International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 05 Issue: 04 | Apr 2018 www.irjet.net p-ISSN: 2395-0072

PARAMETRICAL STUDY OF DIFFERENT SHAPES OF SHEAR WALL IN HIGH RISE SYMMETRICAL BUILDING

Rajesh G. Patel[1], Bhavin S. Bhagat[2]

[1]*P.G. Student, Department of Civil Engineering, HJD ITER, Kera, Gujrat, India*
[2]*Assistant Professor, Department of Civil Engineering, HJD ITER, Kera-Kutch, Gujrat, India*

Abstract - *The multi storey building with different shapes of flanged shear wall I, T, U, Z for 15, 20, 30 storeys building is taken for the similar total volume of concrete for the analysis. Earthquake zone III (Ahmedabad) & zone V (Bhuj) with soil condition I (Hard soil) & soil III (loose soil) are consider to compare the results in terms of time period, storey drift, storey shear, storey displacement. The analysis is done by using Response spectrum method. For dynamic earthquake (IS 1893-2002) and (IS 13920-1993) are used respectively in ETABS V16 software.*

Key Words: **I-shear wall, T-shear wall, U-shear wall, Z-shear wall, similar total volume of concrete, storey shear, storey drift, storey displacement, Time period, Dynamic analysis, Response spectrum method, ETABS**.

1. INTRODUCTION

Recent days, structures are becoming more slender and susceptible to sway and hence dangerous in the earthquake. Engineers and researchers have worked out in the past to make the structure as earthquake resistant. After many practical studies it has shown that use of flanged shear walls in the building configuration has tremendously improved the performance of the structure in earthquake. Generally shear walls are used in the structures are I, T, U, Z, H, L, C, BOX shape, SWSTIK shape etc. In Shear wall the flanged is provided to increase the stiffness, resistance to bending and ductility. The effect of flanged shear wall in control of displacement, tension and pressure declared advantages of flanged shear wall.

2. Research significance

In high rise building with shear wall it is necessary to analyze dynamic loads in both the direction as well as lateral loads of the building.

In this paper four different shapes of shear wall with different flange and web thickness for the similar total volume of concrete are compared in terms of storey displacement, storey shear, time period and storey drift. There are two locations Ahmedabad and Bhuj are considered to analyze the lateral loading. The main object of the research work is to study which shape of flanged shear wall is better to resist lateral load and dynamic load.

3. MODELING OF STRUCTURE

Here the study is carried out for the behavior of different shapes of flanged shear wall for 15, 20, 30 storey building. The analysis of the building by RSM(Response Spectrum Method) by which it gives the seismic response of the structure by considering the various seismic zones such as Zone III and Zone V with different soil conditions as soil type I and III (Hard, Soft). In this study, different research parameters like time period, storey displacement, storey shear and storey drift are analyzed. The analysis is done by using ETABS V16 software.

➢ Building Plan And Dimension Details

- Typical Plan Dimension 30m*48m
- Typical Storey Height 3m
- Bottom Storey Height 4m
- Height of Structure 61m
- Storey 20
- Thickness of wall 230mm
- Thickness of slab 150mm
- Size of Column 900mm*900mm
- Size of Beam 300mm*600mm
- Concrete Grade M-30
- Steel Grade Fe-500
- Concrete Density 25kN/m^3
- Steel Density 78.5kN/m^3
- Density of Masonry 20kN/m^3
- Soil Type I & III
- Zone III & V
- Importance Factor 1.2
- Response Factor 5
- Damping 0.05
- Shear wall conc.volume 219.6m^3

➢ Load Data:

- Dead load on slab 1.5kN/m^3
- Imposed load on slab 3kN/m^3

Table 1: Detail and Dimension of different shapes of Shear wall

Shape	Model No	Flange length (m)	Web length (m)	Total length (m)	Thickness (m)
I	1	12	3	15	0.240
	2	18	3	21	0.171
	3	12	6	18	0.200
T	1	6	3	9	0.400
	2	12	3	15	0.240
	3	6	6	12	0.300
U	1	12	6	18	0.200
	2	18	6	24	0.150
	3	6	6	12	0.300
Z	1	6	3	9	0.400
	2	12	3	15	0.240
	3	6	6	12	0.300

