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Dynamic Analysis of G+5 Residential Building in Zone-IV Using ETABS

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ABSTRACT:

Dynamic analysis of a G+5 residential building in Zone-4 using ETABS would typically include a summary of the study's purpose, methodology, and findings. The purpose of the study is to evaluate the building's seismic response and ensure its structural stability under the effect of earthquake loads. The methodology involves creating a three-dimensional (3D) model of the building in ETABS software and analyzing it using dynamic analysis methods such as response spectrum analysis and time history analysis. The findings of the study will provide an understanding of the building's behavior under different earthquake scenarios, including peak ground acceleration, spectral acceleration, and time history response. The study aims to propose recommendations for improving the building's seismic performance and enhancing its overall structural stability.

The results of the study showed that the G+5 residential building performed satisfactorily under the design earthquake forces specified by the building code. The analysis revealed that the maximum displacement, acceleration, and base shear were well within the acceptable limits. The building's lateral stiffness was found to be adequate to resist the design lateral loads.

Overall, the study demonstrated that ETABS software is an effective tool for analyzing the seismic performance of buildings in high seismic zones. The results of this study can be useful for engineers and designers in designing and evaluating the seismic performance of similar buildings in seismic zone-4.

Keywords: Auto CADD, ETABS, Design, Software, Multistory Residential building

1. INTRODUCTION

Whenever we think of Design and Analysis of residential building in 21st century one thing that comes in our mind is that construction of high rise building has been involved. In Ancient times human lived life as Nomads and accommodated themselves either under trees or in the caves to protect themselves from wild animals, and natural sources like sun rain etc. as the time moved on the people started living either in huts made of timber or mud. Now those houses have been made into beautiful and high floored houses which completely changed the lifestyle of the people.Single storied building generally consists of ground storey only. While multi storied building consist of multiple stories, typically containing vertical structure in form of ramp, stairs, lift etc. With the need of multi storied building requirement all over the world and the buildings touching the sky, safety is the biggest requirement, so people can live happily.

OBJECTIVES:

Following are the objects of the design

1. To Design and Analysis (G +5) Domestic structure using ETABS software
2. To Identify the stability and plasticity of structure against colourful supernatural events
3. To check the stability of ray and column for the designed cargo conditions
4. To analysis for Shear & Bending moment, and assaying with all the Indian Standard Canons for structures

1.1 Load combination :

Dead load	1.5(DL+IL)
Live load	1.2(DL + IL ± EL)
Earth quake load	1.5(DL ± EL)
Wind load	0.9(DL+EL)

1.2 DESCRIPTION OF STUDY MODEL :

A. Project Details :

1. Purpose of the building : Residential
2. Shape of the building : regular (rectangular)
3. No. of stories : (G+5) Beam size =200 x650 Column size = 650 x 200

2. LITERATURE REVIEW:

2.1 Prof. Bhosle Ashwini Tanaji and Prof.Shaikh

A. N (2020) [1] studied the seismic analysis of reinforced concrete (RC) buildings with different types of bracing. The bracing were provided for peripheral columns and at any two parallel sides of building model. A thirteen storey building is taken for analysis which is located at seismic zone III as per IS 1893: 2002 using ETABS software.

2.2 Hussain Imran K.M and Sowjanya G.V(2019)[2]

Studied the stability analysis of rigid steel frames with and without bracing systems under the effect of seismic and wind loads. For this project they had taken five models in which one is without bracing structure and four models with different bracing systems and analyse the response of buildings with and without bracing systems subjected to seismic load and wind load using ETABS. The model is analyse by equivalent static analysis as per IS 1893:2002.

