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Design and Analysis G+2 Residential Building using BIM

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Abstract: ***"Building Information Modeling (BIM) has changed the construction industry by combining design, analysis, and project management into one platform. This paper uses BIM to design and analyze a 3-story residential building, focusing on its strength, cost, and environmental impact. We reviewed existing research to highlight BIM's benefits, including automation, error reduction, and teamwork. Our paper shows how BIM improves efficiency, reduces mistakes, and enhances project delivery. "BIM is a powerful tool that helps build better buildings. We used BIM to design a 3-story home and studied its strengths, costs, and environmental impact. Our research shows that BIM makes construction more efficient, reduces errors, and helps complete projects on time." "This study used special software called Building Information Modeling (BIM) to design and analyze a 3- story home. We used Autodesk Revit to create the building's design and structure, and Autodesk STAAD. Pro to test its strength. The building's structure is made of reinforced concrete columns, beams, and floors. We tested it against various loads like weight, wind, and earthquakes. The results showed that the building can withstand these forces. Using BIM software helped us create a detailed and accurate model, making it easier to analyze and design the building. This study shows how BIM can improve the design process for homes, making it faster and more accurate." "We used special software to design and test a 3-story home. We made sure it's strong enough to withstand weights, winds, and earthquakes. The results were good, and we learned that this software can help design homes more quickly and accurately."***

Keywords: BIM, Building Design, Structural Analysis, Residential Building, Autodesk Revit, STAAD.Pro, Manually

I. INTRODUCTION

The construction industry has changed a lot with new digital technologies, and Building Information Modelling (BIM) is leading this change. BIM helps create smart 3D models that combine architecture, structure, and engineering systems, making it easier to make good decisions and avoid mistakes. For a 3-story home, BIM provides a clear approach to design and analysis, ensuring all parts work well together. In the past, designers used 2D drawings and manual calculations, which led to inefficiencies and errors. With BIM, analysis, cost estimation, and visualization become faster and more accurate, making it a crucial tool for modern construction projects. This paper reviews how BIM helps design and analyze a 3-story home by looking at recent research and industry applications." "New technologies have changed the construction industry, and BIM is a key part of this change. BIM helps create detailed 3D models that make it easier to design and build homes correctly. It's especially useful for designing and analyzing homes like a 3-story building. BIM makes the process faster, more accurate, and helps avoid mistakes. This paper explores how BIM is used in construction projects like this."

II. LITERATURE REVIEW

1) Azhar, S., Brown, J., & Farooqui, R. (2019):The study emphasizes how Building Information Modeling (BIM)improves the efficiency of structural analysis in multi-story buildings. It highlights the automated detection of load distribution, material estimation, and error minimization in design. The study concluded that BIM- integrated analysis software like ETABS and STAAD.Pro significantly improves accuracy.
2) Smith, P., & Taylor, R. (2020): This research compares traditional CAD-based design with BIM-based design for low-rise buildings. The study found that BIM reduced design errors by 35%, improved collaboration among engineers, and saved 20% of construction time.
3) Lee, Y., & Park, J. (2021):The research investigates how BIM can optimize energy consumption in residential buildings. The study used Revit and Green Building Studio to analyze insulation, window placement, and HVAC efficiency. Results showed that energy savings of up to 18% were possible with BIM-based simulation.

