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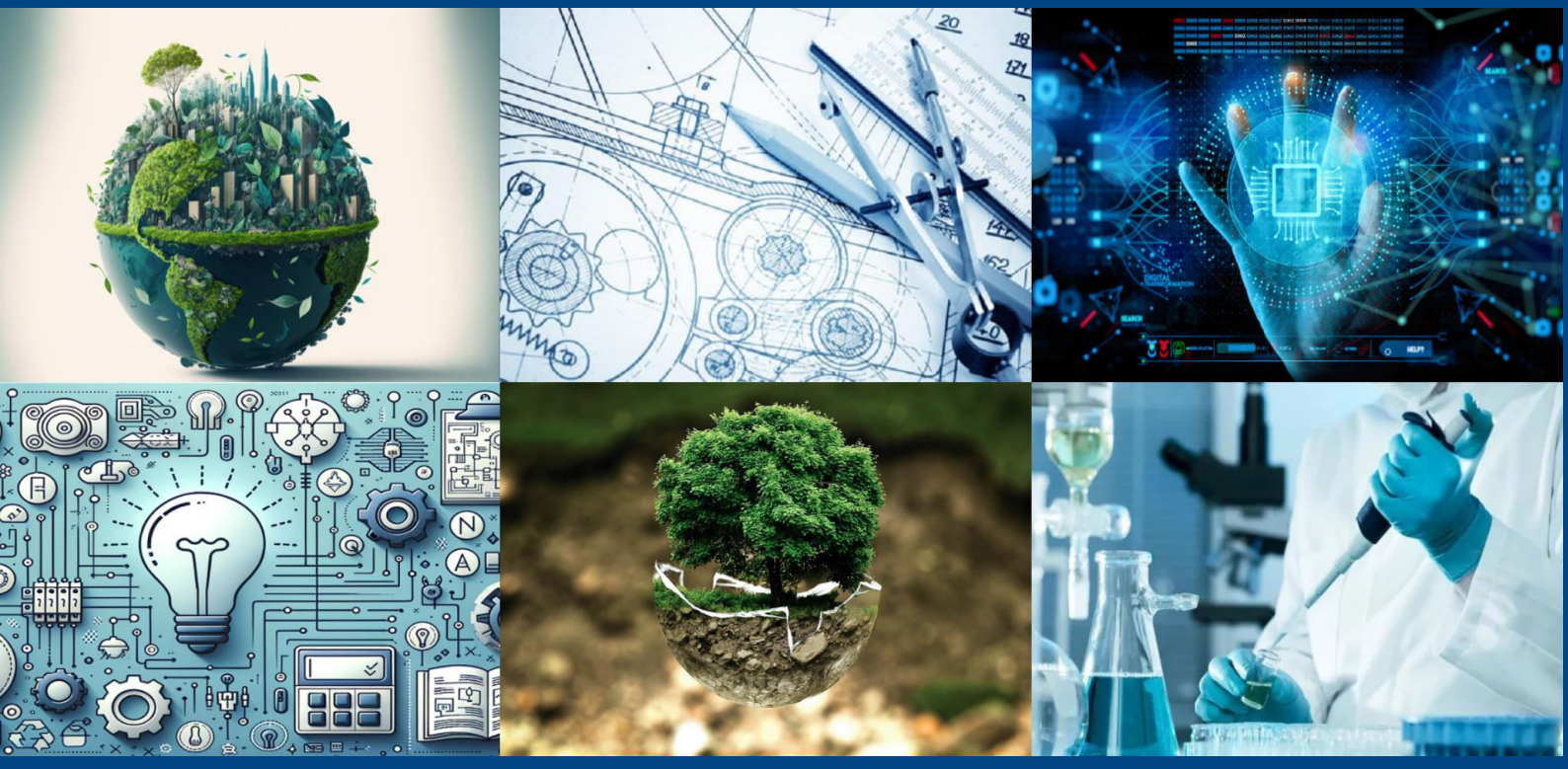

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Design and Layout of School Building using Revit Software

Pallapu Prashanth[1], Shamanthula Prakash[2], Shyaga Raju[3], Kasi Prathap Reddy[4]

U.G. Student, Department of Civil Engineering, Guru Nanak Institutions Technical Campus, Ibrahimpatnam, Telangana, India[123]

Assistant Professor, Department of Civil Engineering, Guru Nanak Institutions Technical Campus, Ibrahimpatnam, Telangana, India [4]

ABSTRACT: The design and layout of school buildings play a crucial role in ensuring a conducive learning environment, integrating functionality, safety, and aesthetics. This study focuses on the design and layout of a school building using Autodesk Revit, a building information modeling (BIM) software that facilitates efficient planning, visualization, and execution of architectural projects. The research involves creating a 3D model of the school, incorporating essential components such as classrooms, administrative offices, laboratories, libraries, and recreational areas, while adhering to building codes and space optimization principles. The study also explores structural analysis, energy efficiency, and sustainability aspects to enhance the functionality and durability of the design. By utilizing Revit's parametric modeling capabilities, material takeoffs, and clash detection tools, the proposed school building design ensures accuracy, cost-effectiveness, and streamlined construction workflows. The findings highlight the advantages of Bim-based design over traditional methods, demonstrating its potential to improve efficiency, collaboration, and sustainability in educational infrastructure development. The proposed school building is designed in 33,600 sqft's. 4,672 sqft is provided for office and primary section. 30' road is provided

KEYWORDS: 2Ddrawings, 3D visualization, Architectural works. 2D & 3D Modeling, Rendering

I. INTRODUCTION

Autodesk Revit is a building information modeling software for architects, structural engineers, mechanical, electrical, and plumbing (MEP) engineers, and contractors. The original software was developed by Charles River Software, founded in 1997, renamed Revit Technology Corporation in 2000 and acquired by Autodesk in 2002. The software allows users to design a building and structure and its components in 3D, annotate the model with 2D drafting elements and access building information from the building model's database.[1] Revit is 4D building information modeling (BIM) application capable with tools to plan and track various stages in the building's lifecycle, from concept to construction and later maintenance and/or demolition.