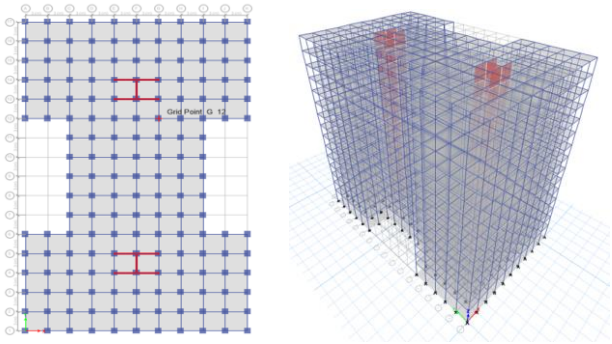

Fig -1: 20 Storey I-1 shear wall Building Plan & 3D view

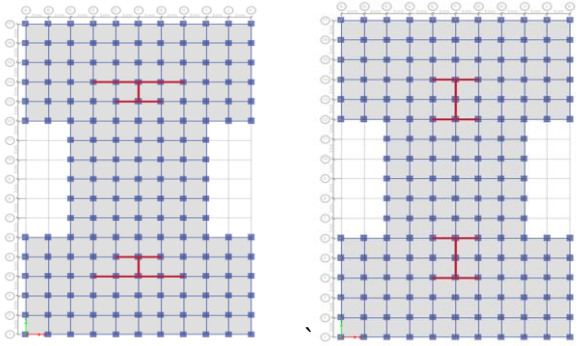

Fig -2: 20 Storey I-2 and I-3 shear wall Building Plan

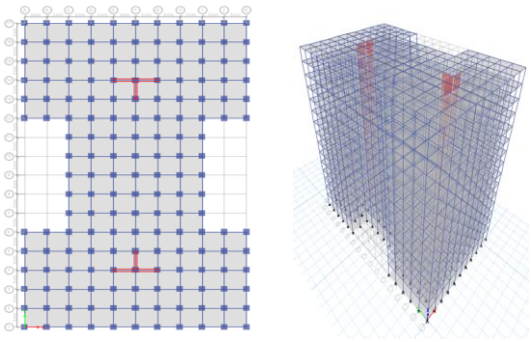

Fig -3: 20 Storey T-1 shear wall Building Plan & 3D view

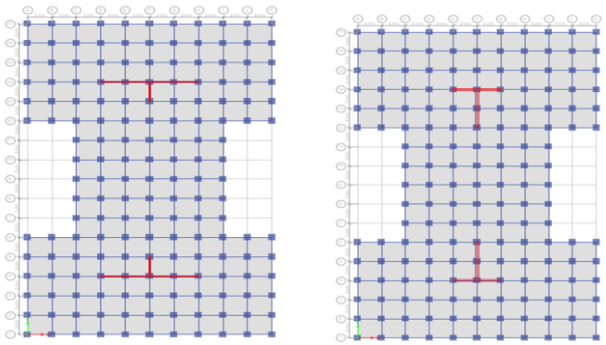

Fig -4: 20 Storey T-2 and T-3 shear wall Building Plan

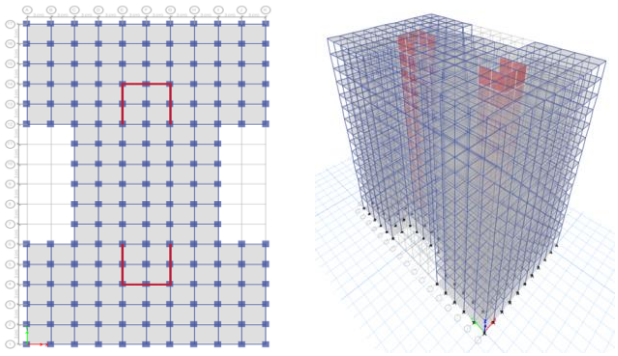

Fig -5: 20 Storey U-1 shear wall Building Plan & 3D view

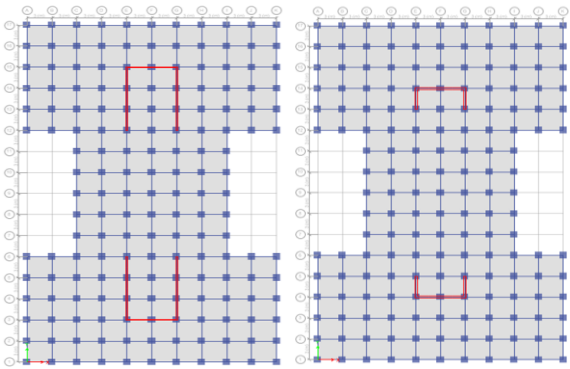

Fig -6: 20 Storey U-2 and U-3shear wall Building Plan

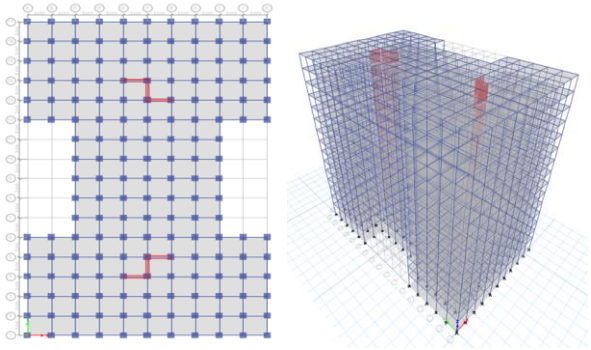

Fig -9: 20 Storey Z-1 shear wall Building Plan & 3D view

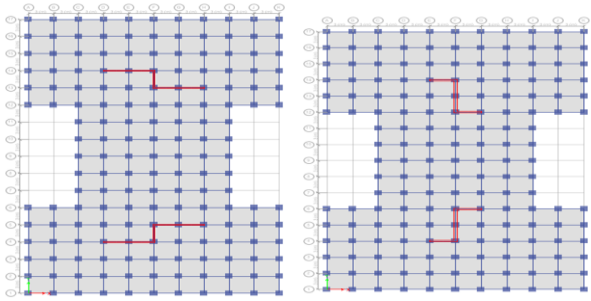

Fig -11: 20 Storey Z-2 shear wall Building Plan & 3D view

4. RESULTS AND DISCUSSIONS

Response spectrum and Seismic response of the buildings are studied using ETABS 2016 by Dynamic analysis. The results of storey shear, storey displacement, storey drift and time period values are taken from the software. Here the results are shown for seismic zone III & V with soil type I & III. The comparison between all models for the parameters mentioned above presented in Graphs below.

4.1 STOREY DISPLACEMENT

The following graphs are showing results for storey displacement in EQ X & EQ Y direction.

