ISSN (e): 2250 – 3005 || Volume, 07 || Issue, 01|| January – 2017 ||
International Journal of Computational Engineering Research (IJCER)

Analysis of G+7 Multistoried Building for Various Locations of Shear Wall Considering the Effect of Torsion Using Response Spectrum Method

Arpan Banerji[1], Vijay Kumar Shrivastava[2]
[1]M-Tech Student of Structural Engineering, Gyan Ganga Institute of Technology &Sciences Jabalpur,
[2]Asst. Prof., Department of Civil Engineering, Gyan Ganga Institute of Technology & Sciences Jabalpur

ABSTRACT

Dynamic Analysis of a 8-storey building is done in this research paper and for this a irregular building has been taken into consideration. The research paper also considers the effect of change in the position of shear wall in the building plan and its effect on the structure during the analysis. Overall 8 cases of the various positions of shear wall has been considered separately and the comparative results has been seen. The building which we have taken for analysis is of irregular shape resembling the letter "L" in plan and has a height of 28.8 m. The dimensions are 25m along x direction and 30m along z direction. STAAD Pro v8i has been used for the dynamic analysis of 8 storied building. The analysis has taken into consideration the effect of torsion also and have been analysed as per IS 1893(Part 1): 2002. The building structure is considered to be made of M-20 grade concrete and Fe-415 grade steel. The factors considered for comparison are Peak storey Shear along both directions, Peak storey Shear along both directions considering torsion, Average Displacement along both directions and Drift along both directions. The structure considered is in Zone III in medium soil.

Keywords: *Shear Walls, Dynamic Analysis, Response Spectrum Method, SRSS combination, Seismicity, Peak Storey Shear, Average Displacement, Storey Drift, Multi Storey Building*

I. INTRODUCTION

The main methods of seismic analysis as per IS:1893 (Part 1)-2002 described as:

1.1. Equivalent Lateral Force method of analysis

In general most of the seismic analysis of multi-storeyed structures are done on the basis of the lateral horizontal force which is assumed to be equivalent to actual dynamic loading.
Hence is calculated the Base Shear corresponding to fundamental mode of vibration and corresponding mode shape.

1.2. Response Spectrum method of analysis

This method is applied to those structures where the modes of vibration other than fundamental mode significantly affect the structure's response.
Hence the response in this method of a MDOF(Multi Degree Of Freedom) structure is expressed as a superposition of the modal response ,where each modal response is generally determined from the spectral analysis of SDOF (Single Degree Of Freedom) system, which are then combined to compute the total response.

