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Planning Analysis and Design of a G+9 Residential Building using Revit Staad Pro and RCDC Software

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Abstract: ***This study presents the planning, analysis, and design of a G+9 residential building using advanced structural engineering software tools such as Revit, STAAD.Pro, and RCDC (Reinforced Concrete Design and Detailing). The objective of the project is to develop an efficient and accurate workflow for multi-storey building design using modern software.***
The building is initially modelled in Revit, where architectural planning, grid layout, and structural components are developed in a 3D environment. The model is then exported to STAAD.Pro for structural analysis. Various loads, including dead load, live load, wind load, and seismic load, are applied as per Indian Standard codes. The analysis provides critical results such as bending moments, shear forces, axial forces, and deflections.
Based on these results, the design of structural elements such as beams, columns, slabs, and footings is carried out using RCDC. The software ensures that all elements are designed as per the limit state method and satisfy safety and serviceability requirements.
The results indicate that the structure is safe, stable, and economical. This study highlights the importance of software integration in improving accuracy, reducing design time, and enhancing overall efficiency in modern structural engineering practice

I. INTRODUCTION

The rapid growth of urbanization has increased the demand for multi-storey residential buildings, making structural design more complex and challenging. Traditional manual methods of analysis and design are time-consuming and prone to errors, especially for high-rise structures. Therefore, the use of advanced software tools has become essential in modern civil engineering practice.
This study focuses on the planning, analysis, and design of a G+9 residential building using software such as Revit, STAAD.Pro, and RCDC (Reinforced Concrete Design and Detailing). Revit is used for architectural planning and 3D modelling, while STAAD.Pro is used for structural analysis under various loading conditions such as dead load, live load, wind load, and seismic load. The design of structural elements is carried out using RCDC in accordance with relevant Indian Standard codes.
The integration of these tools helps in improving accuracy, reducing design time, and ensuring safe and economical structures. This study aims to demonstrate an efficient workflow for the design of multi-storey buildings using modern software techniques.

II. LITERATURE REVIEW

Several studies have been conducted on the analysis and design of multi-storey buildings using advanced software tools. Researchers have emphasized the importance of software such as STAAD.Pro in accurately analysing structures under different loading conditions, including dead load, live load, wind load, and seismic load. These studies show that software-based analysis provides reliable results and reduces the chances of human error.
Previous research also highlights the role of Building Information Modelling (BIM) tools like Revit in improving planning, visualization, and coordination between architectural and structural components. The use of 3D modelling helps in identifying design errors at an early stage and enhances project efficiency.
In addition, studies on RCDC (Reinforced Concrete Design and Detailing) indicate that it simplifies the design of structural elements such as beams, columns, and slabs by ensuring compliance with design codes and generating detailed reinforcement outputs.

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Many researchers have focused on the integration of these software tools, demonstrating that a combined workflow improves accuracy, reduces time, and enhances overall project performance. However, some studies indicate limitations related to software dependency and lack of consideration of real-site conditions.

Overall, the literature suggests that software-based structural design is an effective approach for modern multi-storey building projects, though practical considerations must also be addressed.

OBJECTIVES

To plan and model a G+9 residential building using Revit.

To perform structural analysis using STAAD.Pro under various loads.

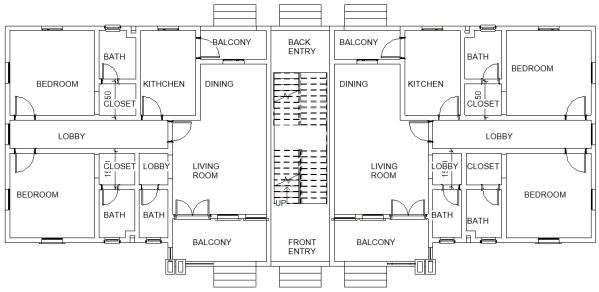
To design structural elements using RCDC (Reinforced Concrete Design and Detailing).

To ensure safety and serviceability as per Indian Standard codes.

To study the effectiveness of software-based structural design.