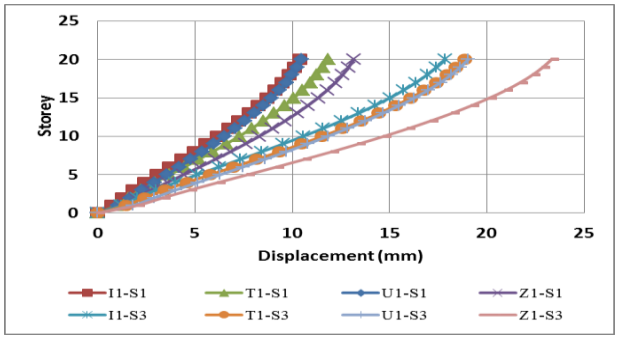

Chart -1: Storey displacement for model-1 in zone III in EQ X direction

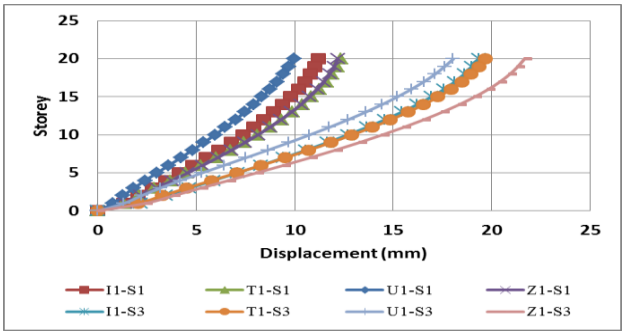

Chart -2: Storey displacement for model-1 in zone III in EQ direction Y

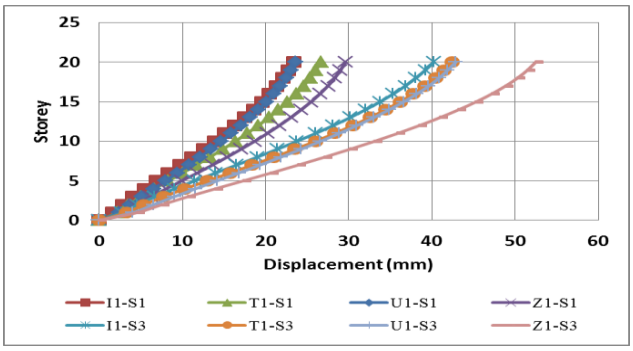

Chart -3: Storey displacement for model-1 in zone V in EQ X direction

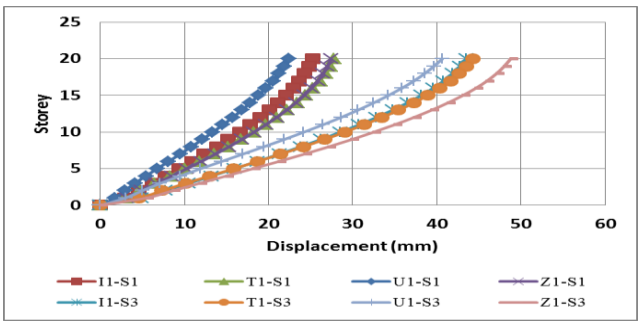

Chart -4: Storey displacement for model-1 in zone V in EQ Y direction

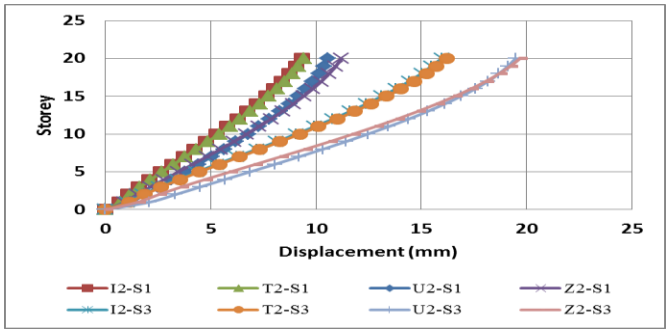

Chart -5: Storey displacement for model-2 in zone III in EQ X direction

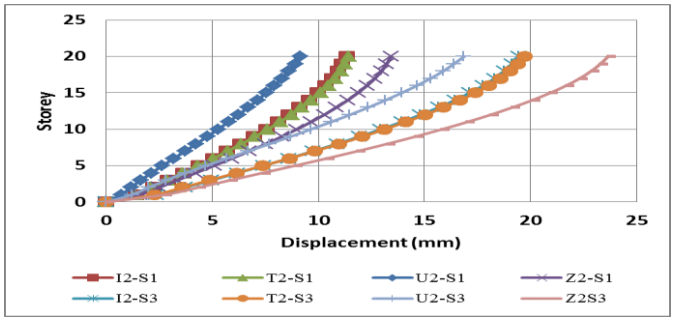

Chart -6: Storey displacement for model-2 in zone III in EQ Y direction

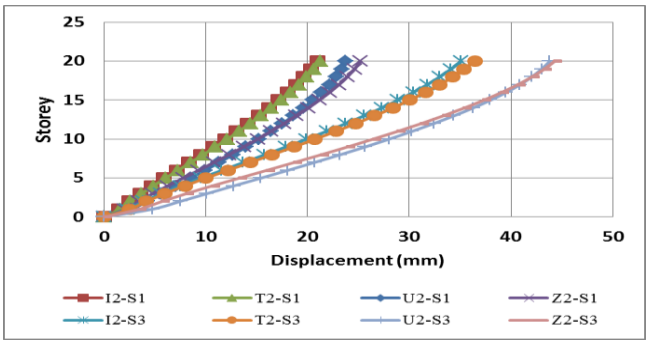