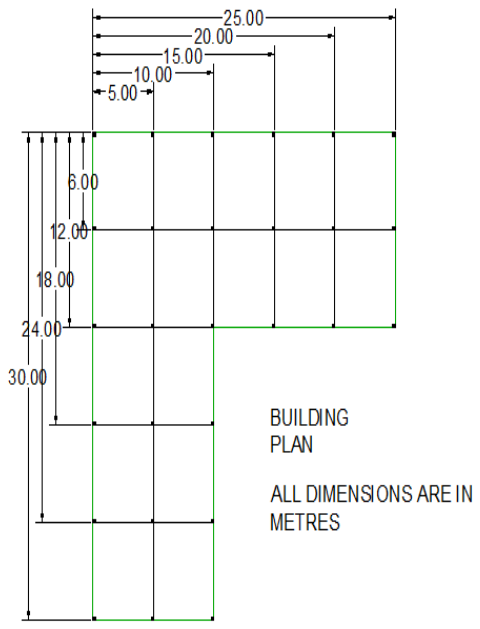
1.3. Time History method of analysis

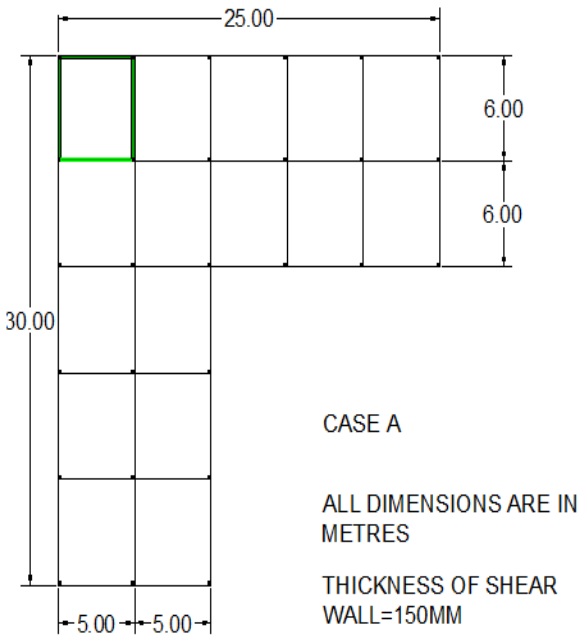
A linear time history analysis generally overcomes all the disadvantages of modal response spectrum analysis, provided non linear behaviour is not involved.
This method requires greater efforts in computing and calculating the response at discrete times.
Relative signs of the response quantities are preserved in the response histories which are an essential aspect when effects in interaction are considered in design among stress resultants.

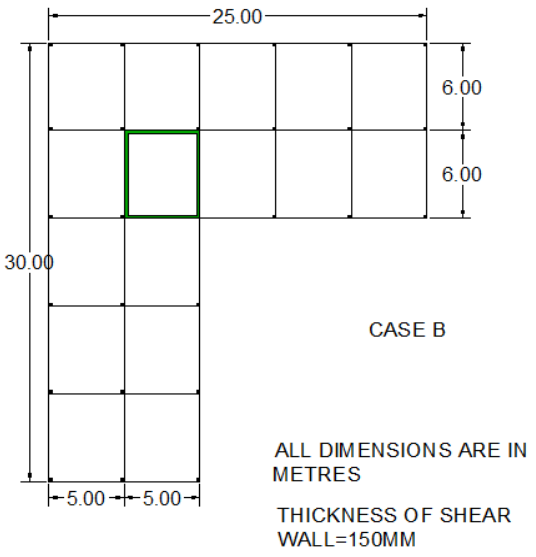
II. PROBLEM FORMULATION

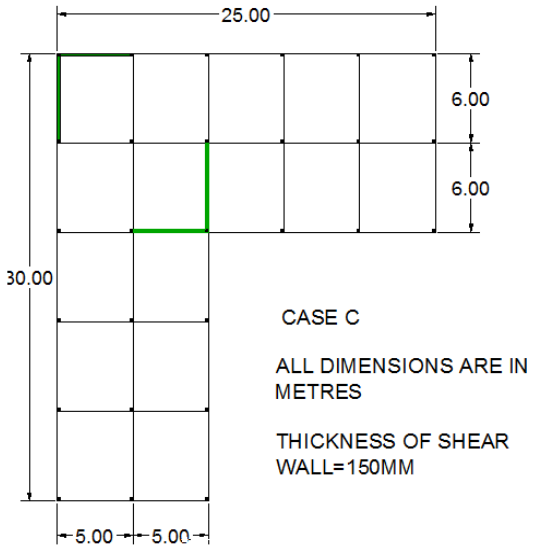
Grade of Concrete: M-20
Grade of Steel : Fe-415

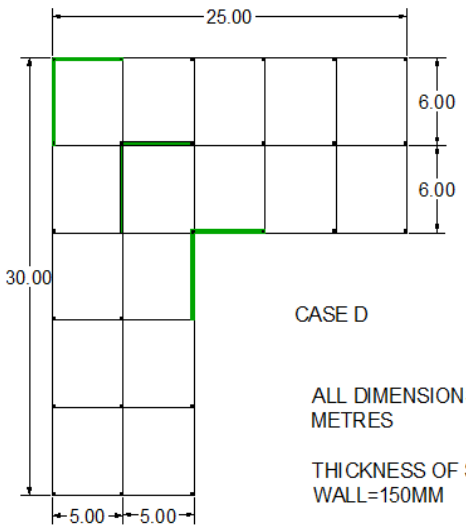
Height of Building: 28.8 m for 8 storied building
Thickness of Shear Wall: 150 mm
Method used for analysis: Response Spectrum Method
Dead Load considered: 4.25 KN/m^3
Live Load considered: 4 KN/m^3
Dimensions of beam: 450mm X 600mm
Dimensions of Column: 380mm X 530mm
Zone Factor Z considered: 0.16 for Zone III
Response Reduction Factor R considered: 3 for Ordinary Moment Resisting Frame
Importance Factor I considered: 1
Soil Type considered: Medium Soil
Response Acceleration Coefficient S_a/g: 2.5
Damping considered: 5%
Maximum Dimension along X direction: 25 m
Maximum Dimension along Z direction: 30 m







