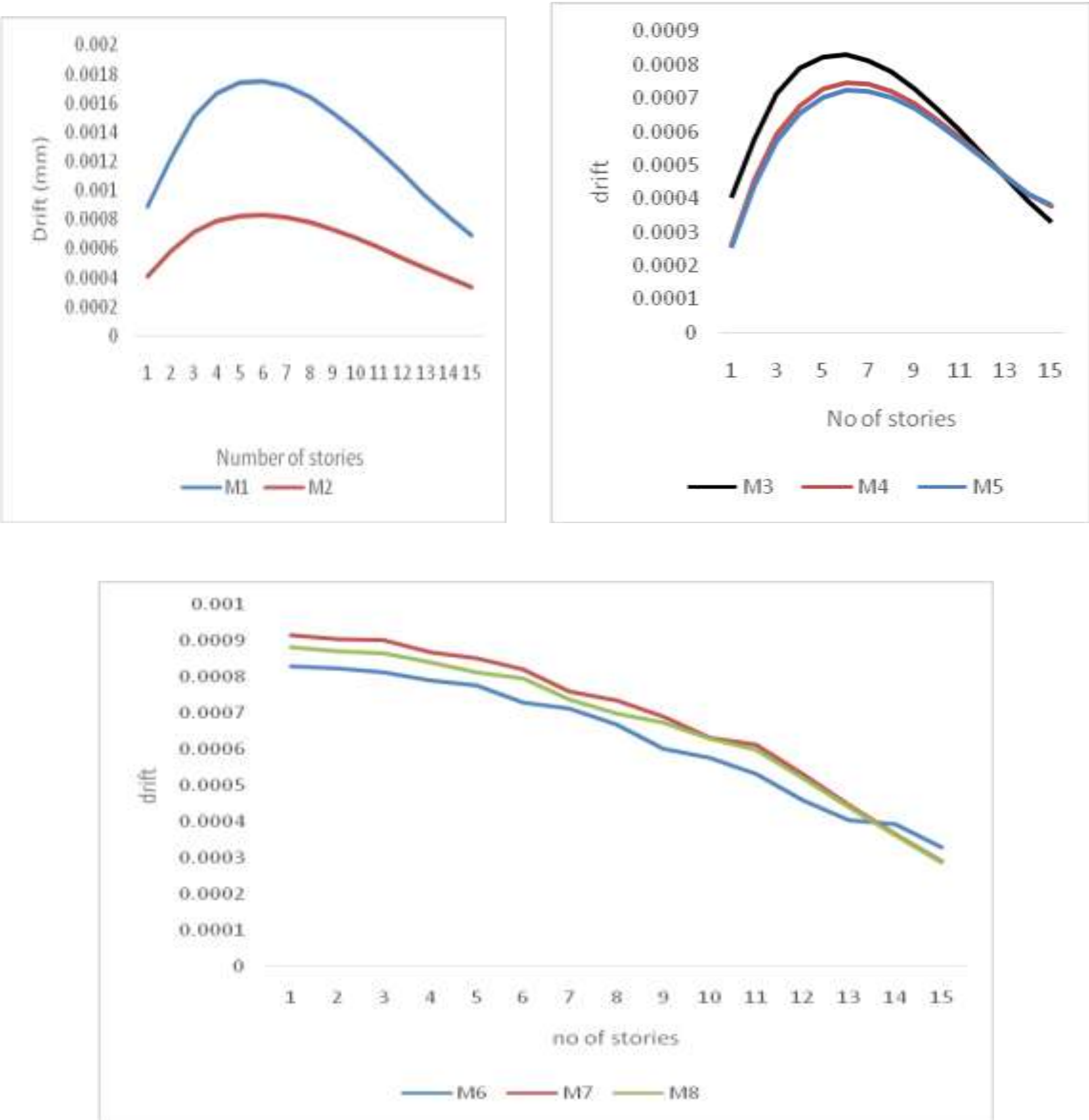


Fig9:Storey Drift plot of model with and without shear wall

**B)Storeyshear**

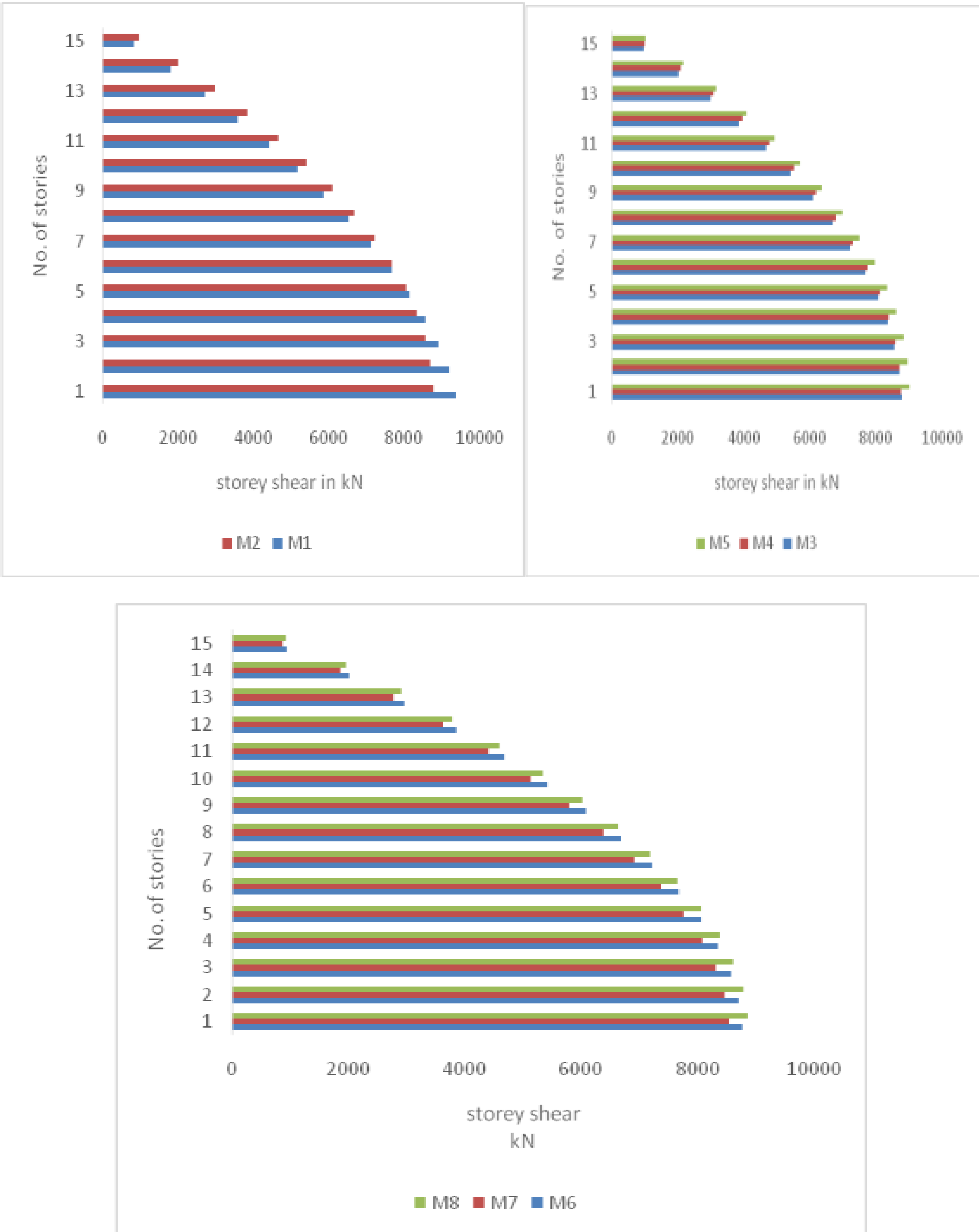


Fig10:Storeyshearplotofmodel with and without shear wall

## Conclusions

From the results and discussions the following conclusions can be made with respect to response spectrum analysis of G+15 storey high rise RC building with or without shear wall

A. Model with shear wall (M2) Shows reduction in displacement , drift substantially and also stiffness of the building increases in presence of building with shear wall
B. it is also observed that incase of RCC framed structure the lateral displacement is very high at top stories and considerably reduces down the storeys
C. Storey drift is the relative displacement which

means that drift of one level relative to other level below and it is observed that drift at top reduces in the model M2 approximately by 40%,