Chart -7: Storey displacement for model-2 in zone V in EQ X direction

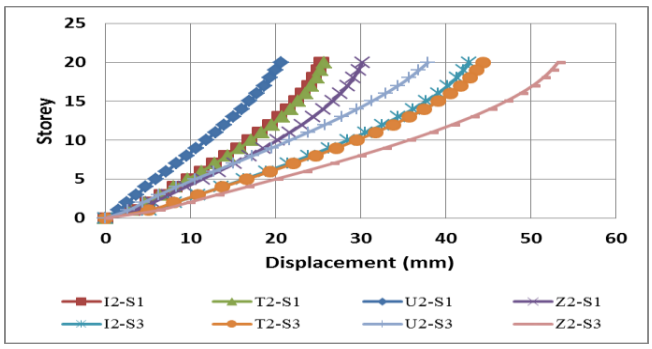

Chart -8: Storey displacement for model-2 in zone V in EQ Y direction

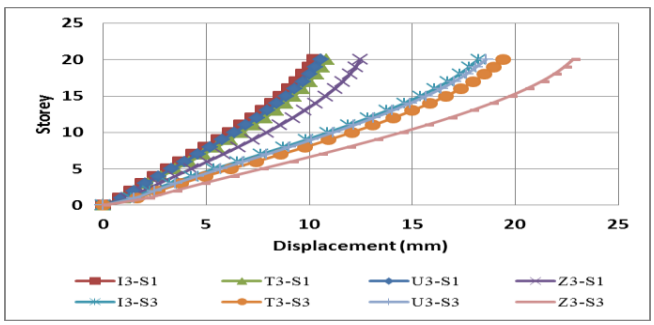

Chart -9: Storey displacement for model-3 in zone III in EQ X direction

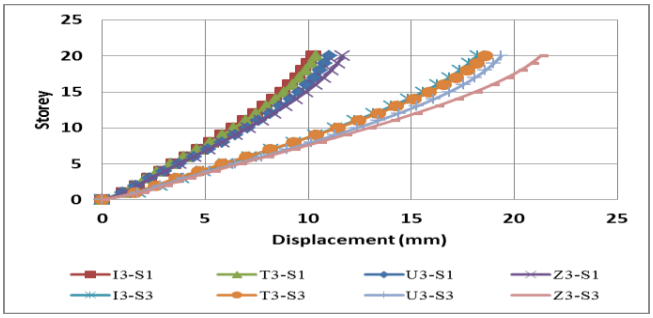

Chart -10: Storey displacement for model-3 in zone III in EQ Y direction

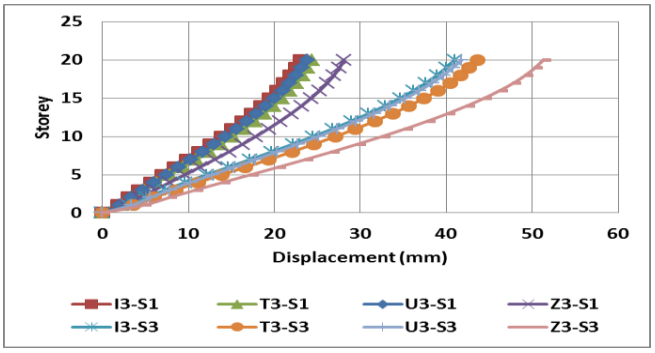

Chart -11: Storey displacement for model-3 in zone V in EQ X direction

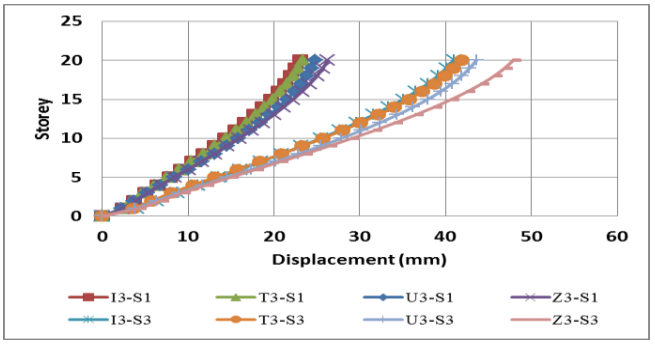

Chart -12: Storey displacement for model-3 in zone V in EQ Y direction

4.2 STOREY DRIFT

The following graphs are showing results for storey drift.