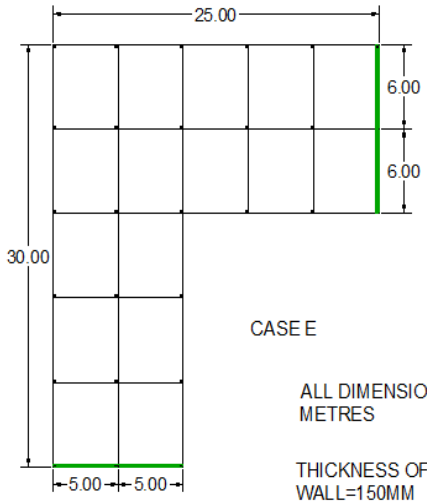




CASE D

ALL DIMENSIONS ARE IN METRES

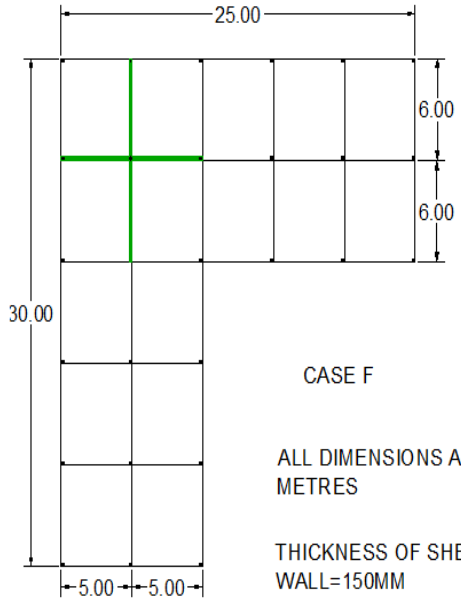
THICKNESS OF SHEAR WALL=150MM



CASE E

ALL DIMENSIONS ARE IN METRES

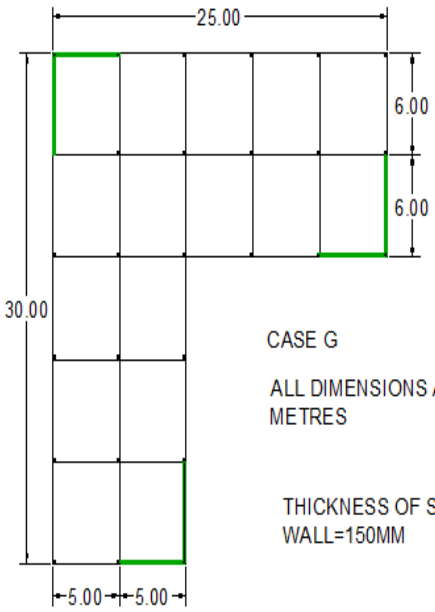
THICKNESS OF SHEAR WALL=150MM



