ISSN: 2582-7219

International Journal of Multidisciplinary Research in Science, Engineering and Technology

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Impact Factor: 8.206

Volume 8, Issue 11, November 2025

© 2025 IJMRSET | Volume 8, Issue 11, November 2025| DOI:10.15680/IJMRSET.2025.0811041

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Comparative Study of Multi-Storey RC Buildings with and Without Shear Walls Under Seismic and Gravity Loads for Different Soil Conditions

A.N. Shaikh, A.L. Bodake

Professor, Dept. of Civil Eng., M.S. Bidve Engineering College, Latur, Maharashtra, India

PG Student, Dept. of Civil Eng., M.S. Bidve Engineering College, Latur, Maharashtra, India

ABSTRACT: The structural system of a high-rise building with Shear walls are lateral load resisting structural systems which provide stability to structures from lateral loads like wind and seismic Loads. The design of multi-storey building it is generally constructed on assumed that underlying soil are Hard, Medium and Soft. A Multi-storey building with RC-Shear wall is to have good lateral load resisting System along with gravity load system for safety of occupant and for better performance of structure even in most adverse condition. As a result, the accuracy in assessing structural safely during earthquake cannot be accounted accurately. So investigation of energy transfer mechanism from soils to buildings during earthquake is vital for the design of earthquake resistant structures and for retrofitting existing structures. Hence the soil -structure interaction analysis of framed structures is the main focus of this study. The effects of soil-structure interaction are analyzed for typical multi- storey building resting on different soils. In Our Project contains a brief description and analysis of Symmetrical frame having 30 storey building with shear wall and without shear wall with different types of soil condition for highly seismic area i.e. zone-5, thoroughly discussed structural analysis of a building to explain the application of shear wall. The design analysis of the multi storied building in our project is done through software ETABs

KEYWORDS: Story displacement, story shear, Seismic analysis and Comparison, ETABS, Base Shear

I. INTRODUCTION

Reinforced concrete framed buildings are adequate for resisting both vertical and the horizontal loads acting on them. When the buildings are tall say more than 10 storey's or so, beam and column sizes work out large reinforcement at beam-column junctions works out quite heavy, so that there is a lot of congestion at these joints and it is difficult to place and vibrate concrete at these places, which fact, does not contribute to the safety of buildings. These practical difficulties call for introduction of shear wall in multi-story buildings. A shear wall is a structural element used to resist lateral/horizontal/shear force parallel to the plane of wall is called shear wall.

1) Shear wall resist the lateral or horizontal force by cantilever action for slender wall where bending deformation is dominant. 2) Shear wall resist the lateral or horizontal force by truss action for short wall where shear deformation is dominant.

II. METHODOLOGY

- To examine a G+24 storey residential building for distinctive loads combinations using ETABS software .
- Study of shear forces, Reactions and bending Moments.
- Compare the manual & software calculation for seismic weight.
- Compare the manual & software calculation for base shear.
- To analyze the building using IS code 1893 (part 1): 2002 for seismic analysis.
- To develop, design and analysis model of the High rise structure in ETABS
- To verify deflection obtained by ETABS with IS codal Limit.

© 2025 IJMRSET | Volume 8, Issue 11, November 2025| DOI:10.15680/IJMRSET.2025.0811041

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

- Modelling of 24-storey building and application of different loads on ETABS , load calculations due to different loading combinations, analysis and design of structure on ETABS

III. MANUAL CALCULATIONS

Concrete

All components unless specified in design: M30 grade all

Ec = 5 000 √fck N/mm^2 = 5 000 √ 30 N/mm^2 = 27368.12 N/mm^2 = 27368 N/mm^2.

For central columns up to plinth, Ground floor and first floor: M30 grade

Ec = 5 000 √fck N/mm^2 = 5 000 √ 40 MN/m^2= 31600 MN/m^2 = 31600 MN/m^2

The general layout of the building is shown in Figure At ground level, the floor beams FB are not provided, since the floor directly rests on ground (earth filling and 1:4:8 c.c. at plinth level) and no slab is provided. The ground beams are provided at 100 mm below ground level

Steel

HYSD reinforcement of grade Fe 500 confirming to IS: 1786 is used throughout.

