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DESIGN & ANALYSIS OF MULTI – STOREY RESIDENTIAL BUILDING (G+5) USING ETABS

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Abstract

The Rapid urbanization in countries like India, has increased the demand for multi-storey residential buildings to optimize the limited land use. This study of “**Design & Analysis of Multi-Storey Residential Building (G+5) using ETABS**”, is being done to understand the proper utilization of resources & This study focuses on the structural analysis & design of G+5 reinforced concrete building using ETABS Software. A 3D model is developed, incorporating slabs, beams, columns, & foundations, with loads applied as per IS 875 & IS 1893 Codes. The analysis accounts for gravity & seismic forces to evaluate internal stresses & displacements. The ETABS is then used to design all structural elements, ensuring, code compliance, durability, & serviceability. The Foundations are also designed based upon the soil conditions. The study demonstrates ETABS as a powerful tool for designing safe & efficient buildings under complex loading conditions.

Keywords: Design of Structure¹, Analysis of Structure², Designing of G+5 Structure³.

Introduction

This document report outlines the principles & practices involved in the design & analysis of multi-storey residential buildings, particularly a G+5 reinforced concrete framed structure.

Introduction to Building Construction:

The Building construction Involves creating enclosed spaces for human habitation, evolving from early shelters to modern, sophisticated homes. The Buildings are

indicators of social progress with individuals investing significantly in owning comfortable residents. The modern construction prioritize economical and quick techniques with engineers and architects handling design planning and layered and draughtman executing drawing.

The Mutli Storey Building: Due to the rapid population growth, utilization and limited urban space, vertical expansion through multi story apartments has become essential. Apartments typically 3 – 7 stories accommodate multiple tenants sharing land and amenities for low income groups, LIG floods are preferred. The Multi storey buildings are classified into load-bearing, composite, framed, reinforcement concrete framed & steel framed construction. The Framed construction is suitable for buildings over 6 stories and offers advantages like Reduce Foundation costs, faster construction, increased floor area and greater glazing.

The Structural Consideration that are taken into account for meeting the requirements set by the Bureau Of Indian Standards are

1. **Loads:** The design considers dead loads (structural components, live loads) &, for taller buildings, horizontal loads like wind force (IS 875 Part 3) & earthquake loads (if applicable). This specific building’s design (G+5) for a 40x28m residential complex with 85 columns uses STAAD Pro for analysis, focusing on dead load, live load & wind load.

2. **Structural Analysis:** In analysis, we examines how the structures behave under design conditions, determining deformation, vibrating, buckling, (or) yielding. It involves evaluating internal forces & ensuring the structure's adequacy to carry loads, satisfying equilibrium, compatibility, & boundary conditions.
3. **Structural Design:** This is the art & science of creating serviceable durable, economical, & aesthetically pleasing structures. The goal is to provide a safe structure meeting user requirements & ensuring safety & serviceability throughout its life cycle.

Methods

Limit State Method (LSM): This method is preferred for structural design, incorporating partial safety factors for loads & materials.

Ultimate Limit State: Collapse due to normal (or) severe loading, (or) catastrophic events.

Serviceability Limit State: Deflection, cracking, & vibration.

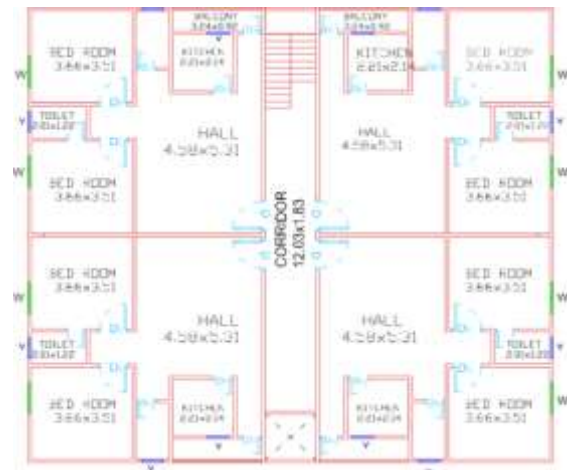
Other Limit States: Fatigue, durability, fire resistance. LSM offers a rational approach, considering material strength & load variations, ensuring strength, stability, & acceptable deformation.

Software Used: The software three software has been used for the project purpose. They are:

1. ETABS: For Structural Modeling, Analysis, & Design.
2. STAAD Pro: For comparative study for Beam & Column forces.
3. AutoCAD: For Structure Plan & Layout Drawing.

Results

We have acquired the favorable result for our project, while maintaining the standards set by the Bureau Of Indian Standards, IS 456:2000, IS 875 (Part 1, 2, 3) & IS 1893:2003. Below is the design layout for all floors.



Summary

The project focuses on the structural analysis & design of a G+5 reinforced concrete residential building using ETABS Software. The key aim was to ensure the safety, stability, serviceability, & compliance with Indian Standards like IS 456:2000, IS 875 (Part 1, 2, 3), & IS 1893:2016.

The ETABS proved itself as an effective in simulating complex behavior & multi-load conditions. Its accurate modeling of building loads & structural members is critical for realistic design. The project concludes with detailed structural drawings & calculation reports.

Conclusion

The structural aided design is easy & also time effective whereas the manual calculations possess tedious & it is a time consuming process. This dissertation successfully demonstrates the comprehensive process involved in the structural analysis & design of a G+5 reinforced concrete residential building using ETABS Software.

Through a systematic approach involving architectural planning, load assessment, modeling, analysis, & design, the project has achieved its primary objective of ensuring structural safety, stability, & serviceability while adhering to the Indian Standard Codes.

Acknowledgement

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10. Use Of SP – 34 (Detailing).

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