CASE F

ALL DIMENSIONS ARE IN METRES

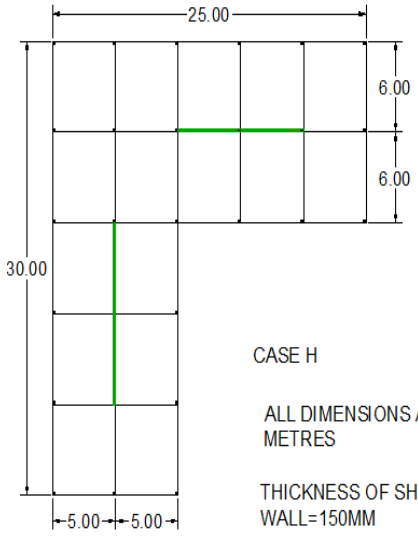
THICKNESS OF SHEAR WALL=150MM



CASE G

ALL DIMENSIONS ARE IN METRES

THICKNESS OF SHEAR WALL=150MM



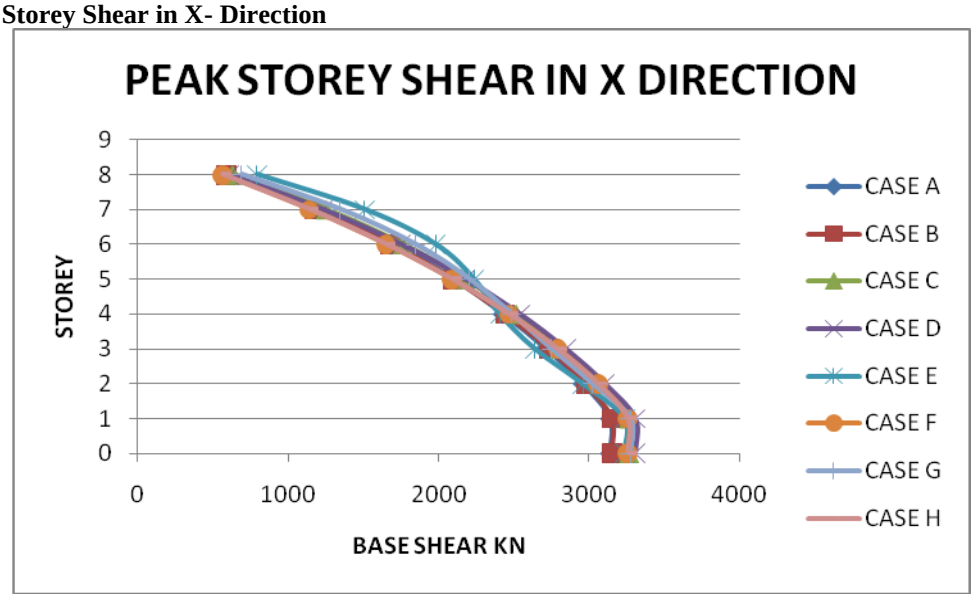
CASE H

ALL DIMENSIONS ARE IN METRES

