



A COMPARATIVE STUDY ON DYNAMIC ANALYSIS OF MULTI-STORIED BUILDING (G+24) WITH VERTICAL IRREGULARITIES

¹ Sanveg T Patil¹, ² M A Chavan²

¹Final year student (M-tech-civil & structure),

² Head & Associate professor,

¹ Department of Civil Engineering,

¹ KIT's college of engineering (Autonomous) Kolhapur, Maharashtra, India

Abstract: The effective procedure for evaluating the seismic performance of building is called dynamic analysis. There will be definitely formation of many weak points in irregular plan. Therefore these type of structure need to be analyzed under dynamic analysis. This project contains multi-story building (G+24) having vertical plan irregularities. The changes occurs in plan vertically after 6th, 12th & 18th floor. By using STAAD pro as well as ETABS software models are created separately. In this paper time history method of analysis are used.

Index Terms - Time History Method, Etabs, Staad pro, Irregular Maximum displacement, IS-1893(part1):2016.

I. INTRODUCTION

The effective procedure for evaluating the seismic performance of building is termed dynamic analysis. Because of lack of land, construction of high rise building is basic need in this sector. In actual practice building shows one in every of the irregularities i.e. diaphragm, stiffness etc. Damages generally occurs at weak points of the building during Earthquake. Because of irregularity in plan there are definitely formation of the many weak points. Therefore, these style of structure must be analyzed under earthquake loading considering seismic design theories in order that they'll sustain moderate to strong earthquake easily. The manual design of multistory building is time-consuming and also develop human errors. Hence, use of computer based software programs are mandatory which provides more correct results and saves the time. There are many methods used for dynamic analysis i.e. Response spectrum method and Elastic Time history method, Equivalent static lateral force method. The Harm control is one amongst dominant design considerations which is increasing its impact. The harm control is fulfilled only by initiating dynamic analysis within the design Software programs like ETABS, STAAD PRO and SAP are used for seismic analysis. Using various load combination to verify various codes like IS 456-2000, IS 1893-2016 modelling are done. The time history method is pragmatic method used for dynamic analysis.

2. OBJECTIVE

For the project, the following objectives have been set.

- To carry out modelling of multi-storey building of (G+24) with vertical irregularities by using Staad pro and Etabs software
- To analyses building using Time History Method by both the software.
- To compare the dynamic behaviour of structures on both software and discuss the results such as Maximum Displacement, Peak storey shear.

3. MODELLING AND ANALYSIS

A (G+24) storied building with vertical irregularities located in zone III of India as per IS-1893(Part1):2016 were taken for the investigation. The Modelling and analysis of the building process is different for both the software. In ETABS we can directly assign floor load of all floors or single floor. But In case STAAD pro we have to decide Y-Range of each floor. Complete quadratic combination method (CQC) is used for determining the maximum seismic response. In both software Time History method is used to find values of maximum storey displacement, Peak storey Shear.

Table -1: Building Description

Particulars	Reinforced concrete Building
Occupancy	Residential building
Number of stories	(G+24)
Total height of building	73 M
Ground floor height	2.9 M
Intermediate floor height	2.9 M
Nature of soil	Medium soil
Seismic zone	III (Table 3,IS 1893 part1:2016)

Table -2: Member Dimension

Column Size	380 x 750 MM
Beam size	230 x 530 MM
Slab Thickness	150 MM
External wall thickness	200 MM
Internal wall thickness	150 MM

Table -3: Loading Considered

Live load on floor	2 KN/m ² (IS 875 part2:1987)
Sunk load	7.17 KN/m ²
Floor finish Load	1 KN/m ² (IS 875 part2:1987)
Staircase Load	20 KN/m ²
Parking Load	5 KN/m ²
Lift Machine Room Load	10 KN/m ²
External Wall load	5.075 KN/m
Internal wall Load	3.045 KN/m
Importance Factor	1.2 (IS 1893 part1:2016)
Response Reduction Factor	5 (IS-1893 part1:2016)
Supports	Fixed

Table -4: Material Used

Grade of concrete	M25
Grade of steel	Fe-500
Density of concrete	25KN/m ³ (IS-875 part1:1987)
Density of AAC Block	7 KN/m ³