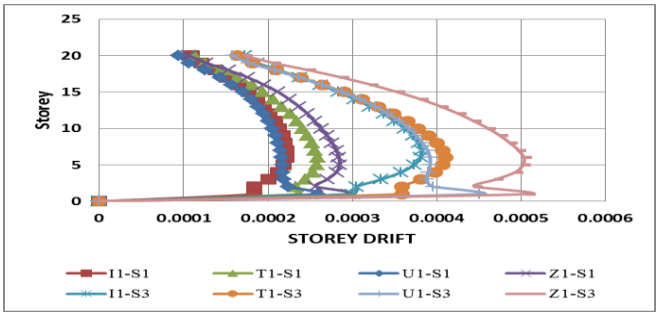

Chart -13: Storey drift for model-1 in zone III

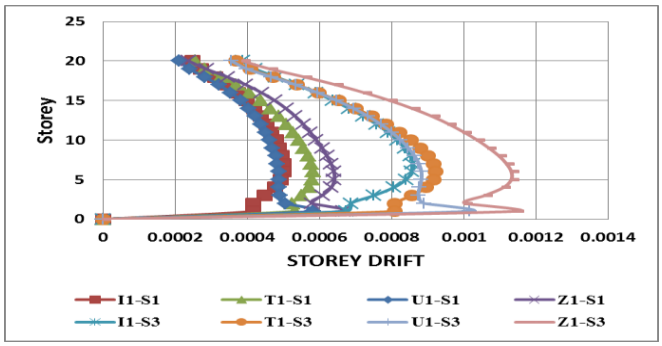

Chart -14: Storey drift for model-1 in zone V

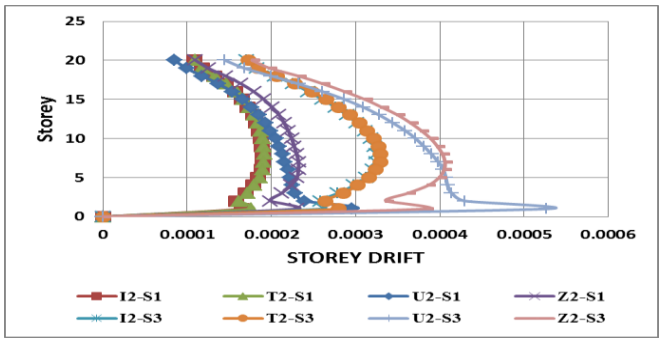

Chart -15: Storey drift for model-2 in zone III

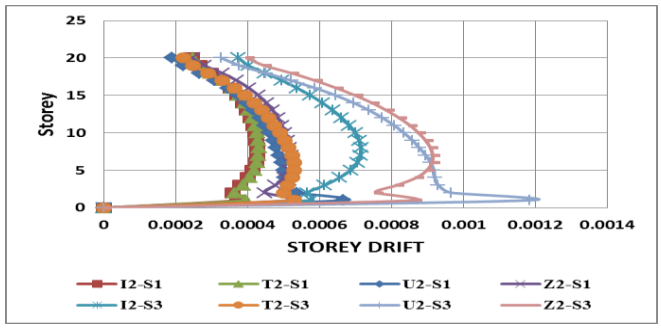

Chart -16: Storey drift for model-2 in zone V

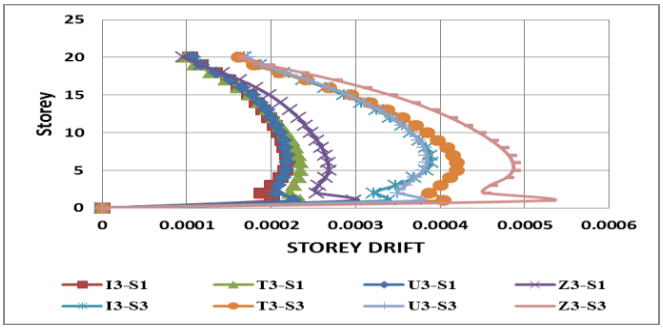

Chart -17: Storey drift for model-3 in zone III

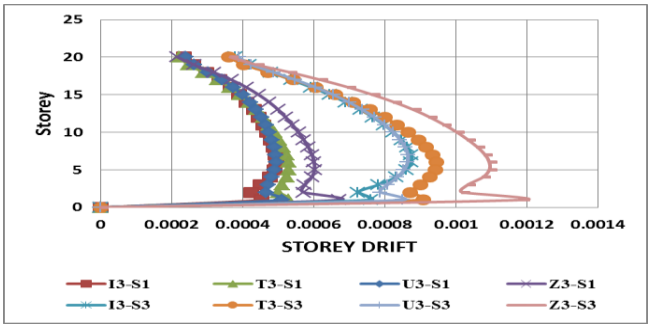

Chart -18: Storey drift for model-3 in zone V

4.3 STOREY SHEAR

The following graphs are showing results for storey shear.