III. BUILDING PLANNING USING REVIT

2D PLAN



GROUND FLOOR

3D VIEW

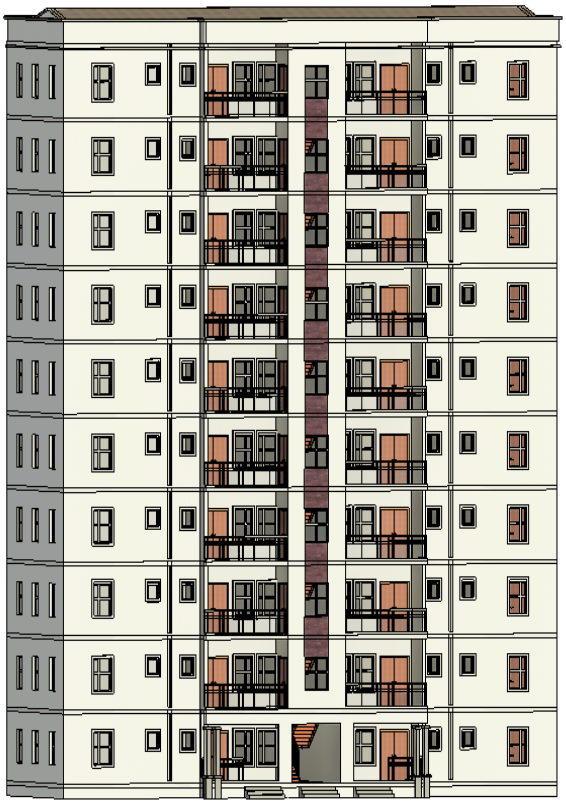


Fig . 3D VIEW

IV. STRUCTURAL MODELLING AND ANALYSIS USING STAAD.PRO

BEAMN DIMENSION	0.23×0.45m
COLUNM DIMENSION	0.3×O.6 m
SLAB DIMENSION	0.15 m
PARAPET WALL DIMENSION	0.2×1 m
HEIGH OF FLOOR	3m
HEIGH OF FOUNDATION	1.2m
TOTAL LIVE LOAD	3KN/m2
TOTAL DEAD LOAD	25KN/m
SEISMIC LOAD FACTOR	1
WIND LOAD FACTOR	1
NUMBER OF FLOOR	G+9
LOCATION	PUNE