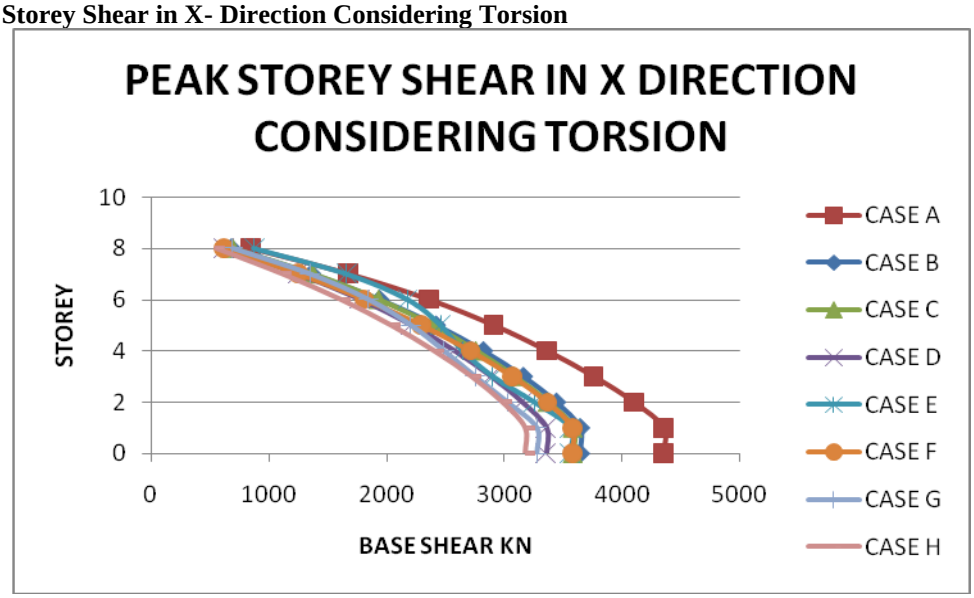
THICKNESS OF SHEAR WALL=150MM

III. RESULTS

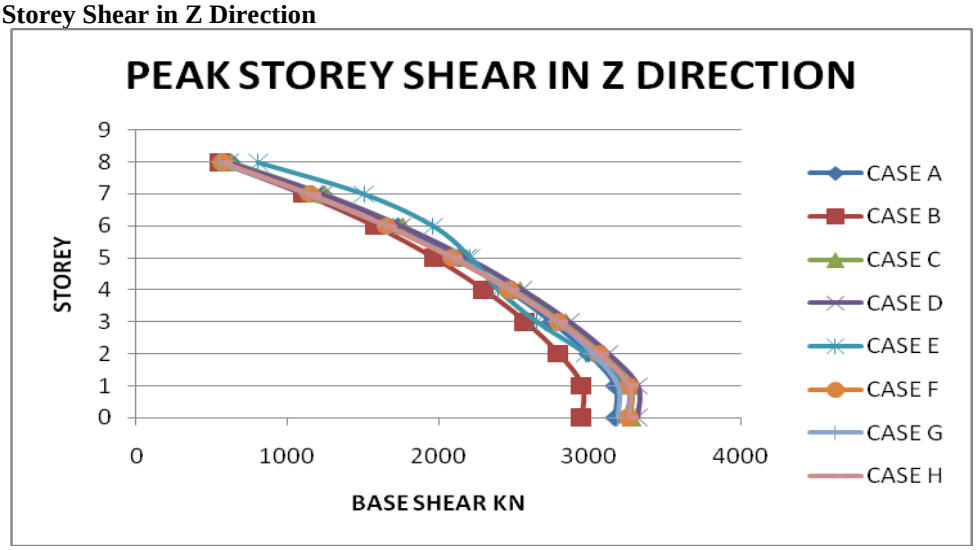
3.1 Peak Storey Shear in X- Direction



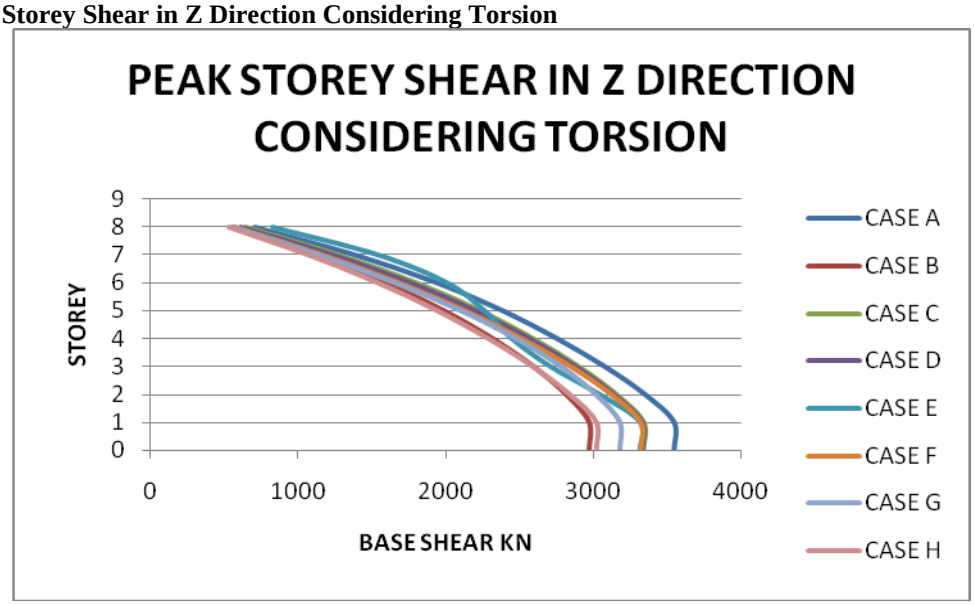
3.2 Peak Storey Shear in X- Direction Considering Torsion



