

A Review on Wind Analysis of a Multi Storied Structure

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ABSTRACT

Due to growing population and less availability of land, multistoried buildings are constructed which can serve many people in less area. Main aim of this project is to analyse and design a (G+16) multistory building using E-TABS. Aims to give proper awareness regarding right design and details of the building. Planning is done using AutoCAD. Design involves load calculations manually and the structure is analyzed using E-TABS. Codes refer for this project are NBC IS (456-2000). Concrete mix use is M30. The steel strength for all members are of grade Fe-415. For analyzing the structure, the loads are very important which are calculated using IS (875). The LIMIT STATE METHOD is the method which has been adopted. The manual design is a difficult process and consumes more time. The project purpose is to give the complete experience in the field of design and to gain the knowledge in a practical way.

Keywords : Multistoried, Planning, Analysis, Design, E-TABS, Residential buildings, Bending Moment, Shear Force, Wind analysis, Case Study, CSI-DETAILING.

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I. INTRODUCTION

For living purpose human civilization needs structure. The building should be built in an efficient manner so that it can serve people and save money. In simple words, a building means an empty space surrounded by the walls and roof, in order to give shelter for human being [1-3]. In ancient period humans use caves to secure themselves from wild animals, fire, rain etc. Thereafter, humans developed and built their homes using timbers i.e. wood material [2]. Nowadays the recent houses are developed into individual and multistory building. Buildings are necessary indicator of social progress of the country [4]. Nowadays many

new techniques have been developed for building constructions. The buildings are built economically to fulfil the needs of the people. The buildings are built quickly too [5-7]. A building frame is a 3D structure which consists of column, beams and slabs. The growth in population is directly affecting the high rise buildings demand. Buildings are a part of the definition of Human civilizations. A building should be constructed as per human requirement and not for earning money.

II. OBJECTIVES

- To design the structure on the basis of load capacity.

- To analyze a detailed study by using simulation tool for designing of a building.
- To create a model in E-TABS.
- To generate the structural framing plan.
- To analyze application of loads on the member.
- Analyzing several buildings with their different heights for wind analysis.

III. LITERATURE REVIEW

Sreeshna K.S (2016), in this paper he deals with structural analysis and design of a Basement+ (G+4) storied apartment building. The work was completed in three stages. The first stage is to make a model and analyze it. The second stage is to design the structural elements. The final is to detail those structural elements. In this project STAAD. Pro software is use for analyzing the building. The IS: 875 (Part 1) and (Part 2) is use for dead load and live load calculation. The elements like column, beam, slab, staircase, retaining wall, shear wall, pile foundation is design according to Indian Standard Codes (IS).

Aman et al., (2016), in this paper they discussed that the main purpose of a structural engineer is to design a safe structure. After that the structure is subjected to the various types of loading (L.L, D.L, W.L). In the first stage loads applied on the structure are considered as static. Finite part analysis is done that exhibit the result of dynamic load like wind result, earthquake result, etc. The work is conducted by using STAAD. Pro software.

Madhurivassavai (2016), in this paper he stays that among the various problems that country is facing one of the problem is growing population. Because of the minimum availability of land multistory building can be constructed to serve many people in less area. Efficient model is performed using STAAD. Pro and AutoCAD. Manual calculations for the building are tedious and time consuming. STAAD. Pro helps us for quick, efficient and correct platform for analysing and coming up with structures.

D.Ramya and A.V.S.Saikumar, Design and analysis of (G+10) multistory building. The study consist of the comparative study of building using two software i.e STAAD-Pro and ETABS. In this design Live load, Dead load and wind load is calculated.

Annop .A et al., They Design a multistory building of (G+5) floors, at kalakode, Kerala, India. The building is design by taking all measures by the standards recommended in INDIAN STANDARD. And also includes requirements for seismic load and wind load.

Aman et al., Analysis and Design of multistory building at Gulbarga city, Karnataka, India. The study is consist of design of slabs, beams, footing, column by using software named as E-TABS.

Deshmukh D.R et al., Analysis and Design of (G+19) multistoried building .The study includes designing of multistory building by STAAD. Pro and it also consist of calculating of wind load and Seismic load. They also compare the result of earthquake load, applied on structure by STAAD-Pro and manual calculations both by seismic coefficient method.

V.Varalakshmi, In this studied a multistoried (G+5) building has been considered at Kukatpally, Hyderabad, India. The whole Study shows the design and analysis of columns, beams, footings and slabs, strips and loading by using E-TABS. In this study they also perform safe bearing capacity of soil.