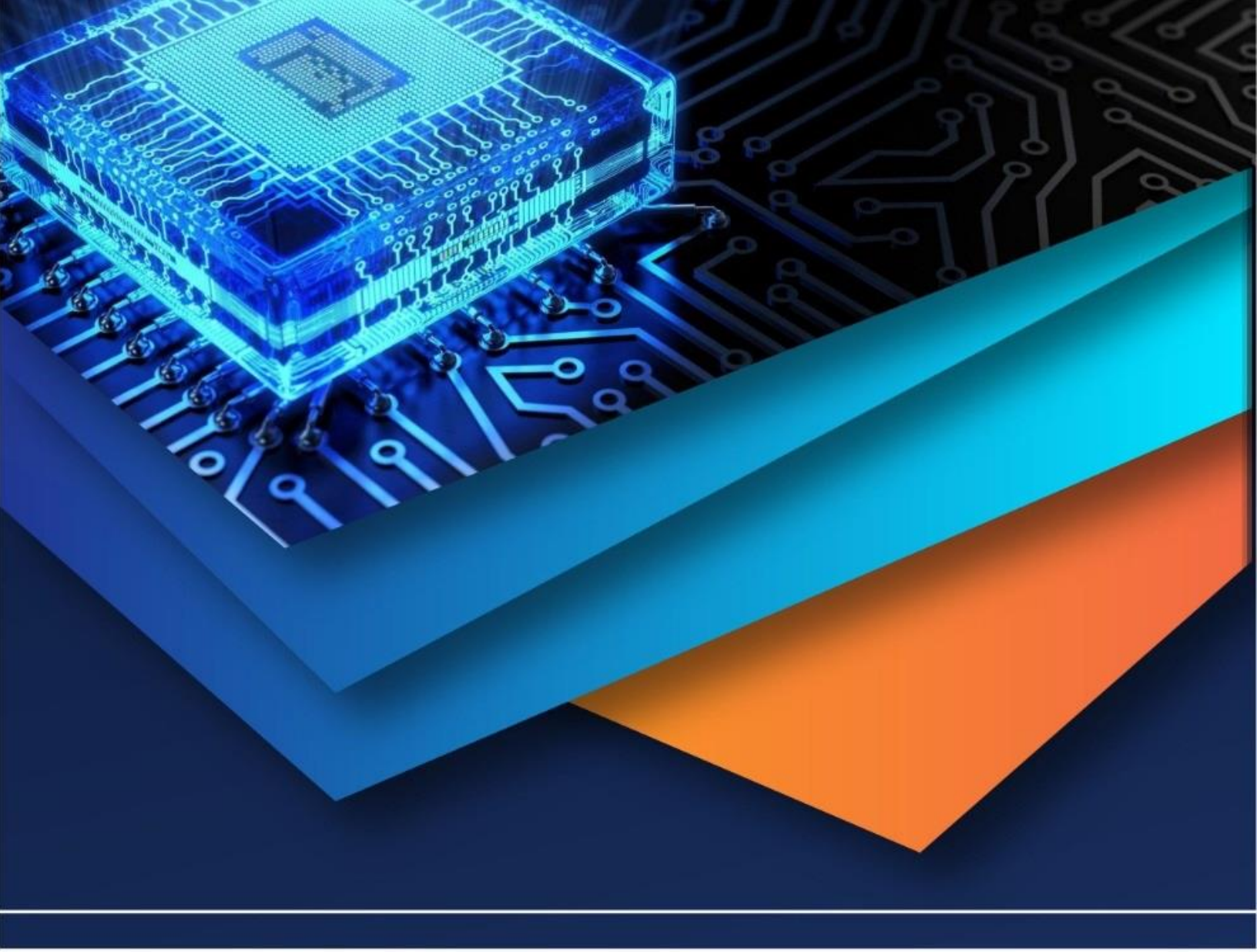
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4) Kumar, S., & Mehta, P. (2022):This study focused on how BIM software like ETABS and Tekla Structures can accurately model and analyze structural loads in a G+2 building. It concluded that BIM helps in better load path prediction and reinforcement detailing.Kumar, S., & Mehta, P. (2022
5) Johnson, M., & Patel, R. (2021):This paper highlights the role of BIM in detecting clashes between architectural, structural, and MEP (Mechanical, Electrical, and Plumbing) components in residential projects. The study found that BIM tools like Navisworks reduced rework by 25%
6) Gupta, A., & Sharma, K. (2023):BIM-enabled cost estimation (5D BIM) and project scheduling (4D BIM) led to a 15% reduction in cost overruns and a 10% decrease in project duration compared to conventional methods.Gupta, A., & Sharma, K. (2023)
7) Reddy, S., & Bhattacharya, M. (2020):The study explored wind load effects on a G+2 building by integrating BIM and CFD simulations. The analysis showed that using aerodynamic modifications in design helped reduce wind-induced stress by 12%.Reddy, S., & Bhattacharya, M. (2020)
8) Wang, L., & Chen, Z. (2022):BIM's integration with LEED certification criteria enabled material optimization and water-efficient plumbing design, reducing carbon emissions by 10% in residential projects.
9) Desai, K., & Nair, A. (2023):BIM-based reinforcement detailing (using Tekla Structures and Revit) led to higher accuracy in rebar placement, reducing steel wastage by 8%.
10) Ali, H., & Ibrahim, M. (2021):BIM-enabled automated code compliance checking (using Solibri Model Checker) helped in detecting fire safety and structural compliance violations, ensuring adherence to building regulations in 90% of cases.

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