

# A Comparison of the Analysis and Design Results of 4 Story Using STAAD Pro and ETABS Software

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## ABSTRACT

All structures are analyzed & designed according codal requirements using manual calculations or by the use of many different analysis and design software like STAAD PRO, ETABS etc. used in various design offices. But it has been found that analysis & design procedure becomes very tedious and time taking process when performed manually. So to overcome this problem these days most of the analysis and designing work are done by the use of software meant for this work. Different softwares are based on different methods of analysis and design, due to which final results may vary from actual results. This paper will check the degree of variations between the results of those obtained by two different design softwares i.e. STAAD PRO and ETABS. An appropriate and economical way of analysis and design of the structure will also be discussed in this paper with the help of an example of a multistory building.

## 1. INTRODUCTION

STAAD Pro and ETABS are the present day leading design software in the market. Many design companies use these softwares for their project design purposes. So, this project mainly deals with the comparative analysis of the results obtained from the design of a multi storey building structure when designed using STAAD Pro and ETABS software separately. In this paper one example of multistory building is taken. Comparison of the analysis results is done considering columns & beams. Basically this comparison is done for Bending Moment, Shear force & earthquake forces. For earthquake IS1893-2002 is considered and all the parameters are taken accordingly.

## 2. PROBLEM DEFINITION

**Table 1:-Design data**

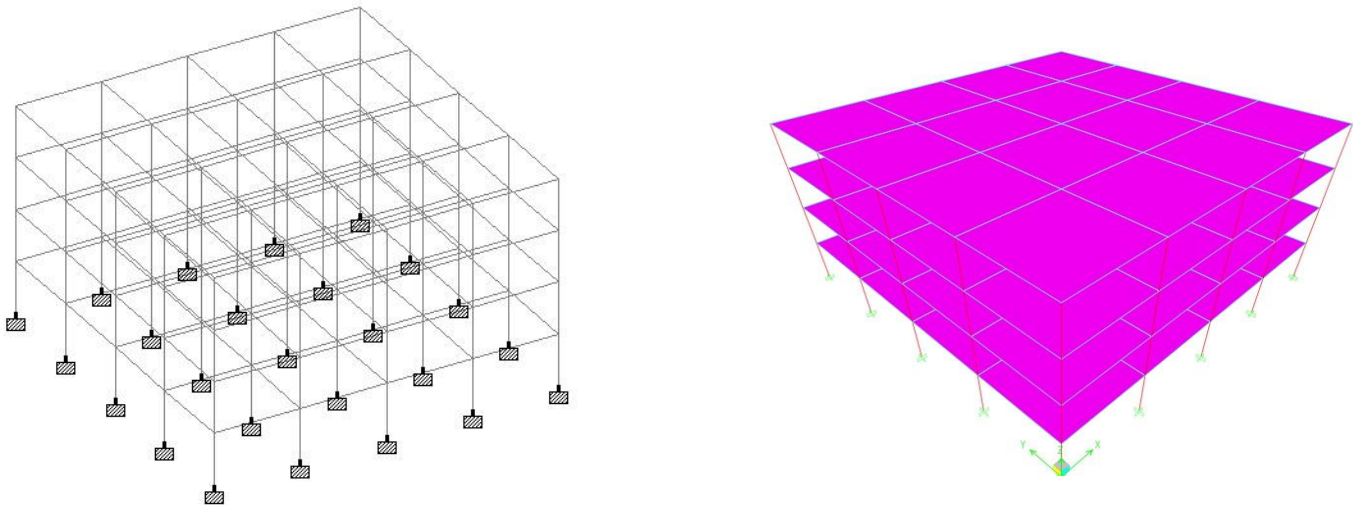
Elements	Dimensions
Length x Width	25mx25m
No. of bays along X-direction	4 bays
No. of bays along Y-direction	4 bays
No. of story	4 story
Height of each story	3 m
Beams sizes	300mmx450mm

Columns sizes	400mmx400mm
Slab thickness	150mm
Supports conditions	Fixed

**3. LOAD CONSIDERED**

**Table 2:-Load Data**

Type of loading	Values
Dead load	According to building sizes
	13.8 KN/m (Wall load)
	5.58 KN/m (Parapet load)
Live load	4 KN/m <sup>2</sup> (At Floor)
	2KN/m <sup>2</sup> (At Terrace)
Superimpose load	0.5 KN/m <sup>2</sup> (At Floor)
	1.5 KN/m <sup>2</sup> (At Terrace)
Earthquake load	Is 1893-2002
	Zone -IV
	Soil type 2
	Importance factor 1
	Reduction factor 5
	Time period as per soft wear calculations



**Figure 1:** 3D view of the structures in “STAAD PRO” & “ETABS”

**4. RESULT AND DISCUSSIONS**

**Table 3:-** Results of vertical reactions of a sample node for different loads

LOADING	STAAD PRO	ETABS
Dead load	445.33 KN	452.58 KN
Live load	85.669 KN	85.85 KN
Earthquake(along length)	50.348 KN	47.38 KN
Earthquake(along width)	50.348 KN	47.38 KN