D. Model with L shaped shear wall (M3) Shows reduction in displacement , drift substantially and also stiffness of the building increases in presence of building with L Shaped shear wall compared to other two types of shear wall(M4 and M5)
E. Model M3 (model with L shaped Shear wall ) offers the less displacement and less storey shear and drift at top approximately reduces by 10% and hence it can be considered as the best interms of displacement, drift , base shear
F. Hence we can conclude that L shaped shear wall performs very better interms of displacement , drift in reducing lateral loads and steel requirement is very less and hence it is very economical.
G. Model with 4 Corner L shaped shear wall (M6) Shows reduction in displacement,drift substantially and also stiffness of the building increases in presence of building with 4 Corner L Shaped shear wall and it has highest stiffness and lowest time period and therefore higher storey shear compared to other two types of shear wall
H. Model with core type of shear wall(M8) also performs better interms of displacement and drift in reducing the lateral loads and it is said to be economical compared to M6 and M7
I. Model M6 (model with 4 corner L shaped Shear wall ) offers the less displacement and higher storey shear and M8 offers less drift and economical
J. Fromthe aboveit can beconcluded that shear wall playsavital rolein reducingandcontrollingthe seismic response ofthe structure which are constructed in earthquake prone areas

## REFERENCE

[1]. Shaik Kamal Mohammed Azam, Vinod Hosur “Seismic Performance Evaluation of Multistoried RCFramedBuildingswithShearWall”, Published at researchgate, www.sciencedirect Volume4, Issue1, January 2013.
[2]. Mr.basavalingappa, Mr.anilkumar B“A Study on Seismic analysis of High rise Buildings with and without floating columns and shear wall ”Volume47, part15 , 2021. http://doi.org/ 10.1016/j. matpr.2021.07.120
[3]. Mohammed Farookh, Dr.Hadihosseini Seismic analysis of high rise RCC building L shape shear walls at the centre core and corners with openings volume 49 number 5 july 2017 by IJETT(International journal of engineering trends and technology).
[4]. Pankaj Agarwal and Manish Shrikhande, “Earthquake Resistant Design of Structures”(PHI Private Limited, New Delhi, India).
[5]. Dr. Vinod Hosur, “Earhquake Resistant Design of Building Structures”(Wiley India Private Limited, New Delhi, India).
[6]. Naziya ghanchi & shilpa kewate Dynamic analysis of G+15 multisrtorey building With or without shear wall volume 10 isssue 6 june 2021 ”, Journal of Structural Engineering andMechanics.Vol 1: No.1, pp1-16.
[7]. ASCE (1982). “State-of-the-Art Report on Finite Element Analysis of Reinforced Concrete”, ASCESpecial Publication, New York, N.Y., U.S.A. 3. Can Balkaya and Schnobrich W.C (1993) “Nonlinear 3DBehavior of Shear-Wall Dominant RC Building Structures”, Journal of Structural Engineering andMechanics.Vol 1: No.1, pp1-16.
[8]. P.P.Chandurkar,Dr.P.S.Pajgade,“SeismicanalysisofRCCBuildingwithandwithoutshearwall”. IJMER,Vol.3,Issue3,May-june2013,pp-1805-1810,2013.
[9]. Balkaya and Schnobrich W.C (1993) “Nonlinear 3DBehavior of Shear-Wall Dominant RC Building Structures”, Journal of Structural Engineering andMechanics.Vol 1: No.1, pp1-16.
[10]. IS13920:1993Ductiledetailingofreinforcedconcretestructuressubjectedtoseismicforces.
[11]. IS1893 (Part1):2016 Criteriaforearthquakeresistantdesignofstructures.
[12]. IS 875(Part I):Criteria for dead loads
[13]. IS 875(Part II):Criteria for live loads
[14]. IS 875(Part III):Criteria for Wind loads
[15]. IS456(2000):PlainandReinforcedconcrete-codeofpractice
[16]. IS800(2007):Codeofpracticeforgeneral constructioninsteel
[17]. IS1893Part 1(2016)Criteriaforearthquakeresistantdesign ofstructures