IV. SOFTWARE CALCULATIONS

In this paper, methodology of structural analysis and design on ETABS and step by step procedure of has been explained with the help of diagrams. Further, load calculations have been explained in depth/thickness and manual seismic load calculations have also been included in this Project.

- The main objective is to estimate and check seismic response of building and analyze & Design it on that basis using ETABS software.
- Design and seismic analysis of multistoried building before construction work using ETABS Software using.

RESPONSE SPECTRUM METHOD:

- The representation of the maximum response of idealized single degree freedom system having certain period and damping, during earthquake ground motions. The maximum response plotted against of undamped natural period and for various damping values and can be expressed in terms of maximum absolute acceleration, maximum relative velocity or maximum relative displacement. For this purpose, response spectrum case of analysis has been performed according to IS 1893

MODELING PROCEDURE

Step-1:

Modeling: With respect to the consideration of type of structure modeling has been done using Geometry and Structural Wizard tool.

Step-2:

Generation of NODE Point: As per the planning with respect to the positioning of column in building, their respective nodal point has been created on that model.

Step-3:

Property Definition: Using General-Property command define the property as per size requirement to the respective building on ETABS. So, beam and columns have been generated after assigning to selected beam and columns.

Step-4:

Create and Assign Support & Member Property: After column definition at supports have been provided as fixed below each column and its cross-section assigning based on load calculations and property definition.

Step-5:

Load Assignment:

I. Dead load

The dead load contains of the weight of walls, partitions floor finishes, false ceilings, floors and the other permanent standing construction in the buildings. The dead load loads are estimated from the dimensions of various members of

© 2025 IJMRSET | Volume 8, Issue 11, November 2025| DOI:10.15680/IJMRSET.2025.0811041

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

building and their unit weights. The unit weights of plain concrete and reinforced concrete taken as25kN/m3. The unit weight of masonry taken as 20 kN/m3. As per IS: 1893 (Part 1)-2002, the dead load has been assigned on the basis of member load, floor load, self-weight of the beam's definition.

II. Live Load

As per IS: 875 (part 2)-1987, live load 2.0 kN/m has been assigned to the members.

I. Seismic Load

After defining the seismic load as per requirement of IS: 1893 (Part 1): 2002, the seismic load has been assigned with respect to +X, -X, +Y, and –Y directions with their respective appropriate seismic factor

II. Load combination

Required load combinations cases for seismic analysis have been assigned to the model based on specified loading combinations provided in the Indian standard CODES that are also available in ETABS .

Step-6:

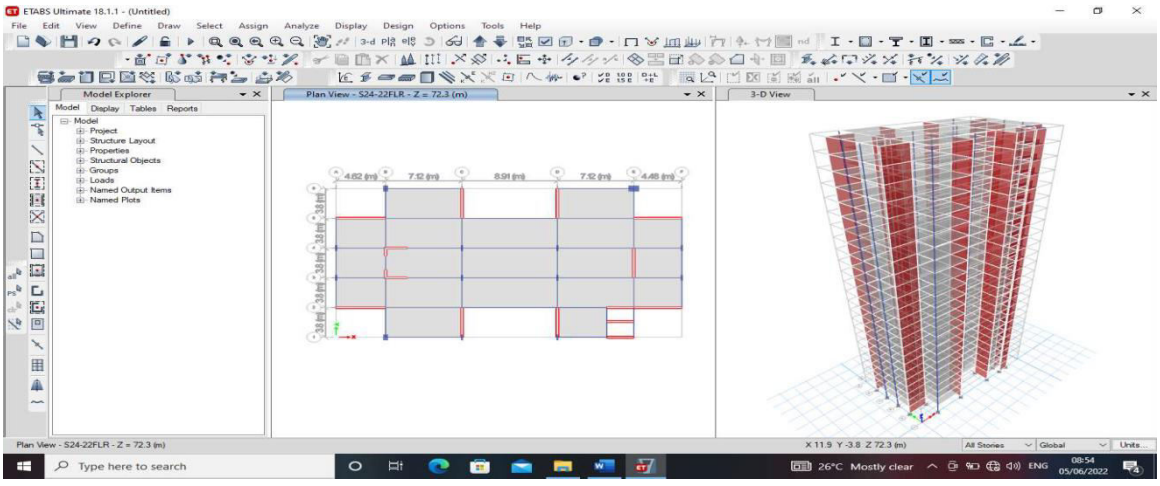
Structural analysis on ETABS. After adding Analysis/Print, using Run Analysis Command, the structure is analyzed and detailed study of forces and bending moment is undertaken through the Post processing mode to recognize their shear forces, bending moment diagrams to it check is safe or not.