**Table 4:** Bending Moment and Shear Force of a sample column.

LOADING	FORCES	STAAD PRO.	ETABS
Dead load	Fx	445.330 KN	452.58 KN
	Fy	8.884 KN	8.52 KN
	Fz	8.884 KN	8.52 KN
	Mx	0.000 KN	0.00 KN
	My	8.888 KN	8.305 KN
	Mz	8.888 KN	8.305 KN
Live load	Fx	85.669 KN	85.85 KN
	Fy	2.421 KN	2.3 KN
	Fz	2.421 KN	2.3 KN
	Mx	0.000 KN	0.00 KN
	My	2.423 KN	2.246 KN
	Mz	2.423 KN	2.246 KN
Earthquake(along length)	Fx	50.348 KN	47.38 KN
	Fy	19.965 KN	19.02 KN
	Fz	0.028 KN	0.00 KN
	Mx	0.448 KN	0.00 KN
	My	0.045 KN	0.00 KN
	Mz	42.322 KN	40.234 KN
Earthquake(along width)	Fx	50.348 KN	47.38 KN
	Fy	0.028 KN	0.00 KN
	Fz	19.965 KN	19.02 KN
	Mx	0.449 KN	0.00 KN
	My	42.322 KN	40.234 KN
	Mz	0.045 KN	0.00 KN

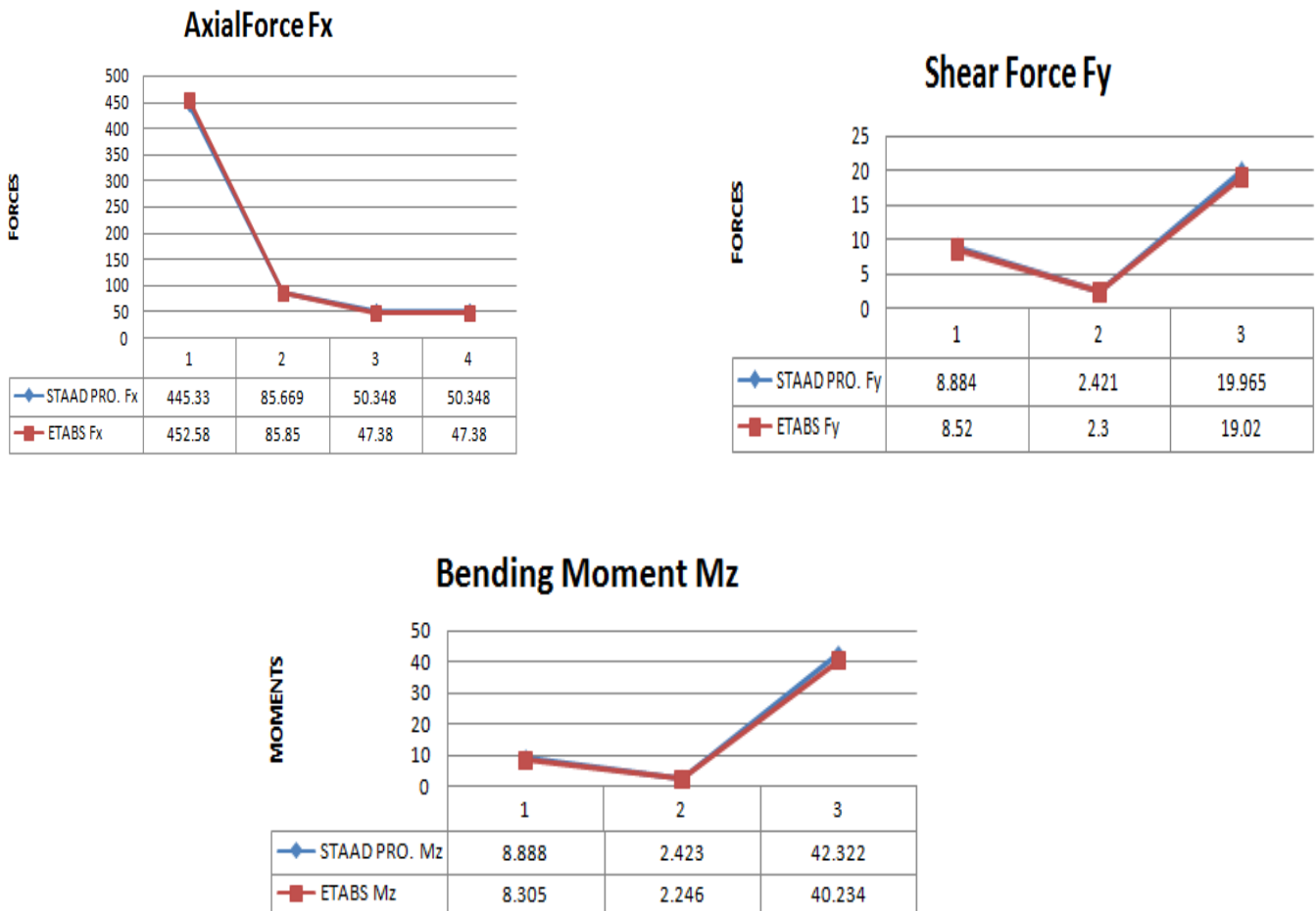
**Table 4:** Design result of a column and beams.

ELEMENT	STAAD PRO	ETABS
Beam		
Main Reinforcement	723 mm <sup>2</sup>	560 mm <sup>2</sup>
Shear Reinforcement	2 legged 8mm dia. @165mm c/c	2 legged 8mm dia. @300mm c/c
Column		
Main Reinforcement	714 mm <sup>2</sup>	1280 mm <sup>2</sup>
Tie Reinforcement	8mm dia. @190mm c/c	8mm dia. @232mm c/c

## 5. CONCLUSION

From the analysis results of column, we may conclude that ETABS gave lesser forces as compared to STAAD PRO.

**Fig. 2:** Analysis result of a column and beams.



## 6. REFERENCES



[1] Bureau of Indian Standards: IS-875, part 1 (1987), Dead Loads on Buildings and Structures, New Delhi, India.

[2] Bureau of Indian Standards: IS-875, part 2 (1987), Live Loads on Buildings and Structures, New Delhi, India.

[3] Bureau of Indian Standards: IS-1893, part 1 (2002), Criteria for Earthquake Resistant Design of Structures: Part 1 General provisions and Buildings, New Delhi, India.