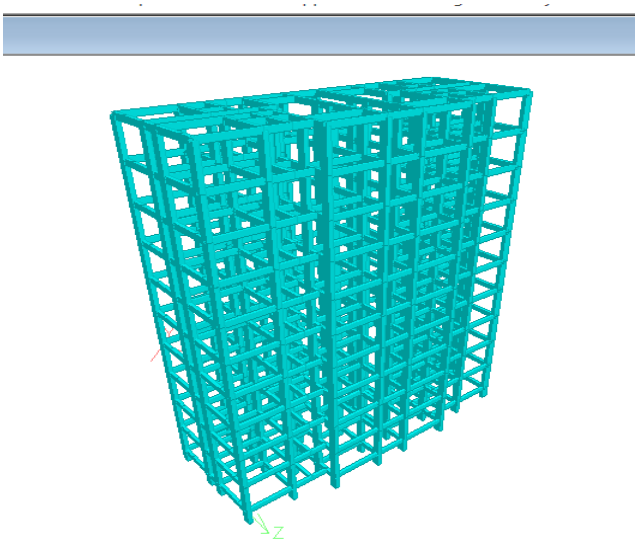


Fig . 3D Rendering

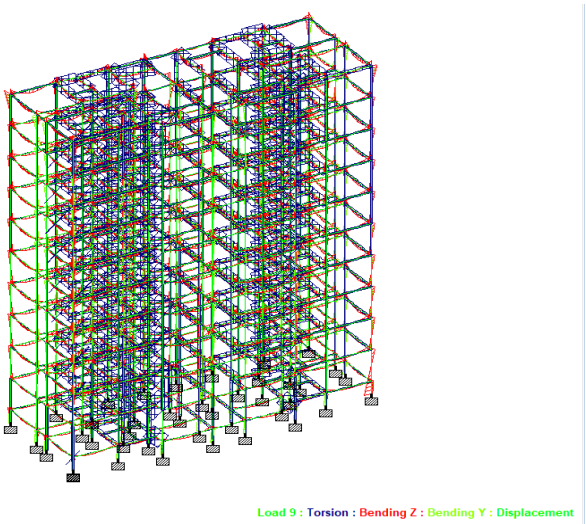


Fig . Bending Moment Results

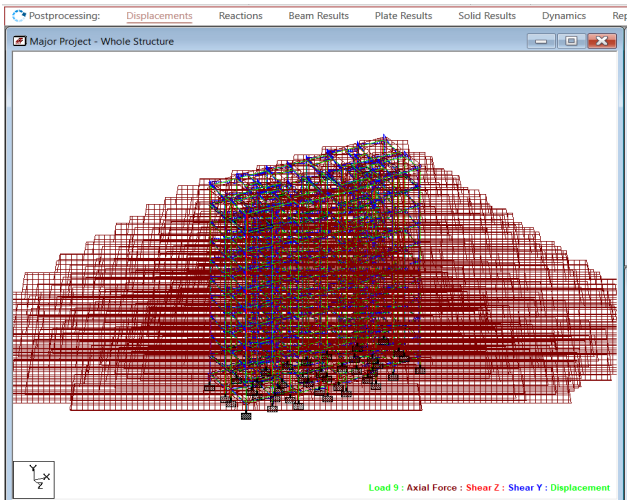


Fig . Shear Force Results

V. DESIGN OF STRUCTURAL ELEMENTS USING RCDC DETAIL REINFORCEMENT

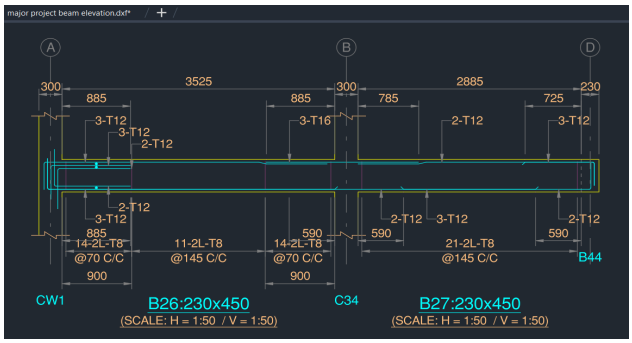


Fig . Beam Reinforcement

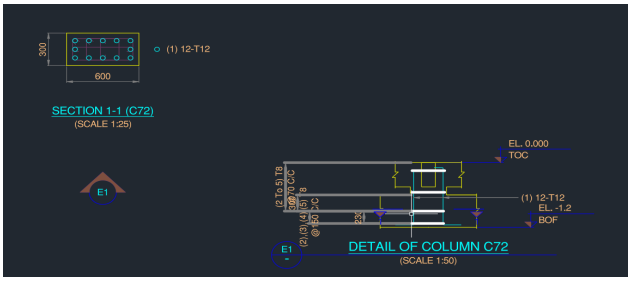


Fig . Column Reinforcement

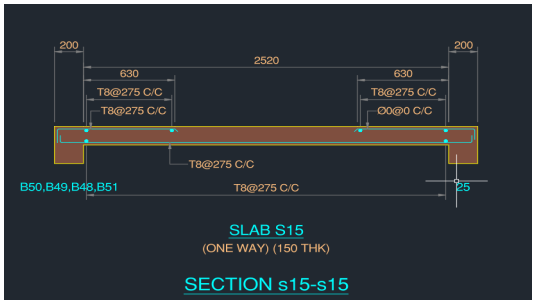


Fig 35 . Slab Reinforcement

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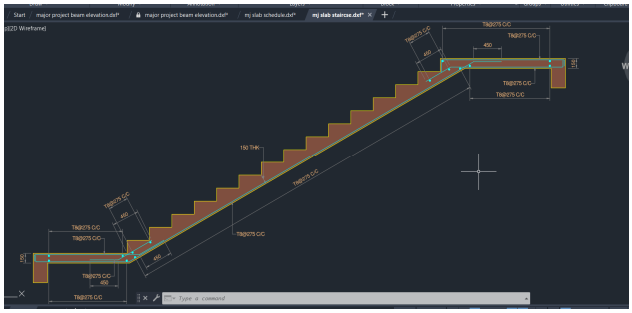


Fig . Staircase Reinforcement

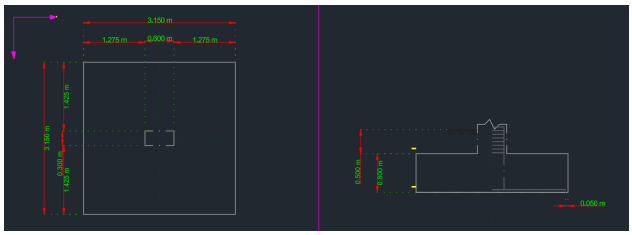


Fig . Footing Reinforcement

B0Q OF BEAM	38,45,550
BOQ OF COLUMN + WALL	41,00,299
BOQ OF SLAB +STAIRCASE	39,69,970
BOQ OF FOUNDATION	20,00,000
TOTAL COST	99,45,849 Rs