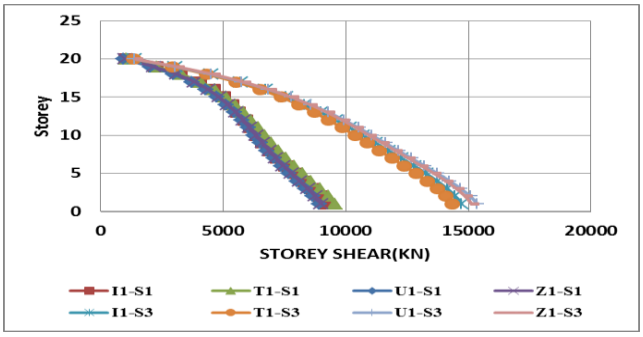

Chart -19: Storey shear for model-1 in zone III

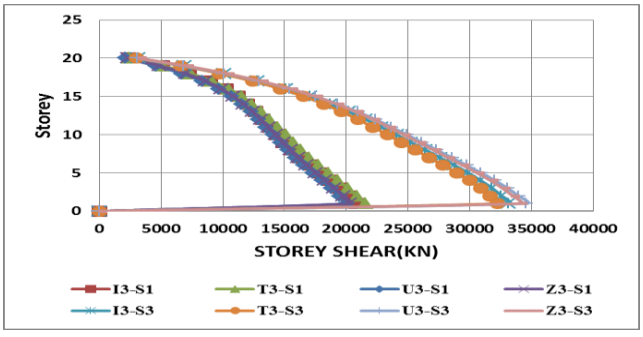

Chart -20: Storey shear for model-1 in zone V

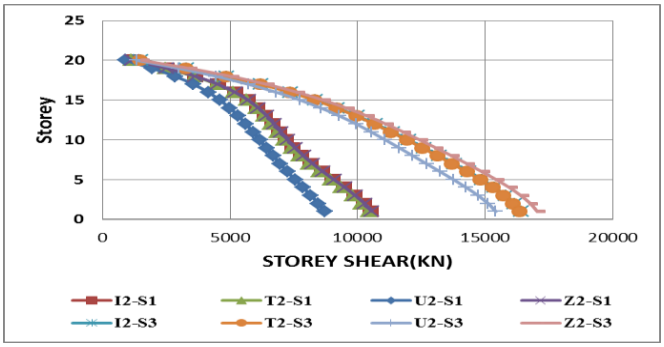

Chart -21: Storey shear for model-2 in zone III

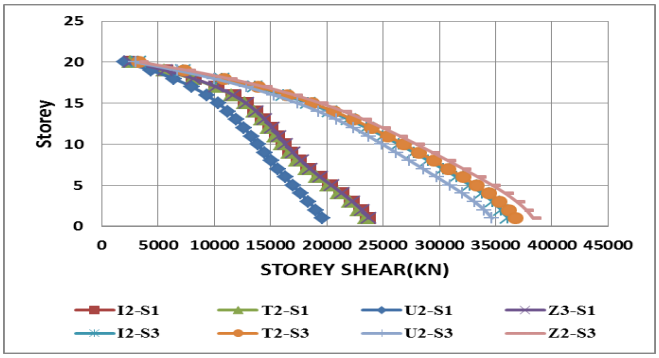

Chart -22: Storey shear for model-2 in zone V

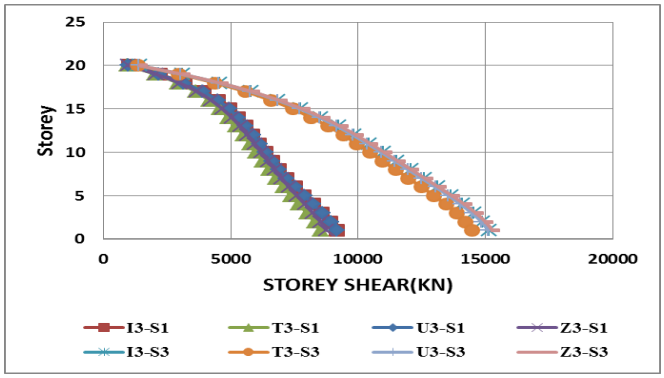

Chart -23: Storey shear for model-3 in zone III

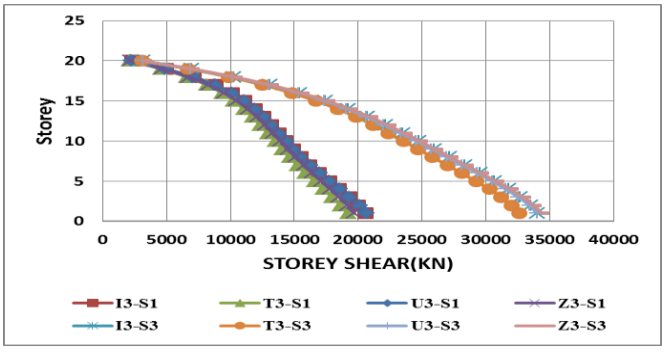

Chart -24: Storey shear for model-3 in zone V

4.4 TIME PERIOD

The following graphs are showing results for TIME PERIOD.