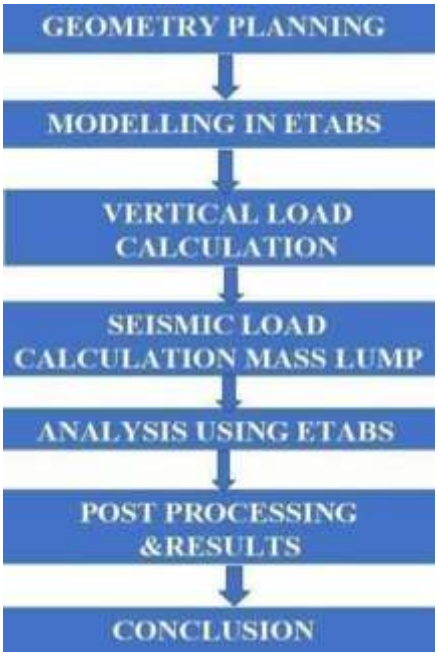
2.3 K. Sugantha Priya et al., (2018) [3]

Has conducted a review of literature of asymmetrical building with bracing. They conducted a study on literature assembling the need of steel braces over asymmetrical buildings. The author numbers of possibilities to arrange steel bracing such as suggestions were discussed and possible ways to persuade the types of bracing over asymmetric building were framed in this paper.

2.4 Shailendra kumar Dubey and Sunil Kute(2016) [5]

studied the use of steel bracing for minimizing captive column effect of RC frames. The research mainly focused on the behaviour of Reinforced Concrete (R.C.) frames by using steel bracing under horizontal loading and to decrease the potential for captive-column damage. The study is carried out on single, single storey for R.C. frames with bare and corner steel bracing

3. METHODOLOGY:



LOAD CALCULATIONS : STEP-1:

Inner dimensions= (4×3.6) m2 Assuming fy = 415 N/mm2 Fck = 20 N/mm2

Effective span (Lx)= 3.6m Effective span (Ly) = 4 m

Aspect ratio (Ly/Lx) = [4/ 3.6] = 1.1 < 2 Assume over all depth of slab = 120 m Effective depth = 120 – 15-10/2 = 100mm

Self weight of slab = 0.12 × 25=3 kN/m2 Live load = 2kN/m2

Dead load = 1kN/m2 Total weight = 6kN/m2

Load per meter run = 6.0 × 1.0 = 6.0kN/m Factored load = 1.5 × 6.0 = 9.0 kN/m

STEP-2:

DESIGN MOMENTS

Using bending moment coefficients from table – 26 of IS 456:2000, the bending moments are

calculated as follows. Mx=αxwLx2 , My=αywLx2

Bending Moment Coefficients:

	AT SUPPORTS	AT MID SPAN
A LONG SHORT SPAN (αx)	-0.037	0.028
A LONG LONG SPAN (αX)	-0.032	0.024

MAIN PLAN:

Figure : 3.1

4. Analysis and Design

After the completions of all the above steps we have performed the analysis and checked for errors.