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VI. CONCLUSION

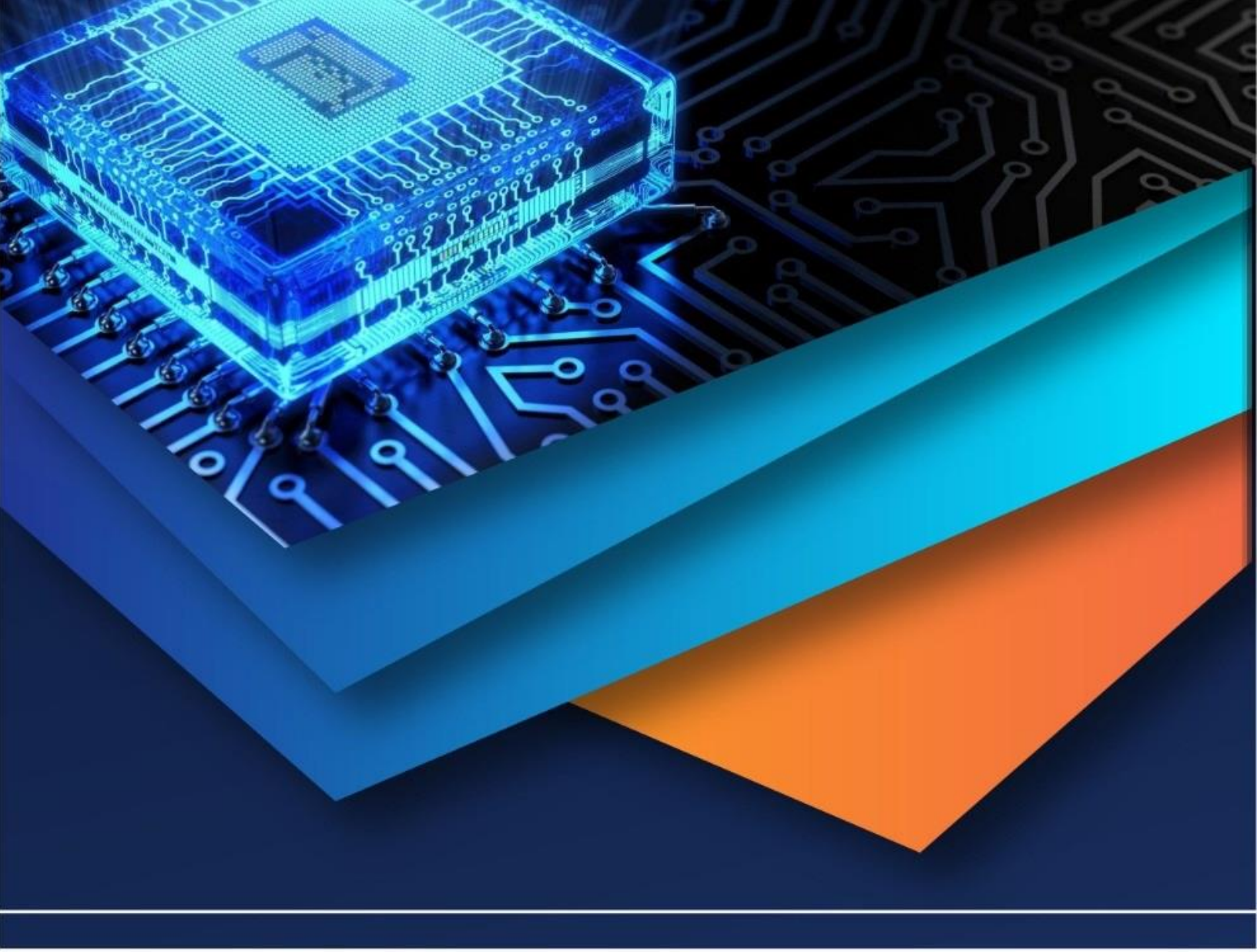
This study presented the planning, analysis, and design of a G+9 residential building using Revit, STAAD.Pro, and RCDC (Reinforced Concrete Design and Detailing). The integration of these software tools enabled efficient modelling, accurate structural analysis, and reliable design of structural elements.

The results show that the building is safe and stable under various loading conditions, including dead, live, wind, and seismic loads. The use of software improved accuracy, reduced design time, and ensured compliance with Indian Standard codes.

Overall, the study highlights the effectiveness of software-based approaches in modern structural engineering and demonstrates their importance in achieving safe and economical building design.

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