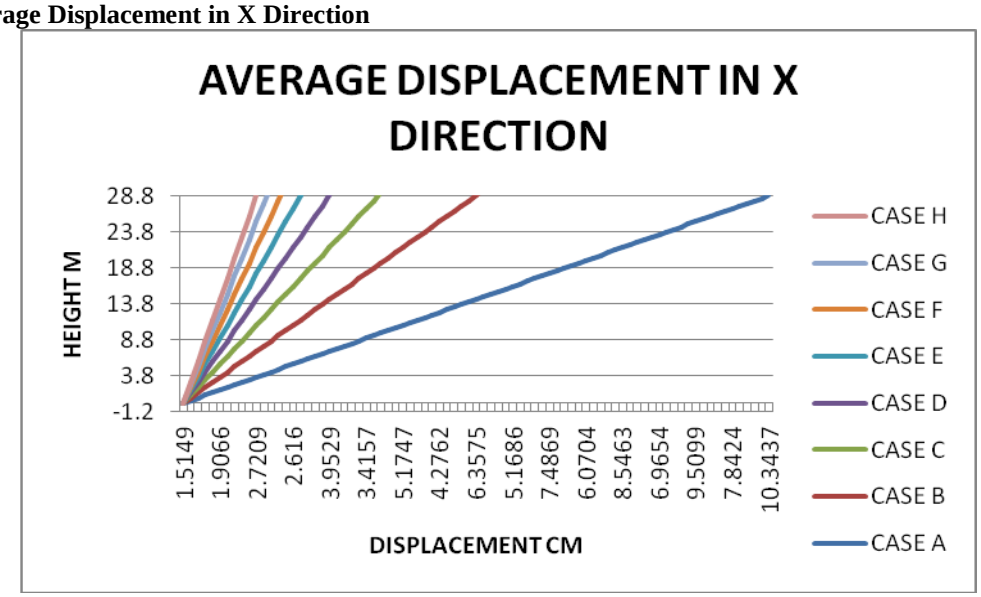
3.3 Peak Storey Shear in Z Direction



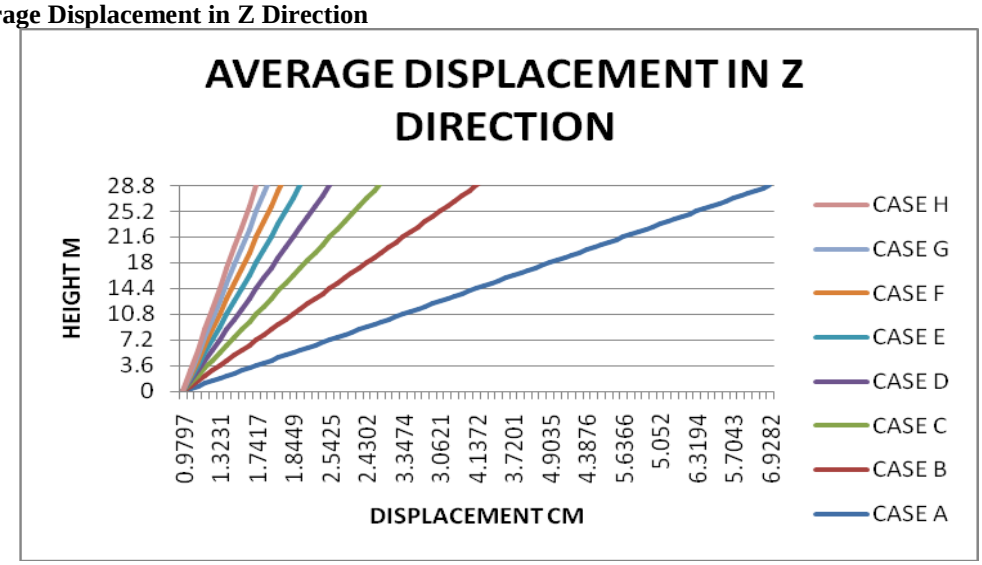
3.4 Peak Storey Shear in Z Direction Considering Torsion