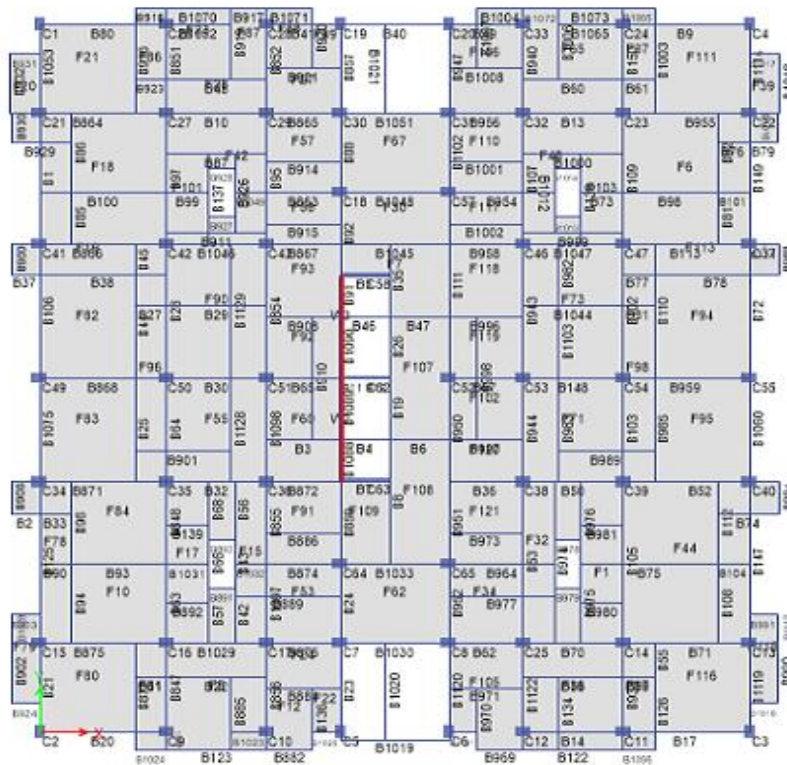


Fig -1: Plan of model using ETABS

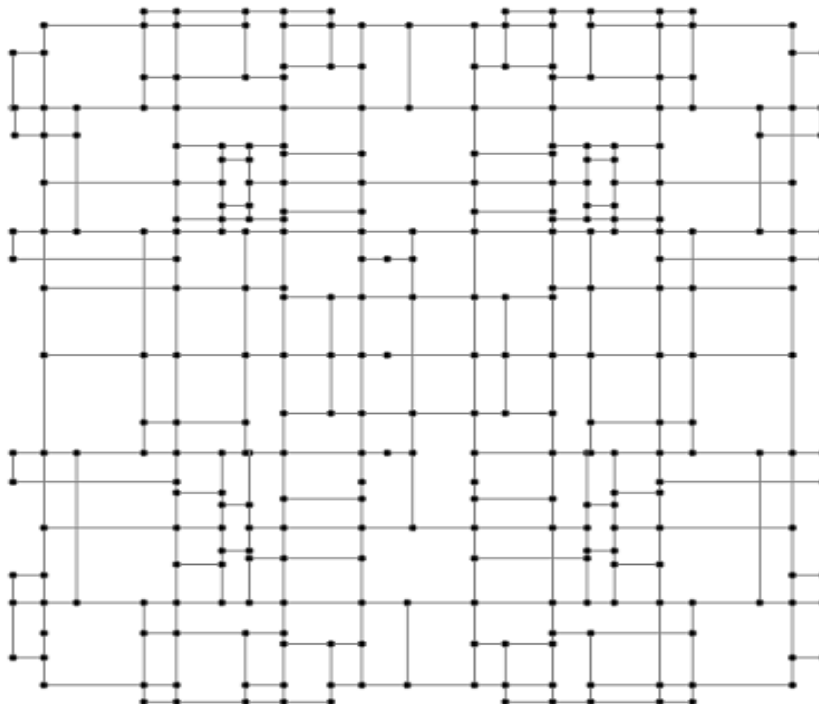


Fig -2: Plan of model using STAAD PRO