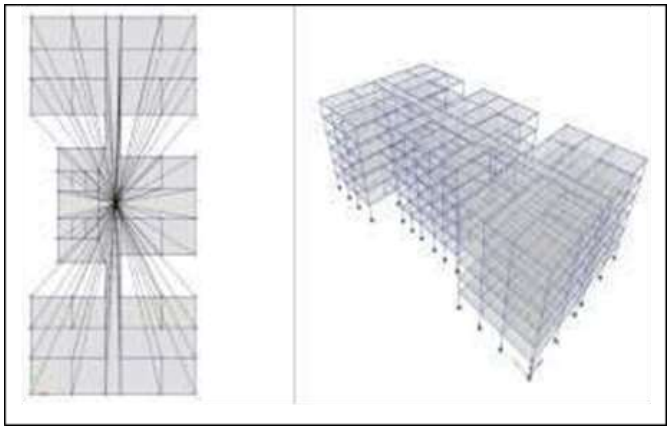


Figure : 4.1

Detailing

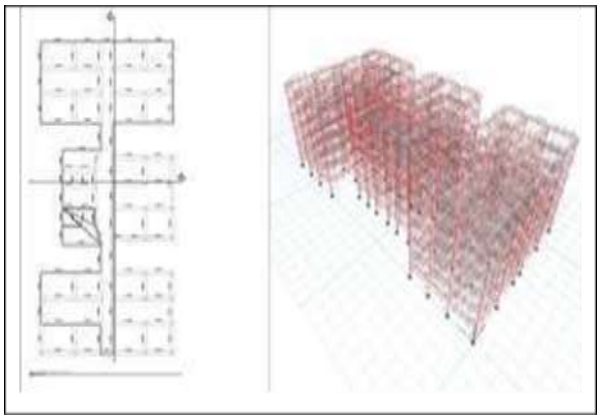


Figure :4.2

Longitudinal Reinforcing

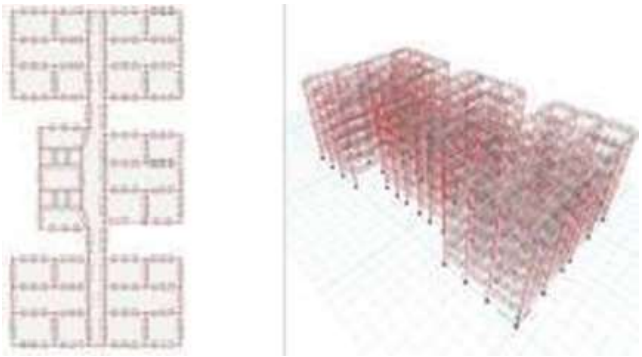


Figure :4.3

Shear and bending moments diagram are anyaltial tool used in conjuction with structural analysis to help and perform structrucal design by determing the value of shear force and bending moment at a givenpoint of structural element such as beam

Bending Moment

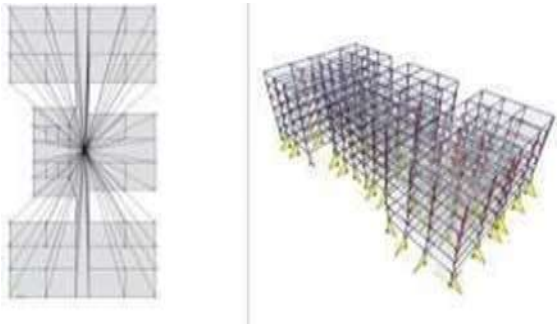


Figure 4.4

Shear Force

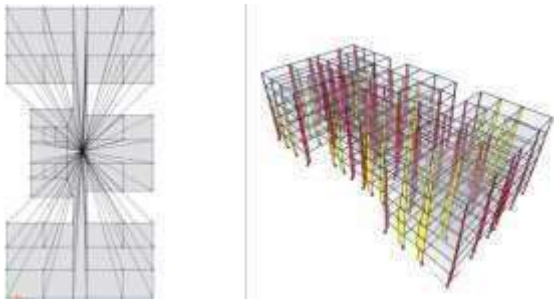


Figure 4.5

Top view - Moment

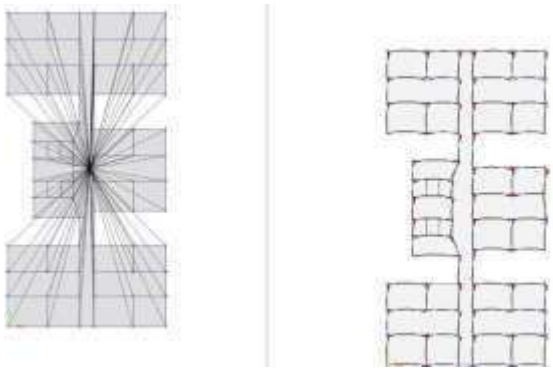


Figure 4.6

Graph for story -6

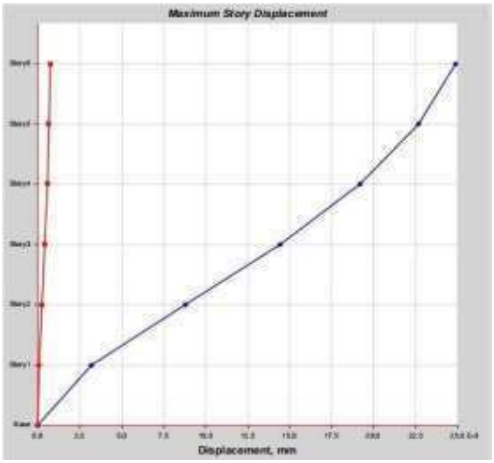


Figure :4.7

Tabulated Plot Coordinates

Story Response Values

Story	Elevation m	Location	X-Dir mm	Y-Dir mm
Story6	18	Top	0.025	0.001
Story5	15	Top	0.023	0.001
Story4	12	Top	0.019	0.001
Story3	9	Top	0.014	4.188E-04
Story2	6	Top	0.009	2.523E-04
Story1	3	Top	0.003	8.989E-05
Base	0	Top	0	0