P.Jayachandran, it includes the design, planning and analysis of multistoried (G+4) building at Salem, tamilnadu, India. The study shows the design and analysis of footings, columns, strips, beams and slabs by using E-TABS.

L.G.Kalurkar In this study they design and analysis of multistoried (G+5) building using composite structure method at earthquake (zone-3) is done. A 3D model, planning and analysis of the structure are carried out with the help of SAP 2000 software. They used the Equivalent Static Method for the analysis of both Composite and RCC structures. Response Analysis Method of Analysis of structure method is used for the analysis of both Composite and RCC structures.

All the results are found and compared. It shows that the composite structure are more economical.

B Suresh et.al in (2012), in this paper they found that STAAD-PRO software is widely used in analyzing and designing structures, buildings, bridges, towers, and transportation, industrial and utility structures. The Design involves building structures like beams, columns, slabs, tunnel, bridge, pile and building materials like concrete, steel etc.

Prashant et.al in (2012), presented STAAD. Pro and ETABS are the cutting edge leading design software in the market. Many design group use these software for their challenge design purpose. The outcomes obtained from the design of an everyday multistory building shape when designed by the use of STAAD.Pro and ETABS software one by one.

KhushbuJani et.al in (2013), presented the advancement in product generation, materials, structural structures and analytical techniques for evaluation and layout facilitated the increase of excessive upward push buildings. Structural design of excessive rise homes is governed by means of lateral hundreds because of wind or earthquake.

T.T. I Soong et.al in (2014), they had concluded that structural engineering is the main branch of civil engineering. In that structural engineers are trained to understand , predict, and calculate the strength, stability, rigidity of built structure. They also involve in the process of medical equipment, machinery and vehicle ehere structural integrity affects.

D.Ramya, A.V.S.Sai Kumar (2015), they shows the comparative study on (G+10) structure by using STAAD.PRO and E-TABS. Mainly the focus is on the results of these two software. Finally they found that sometimes STAAD.PRO is good for use but many times E-TABS is more convenient.

Aman, et al. (2016), their aim is Analysis and design of a multistory structure by using STAAD.Pro for the (G+5) commercial/residential building and shows bending moment, shear force, short term deflection. structure has to be safe in all loading and amount of steel provided is economic.

M C Griffith and A V Pinto (2000),

Sanghani and Paresh (2011), they studied the behavior of beam and column on different levels. They found that the maximum axial force generated in the ground floor columns has maximum reinforcement required in the second floor beams.

Poonam et al. (2012), She shows that the results of the numerical analysis of any stored, especially the first storey, must not be softer or weaker than the stories above or below. Irregularity in mass distribution also contributes to the increase in response of the buildings. If required they need to be provided by appropriate and extensive analysis and design processes.

IV. METHODOLOGY

- Insert the center-line plan from Auto-cad in .dxf format.
- Add beams and columns, by using add beam command we had drawn the beams and columns between the corresponding node points.
- Then add three dimensional view of structure. Here we have use the transitional repeat command in Y-direction to get the three dimensional view of structure.
- Assign the dead load. The dead loads are calculated as per IS 875 (PART 1) for external walls, internal walls, parapet wall including self - weight of structure.
- Assign the live loads. Live loads are assigned on every floor as 3KN/m² based on IS 875 (PART 2).
- Assigning the wind loads. Wind loads are assigned as per IS 875 (PART 3) based on intensity calculated and exposure factor. Then loads are imported in load case details in +X,-X, +Z,-Z directions.
- Importing of load combinations. After all the loads are assign, the load combinations are given with suitable factor of safety as per IS 875 (PART 5).

- Analysis the completion of all the above steps we have performed the analysis and checked for errors.
- The difference in steel quantity is due to human error.

V. RESULTS & DISCUSSIONS

- Analyzing different building with their different height for wind analysis.
- Determine various results for high rise building after the wind forces applied.
- The comparative study on different number of RCC structure and composite structures.
- Analysis of wind on G+16 storied RC Residential building as per IS code provided with different shapes.
- Analysis of wind G+16 storied RC Residential building with different stories.
- Analysis of wind G+16 storied RC Residential building story drift, base reaction and displacement.

VI. CONCLUSION

The conclusion from the above studies are:

- All the structural components of the building are safe in shear and flexure.
- Amount of steel provided for the structure is economic.
- The sizes of the elements can be used in the structure.
- E-TABS graphical input generation facility allows generation of structural models graphically.
- All the other specifications such as section properties, material constants, support load, analysis and design requirements, printing, plotting facilities are available.
- Hence, I conclude that we can gain more knowledge in practical work when compared to theoretical work.
- E-TABS is fast and accurate structural design software .It also provide economical design of the structure.

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