Step-7:

The analyzed model is checked for the seismic weight and base shear from the output of ETABS.

Step-8:

Output Generation. After that output file is generated which containing the structural design of each individual beam and column member of structure.



V. RESULT AND DISCUSSION

COMPARISON OF SEISMIC WEIGHTS

Description	Manual Calculation	ETABS Software
Time Period	1.85 sec	2.0 sec
Sa/g	1.5	1.506
Seismic Weight	124117.55 KN	130446.55 KN
Base Shear	6714 KN	6719 KN

ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 8.206| ESTD Year: 2018|

International Journal of Multidisciplinary Research in Science, Engineering and Technology (IJMRSET)

(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)

Modal Time Period for G+ 24 FLOORS WITH SHEAR WALL

CASES	TIME PERIOD (SEC)
G+ 24 FLOOR WITH SHEAR WALL SOIL TYPE 1	2.775
G+ 24 FLOOR WITH SHEAR WALL SOIL TYPE 2	2.817
G+ 24 FLOOR WITH SHEAR WALL SOIL TYPE 3	2.94

VI. CONCLUSION

DETAILED STRUCTURAL DESIGN OF BUILDING IS IMPORTANT ASPECT OF CONSTRUCTION PROCEDURE. PRACTICALLY AN ENGINEER EMPLOYED MUST HAVE KNOWLEDGE ON DESIGNS, CONSTRUCTION PROCEDURES, SITE STUDY ETC. THE PROJECT WORK WAS ONLY RELATED WITH THE PRACTICAL APPLICATION OF THE STUDIED COURSES IN THE FIELD. FINALLY, I HOPE THAT EFFORTS AND COORDINATION FOR THE PROJECT WORK WILL PROVE MUCH USEFUL IN OUR CAREER AND PROJECT WILL BE HELPFUL IN PROVIDING INFORMATION ON THE EARTHQUAKE RESISTANT DESIGN AND ITS SAFE PRACTICE.

1. DESIGN BASE SHEAR (MANUALLY)
= **6714 KN**
2. DESIGN BASE SHEAR (ETABS)
= **6719 KN**

- THE G+24 RESIDENTIAL BUILDING HAS BEEN ANALYZED AND DEIGNED USING ETABS
- DESIGNING USING SOFTWARE'S LIKE ETABS REDUCES THE MAN POWER AND SAVES TIME IN DESIGN WORK.

REFERENCES

[1] ThupdenTashiLachenpaBhutia, Dr. Rajendra. S., Vijay. K. (July 2016). "Performance Based Analysis Of Multistoried Building With Soft Story At Different Levels". International Journal of Engineering, Research and Technology.Vol 4, Issue
[2] Ankit Purohit, LovishPamecha (April 2016) "comparative study of analysis and design of RC frame". International Journal of Science, Engineering and Technology Research (IJSETR)
[3] Suman, Dr.Sunil, Kumar Tengali (July 2017) Analysis and Design of High Rise Building Subjected to Combined Effect of Earthquake and Strong Wind using E-Tab Software International Journal of Science, Engineering and Technology Research (IJSETR)
[4] Guleria Abhay,"Structural Analysis of a Multi- Storeyed Building Using ETABS for Different Plan Configurations." Vol.3.Issue 5 (2014).
[5] Patil S.S. (2013), " Seismic Analysis of High-Rise Building by Response Spectrum Method", International Journal Of Computational Engineering Research (Ijceronline.Com) Vol. 3 Issue. 3.
[6] Sangeeta Uikey, Er. Rahul Satbhaiy, "Seismic Response Analysis of Tall Building Using STAAD Pro Software", Journal of Earthquake Science and Soil Dynamics Engineering Volume 3 Issue 1

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com