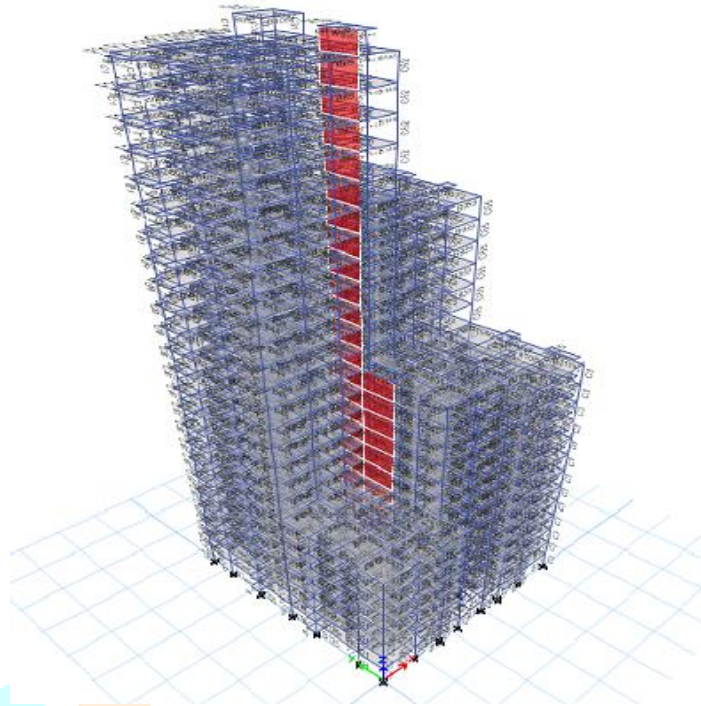


Fig -3:3D view of model using ETABS

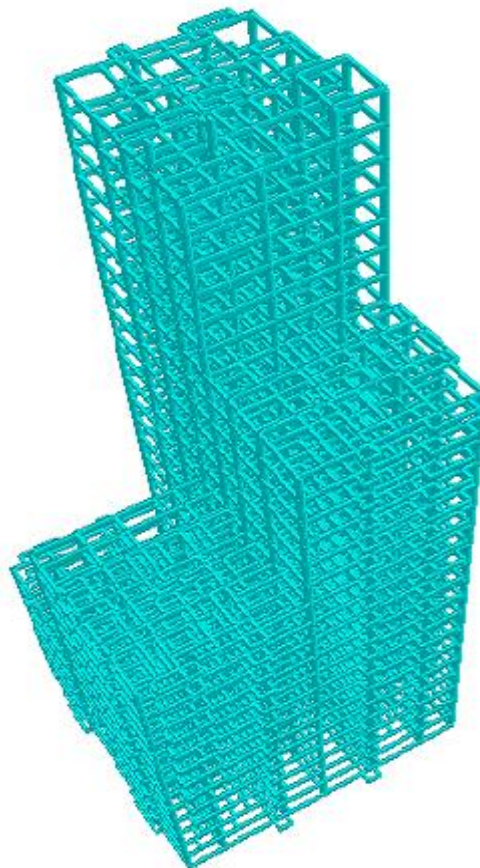