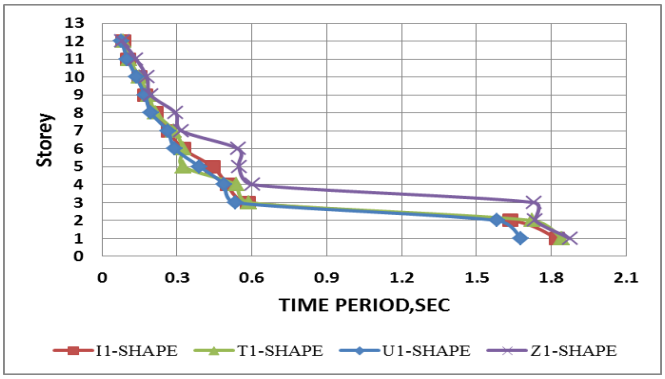

Chart -25: Time period for model-1

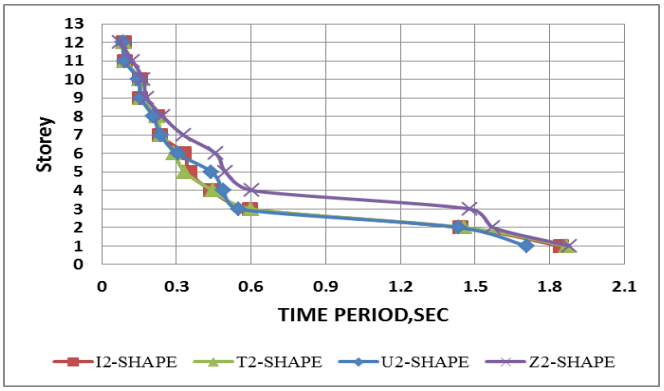

Chart -26: Time period for model-2

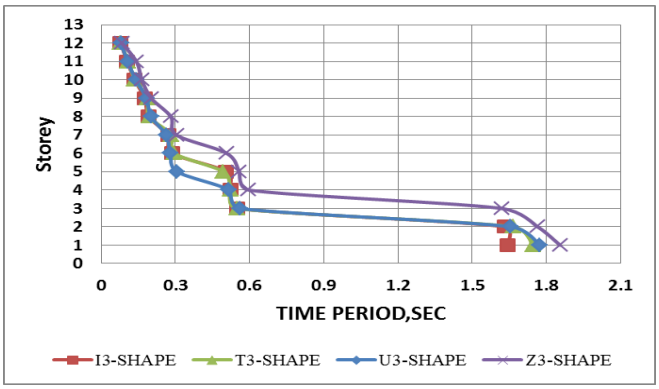

Chart -27: Time period for model-3

5. CONCLUSION

From the dynamic analysis of 20 storey with different shapes of shear wall building we have got the following conclusion:

- The values of storey displacement and drift are generally reduced by the provision of shear wall the reason behind this is the shear wall increases.
- The shape of shear wall has a significant influences on the time period. The values of time period is more with T and Z shaped shear wall than I and U shaped shear wall.
- The displacement values of I shear wall is more effective in X-direction while in Y-direction U shear wall is more effective
- Values of drift are reduced with I and U shaped shear wall.
- For constant volume of concrete it is also observed that shear wall with less thickness and large flange length is more effective than others so model 2 of I shaped and U shaped shear wall is more effective than all other models of shear walls.
- The values of storey shear are more in T shear wall than other shape of shear wall.
- From the comparison it can be observed that values of displacement and drift are more in soft soil than hard soil.
- It can also be observed that the values of displacement are increases as the height of the building increases.

5. REFERANCES

- Sanisha Santhosh , LindaAnn Mathew "Seismic Analysis of Multi Storied Building with Shear Walls of Different Shapes" , *IJERT* ,ISSN :2278-018 Vol. 6 Issue 06, June – 2017
- Mallika k,Nagesh Kumar G"Analysis of Shear Wall in High Rise Unsymmetrical Building Using Etabs" IJIRSET ,ISSN : 2319-8753 Vol. 5, Issue 11, November 2016
- MD Afroz Patel , Prof. Shaik Abdulla "A Study on Positioning of Different Shapes of Shear Walls in L Shaped Building Subjected to Seismic Forces IJERT, ISSN: 2278-0181 Vol. 5 Issue 07, July-2016
- A Murli Krishna,DR E Arunakanthi "Optimum Location of Different Shapes of Shear Walls in Unsymmetrical High Rise Buildings" *IJERT,* ISSN: 2278-0181 Vol. 3 Issue 9, September- 2014
- Ahmed Najm abdullah al-askari, Prof n. v. ramana rao "A Study on Positioning of Different Shapes of Shear Walls in U Shaped Building Subjected to Seismic Forces" , IJERT, ISSN: 2278-0181 Vol. 5 Issue 07, SEPT-2014
- VaishalI BhartI & Saleem Akhtar "The Effect Of Flange Thickness On The Behaviour Of Different Types Of Flanged Shear Wall" IJCSEIERD, ISSN: 2278-0181 Vol. 5 Issue 05, July-2013
- P. P. Chandurkar, Dr. P. S. Pajgade "Seismic Analysis of RCC Building with and Without Shear Wall" IJMER, Volume;03, Issue. 3, Jun-2013
- Dr. Laju Kottallil "Effect of shear wall location in buildings subjected to seismic loads" ISOIJEC, Volume: 01, Issue: 01, Nov -2014
- Anshuman. S, Dipendu Bhunia, Bhavin Ramjiyani "Solution of shear wall location in Multi-storey building" IJCSE, Volume;02, No 2, 2011

BIOGRAPHIES

Rajeshkumar G. Patel
P.G. Student,
Department of Civil Engineering,
Gujarat, India

Mr. Bhavin S. Bhagat
Assistant Professor
HJD ITER, Kera-Kutch,
Gujarat,India