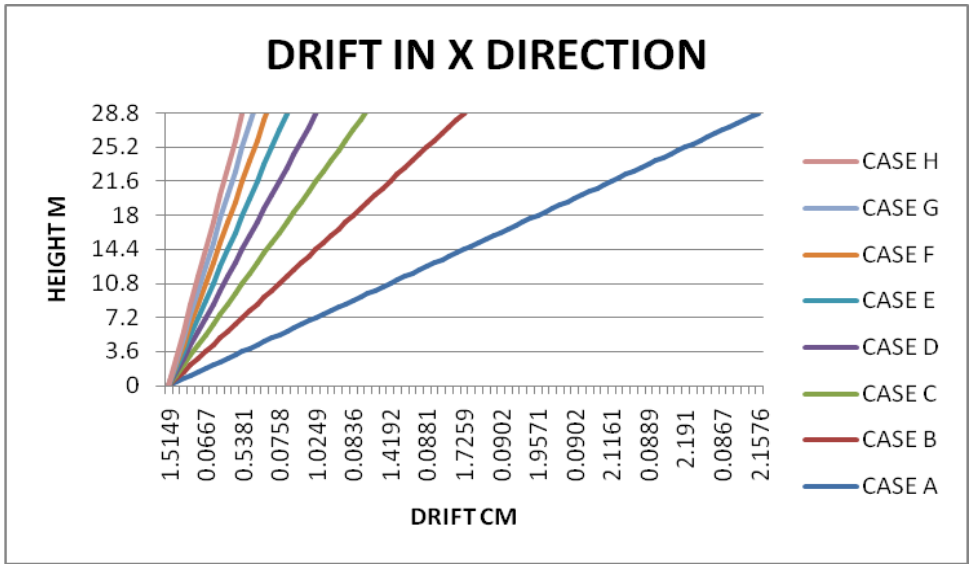
3.5 Average Displacement in X Direction



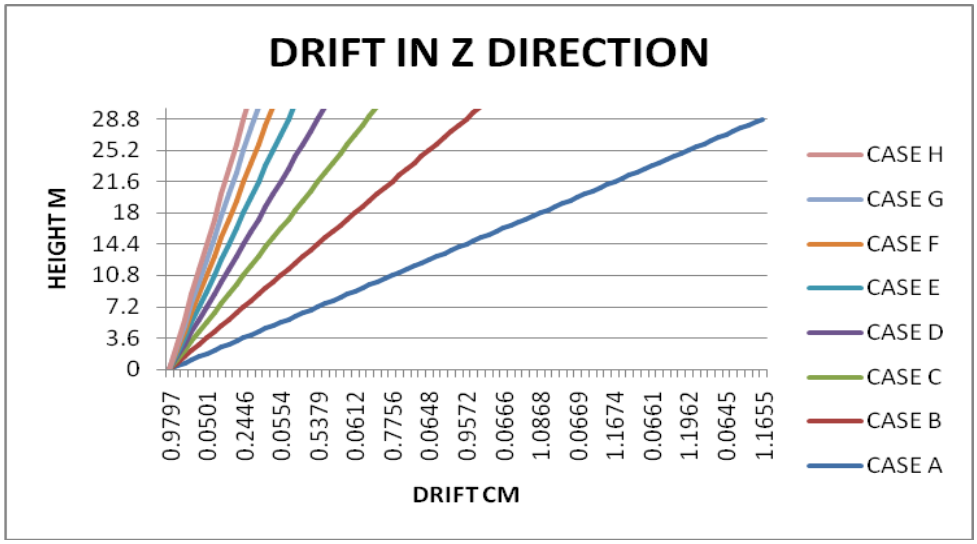
3.6 Average Displacement in Z Direction



3.7 Drift in X Direction



3.8 Drift in Z Direction



IV. CONCLUSION

4.1. Its concluded that considering the case of Peak Storey Shear and peak storey shear considering torsion along both the horizontal directions, Case H gives the best results.

4.2. Its seen that considering the parameter of Average Displacement along both the horizontal directions , Case G gives the best results.

4.3. Its seen that considering the parameter of Drift along both the directions, Case G gives the best results.

4.4 Hence the best combination of all is CASE H

REFERENCES

[1]. Anuj Chadiwala. Earthquake Analysis of Building Configuration with different positions of Shear Wall. IJETAE Vol. 2, Issue 4, June 2012

[2]. Prof. Wakchaupe M R and Nagare Y U. Effect of Torsion Consideration in analysis of Multi-Storey Frame. IJERA Vol 3,Issue 4, July 20-24 ,2008

[3]. P S Kumbhare and A C Saoji. Effectiveness of RCC Shear Wall for Multi-Storey Building. IJERT Vol. 1, Issue 4, June 2012

[4]. S R. Damodarasamy and S. Kavita. Basics of Structural Dynamics and A seismic Design. PHI Publications, 2009

[5]. Bungale S Taranath. Structural Analysis and Design of Tall Buildings. McGraw Hill Book Company,1978

[6]. Bungale S Taranath. Reinforced Concrete Design of Tall Buildings. CRC Press Taylor and Francis Group, 2010

[7]. Bungale S Taranath. Wind and Earthquake Resistant Buildings Structural Analysis and Design. Marcel Dekker, 2005

[8]. Dr. Vinod Hosur. Earthquake Resistant Design of Building Structures. Wiley India Pvt. Ltd. Publications, 2014

[9]. Pankaj Agarwal and Manish Shrikhande. Earthquake Resistant Design of Structures. PHI Learning Private Ltd., 2015