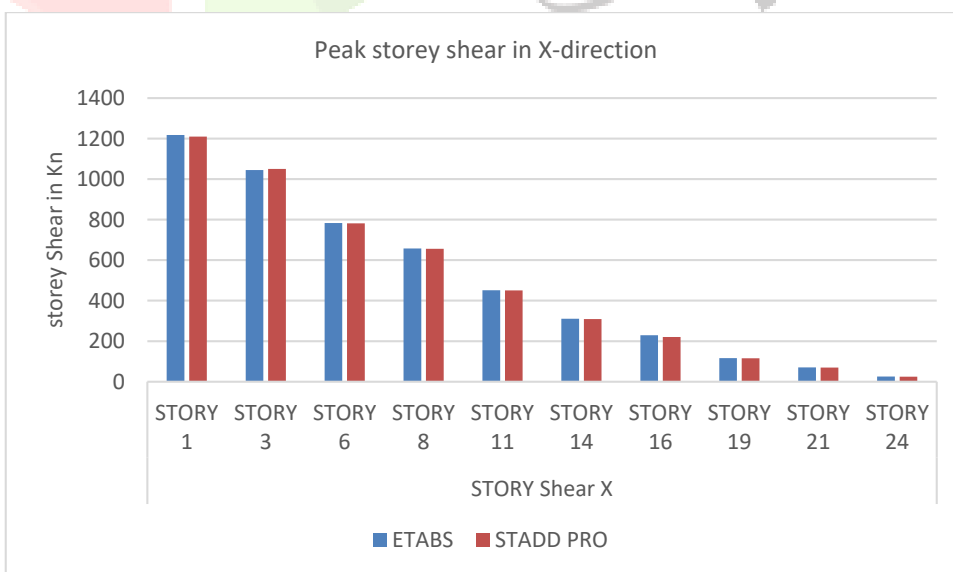
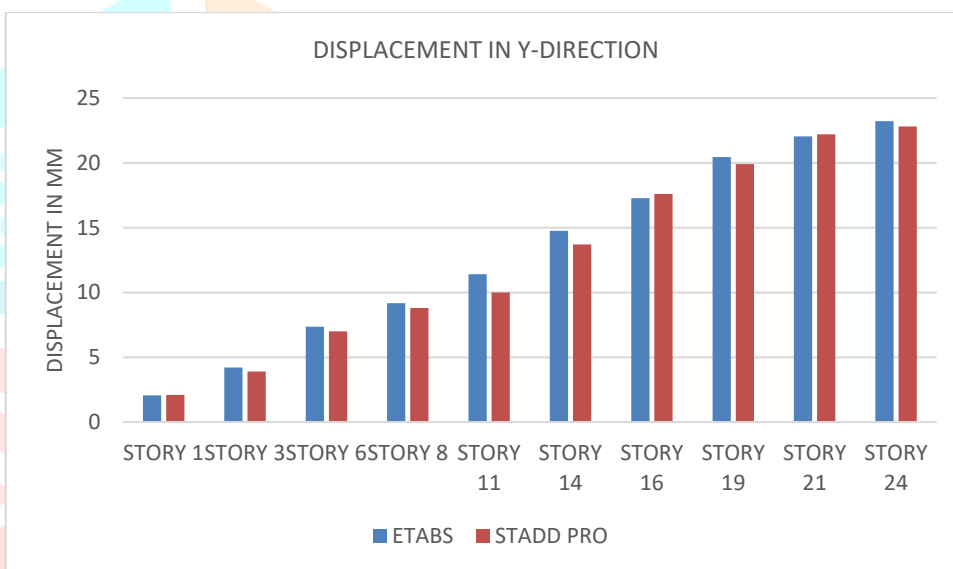
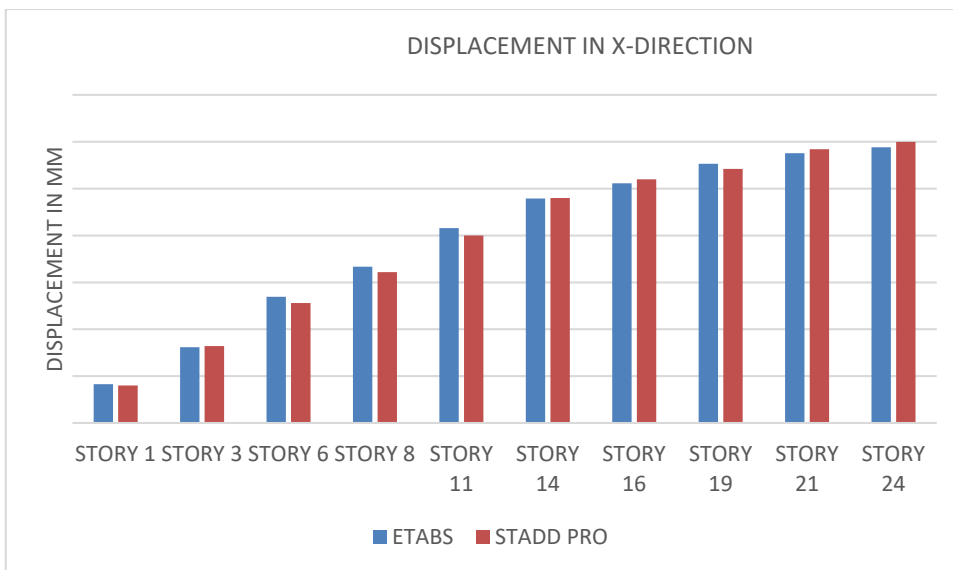
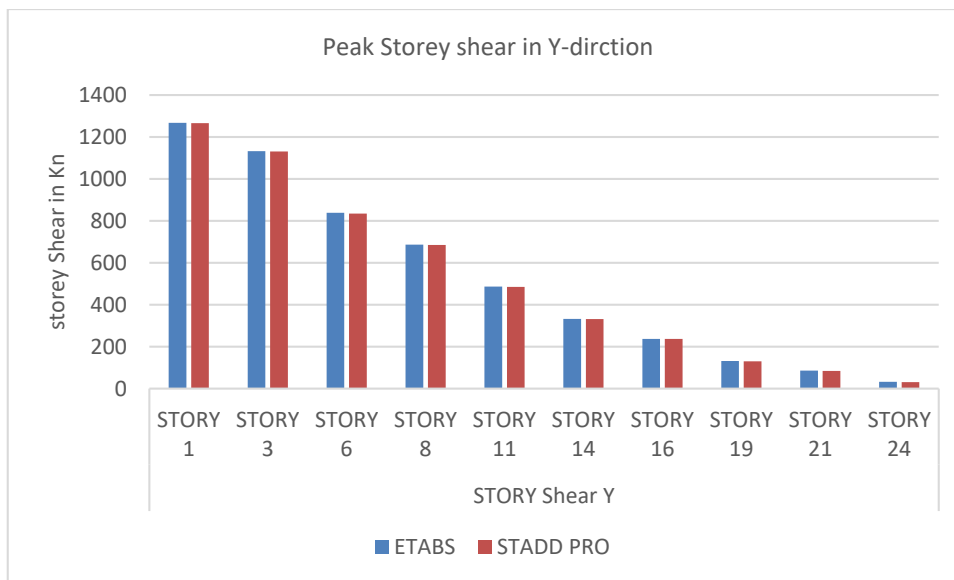