Table :4.1

5. CONCLUSION

1. A dynamic analysis of a structure is typically carried out to determine its response to earthquake forces, which can help identify areas of potential weakness or failure. ETABS is a software program commonly used by structural engineers to perform such analyses.
2. The conclusion of a dynamic analysis using ETABS for a G+5 residential building in seismic zone 4 would typically include an assessment of the building's overall performance during an earthquake event. This might include analysis of the building's displacement, acceleration, and drift, as well as an assessment of the forces acting on individual structural components.
3. The conclusion might also include recommendations for structural modifications or improvements to strengthen the building against seismic forces. This could include modifications to the building's foundation, columns, beams, or other structural components.
4. In addition, the conclusion might also provide recommendations for appropriate building codes and standards that should be followed for construction or renovation of buildings in seismic zone

REFERENCES

1. Indian Standard Code of Practice for Design Loads (Other than Earthquake) for Buildings and Structures (IS: 875-Part 2), Bureau of Indian Standards.
2. Indian Standard Code of Practice forrDesign Loads (Earthquake) for Buildings and Structures (IS: 1893-Part 1), Bureau of Indian Standards.
3. Seismic Analysis and Design of 10 Story RC Building Using ETABS Software, International Journal of Engineering Research and Development, Vol. 10, Issue 4, pp. 22-27.
4. Seismic Response of Multi-Story Buildings in Different Seismic Zones of India: A Comparative Study, International Journal of Engineering and Innovative Technology, Vol. 3, Issue 3, pp. 142-146.
5. ETABS User Manual, Computers and Structures, Inc.
6. Design of Earthquake Resistant Buildings Using ETABS, ETABS Tutorial Series, Computers and Structures, Inc.
7. Analysis and Design of Multi-Storeyed Building Using ETABS, International Journal of Innovative Research in Science, Engineering and Technology, Vol. 5, Issue 11, pp. 19548-19556.
8. Seismic Analysis of G+5 RC Building in Zone-IV Using ETABS, International Journal of Engineering Research and Applications, Vol. 5, Issue 5, pp. 1-7
9. " ETABS stoner's Manual" by Computers and Structures Inc. This is the sanctioned stoner's primer for ETABS software and includes detailed information on how to perform colorful types of analyses using ETABS, including dynamic analysis.
10. " Seismic Analysis and Design of 10 Story RC Building using ETABS" by Ashutosh B. Jogal, Prof. P. S. Pajgade and Prof. M. S. Shinde. This exploration paper describes the seismic analysis and design of a 10- story corroborated concrete structure using ETABS software. It includes information on how to model the structure, perform the dynamic analysis, and interpret the results.
11. " Dynamic Analysis of Multi storyed Building Using ETABS" by Bhavin H. Shah and Jatin N. Vaidya. This paper presents a step- by- step procedure for performing dynamic analysis of a multistory structure using ETABS software. It includes information on how to model the

structure, assign loads, and perform the analysis. " Dynamic Analysis of Building Using ETABS Software" by K.V. VinodKumar and K.S.S. SeshagiriRao. This exploration paper presents a relative study of colorful styles of dynamic analysis using ETABS software. It includes information on how to model the structure, assign loads, and perform the analysis using different styles.

12. " Dynamic Analysis of a 10- Story Steel Building sing ETABS" by Ehsan Azarshahrak and Mohammad Javad Ghasemi. This paper describes the dynamic analysis of a 10- story sword structure using ETABS software. It includes information on how to model the structure, assign loads, and perform the analysis using the response spectrum method