Fig -4: 3D View of model using STAAD PRO

4. RESULTS

From Time History Method storey displacement, peak storey shear for structural models are obtained from ETABS and STAAD PRO software's also the results are graphically presented below.





5. CONCLUSION

1. The results show maximum storey displacement & storey shear approximately same values for both the softwares.
2. Up to 11th floor, center of mass and center of rigidity shows approximately same value. So building shows balanced resistance.
3. Above 11th floor, values of center of mass and center rigidity are different. So structure shows rotational displacement.
4. For analysis of multi-storey building ETABS software is more user friendly, time saving.
5. In ETABS software, it is easy to assign various loads and it is easy to apply Time History analysis.

REFERENCES

- [1] Sayeed ur Rahaman, Dr.Sabih Ahmad “Comparative Study of Static and Dynamic Analysis of Irregular Reinforced Concrete Building due to Earthquake”. JETIR (APRIL2019) Pages. 350-358
- [2] Prof . Neeraj Singh Bais, Sayali Jilhewar “Comparison of Analysis of Multi-Storied Building by ETABS & STAAD – Pro: Effect of Number of Stories” –IRJET (Aug-2021) Pages.692-695
- [3] Kolagani.Navya Deepthi, Kolla.Naga Sreenivasa Rao “Comparison of Design Results of Rcc (G + 8 Storey) Building Using STAADPro And ETABS Software.”– IJSDR(Jun 2018) Pages.278-284
- [4] D.Ramya, A.V.S.Sai Kumar “Comparative Study on Design And Analysis of Multistoried Building (G+10) By STAAD.Pro And ETABS Software’s” –IJESRT (Oct 2015) Pages.125-130
- [5] B.Rajesh, Mr.Sadat Ali Khan, Mr.Mani Kandan, Dr.S.Suresh Babu “Comparison of Both Linear Static And Dynamic Analysis of Multistoried Building with Plan Irregularities” – IJSEAS (Oct 2015) Pages.512-518
- [6] Mohit Sharma, Dr.Savita Maru “Dynamic Analysis of Multistoried Regular Building” –IOSR-JMCE (Jan 2014) Pages.37-42
- [7] NI NI WIN, KYAW LIN HTAT² “Comparative Study of Static and Dynamic Analysis of Irregular Reinforced Concrete Building due to Earthquake.” – IJSETR(May-2014)Pages.1205-1209
- [8] Bahador Bagheri, Ehsan Salimi Firoozabad, Mohammadreza Yahyaei “Comparative Study of the Static And Dynamic Analysis of Multi- Storey Irregular Building” –IJCEE (2012) Pages.1045-1049