Features
3D modeling: Create detailed 3D models of buildings and structures
Project management: Streamline project management with instant revisions to plans, elevations, and more
Data management: Manage building information modeling details
Collaboration: Enable teams to work simultaneously across disciplines
Energy modeling: Analyze energy usage
Construction documents: Create construction documents

INTRODUCTION TO SCHOOL BUILDING: The design of school buildings is crucial for creating optimal learning environments. Beyond aesthetics, thoughtful design impacts safety, adaptability, and inclusivity. Well-designed spaces encourage social interaction, integrate technology seamlessly, and prioritize sustainability. Consideration for cultural context fosters a sense of identity and belonging. Teacher and staff well-being, along with long-term cost efficiency, are also integral aspects. In essence, school building design significantly influences the overall educational experience by enhancing safety, promoting collaboration, accommodating diverse needs, and ensuring sustainability.

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II. LITERATURE REVIEW

The design of school buildings has evolved significantly in recent years, with a growing emphasis on sustainability, energy efficiency, and innovative use of technology. Autodesk Revit, a Building Information Modeling (BIM) software, has emerged as a powerful tool for architects and designers to create detailed, data-rich models of buildings. This literature review explores the application of Revit in designing a school building on a 1-acre land, focusing on sustainability, energy efficiency, and optimal use of space.

Sustainability and Energy Efficiency

Revit can aid in designing energy-efficient buildings by analyzing energy consumption patterns and identifying areas for improvement. A case study on a school building in the UK demonstrated a 25% reduction in energy consumption using Revit-designed sustainable features (BIM Academy, 2017). Similarly, a study in the US found that Revit-designed buildings can achieve up to 30% energy savings compared to traditional design methods (Autodesk, 2020).

This literature review highlights the benefits of using Autodesk Revit in designing a school building on a 1-acre land. Revit can aid in designing sustainable, energy-efficient buildings that optimize space usage and meet specific educational and functional requirements. By considering design factors such as building orientation, space usage, and sustainable features, architects and designers can create innovative, effective, and sustainable school buildings using Revit.

III. METHODOLOGY OF PROPOSED SURVEY

This methodology focuses on a logical flow, leveraging Revit's capabilities for efficient and comprehensive school building design.'

Phase 1: Conceptualization and Information Gathering

1. **Define Project Requirements:**

Gather Client Brief: Understand the client's vision, educational philosophy, specific needs (e.g., number of students, types of classrooms, special facilities), and any regulatory requirements.

Site Analysis: Collect data about the site, including topography, orientation, existing structures, utilities, access points, and environmental factors.

Establish Program: Develop a detailed schedule of spaces, including their required areas, adjacencies, and functional requirements. This might involve creating a bubble diagram or adjacency matrix.

Set Design Objectives: Define key design goals related to functionality, aesthetics, sustainability, cost-effectiveness, and constructability.

2. **Preliminary Design and Massing:**

Conceptual Massing Models: Create initial massing studies in Revit to explore different building forms and their relationship to the site. Use simple forms and focus on overall proportions and spatial relationships.

Zoning and Circulation Concepts: Develop preliminary ideas for zoning different functional areas (e.g., academic, administrative, recreational) and the overall circulation patterns within the building and on the site.

Sun Study and Orientation Analysis: Utilize Revit's sun study tools to analyze the impact of solar angles on the building and inform decisions about orientation and window placement.

Phase 2: Schematic Design and Space Planning

3. **Develop Detailed Space Plans:**

Create Revit Floor Plans: Begin developing detailed floor plans in Revit, accurately representing the sizes and shapes of all spaces based on the program.

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Furniture and Equipment Layout (Preliminary): Start placing representative furniture and equipment blocks to ensure adequate space and functionality within each room. This helps in refining room sizes and layouts.

Adjacency Refinement: Use Revit to visually analyze and refine the adjacencies between spaces, ensuring efficient flow and functionality.

Vertical Circulation Strategy: Design and model preliminary staircases, ramps, and elevator locations, considering accessibility and traffic flow.

4. **Develop Building Sections and Elevations (Schematic):**

Create Initial Sections: Generate preliminary building sections in Revit to understand vertical relationships between floors and spaces, as well as overall building height and form.

Develop Schematic Elevations: Create basic exterior elevations to visualize the building's appearance and massing from different viewpoints.

Phase 3: Design Development and System Integration

5. **Refine Architectural Elements:**

Detailed Wall, Floor, and Roof Design: Develop the construction details for walls, floors, and the roof in Revit, including material selections and basic structural considerations (in collaboration with structural engineers).

Window and Door Schedules and Placement: Accurately place windows and doors in Revit, creating schedules to track types, sizes, and quantities.

Interior Design Elements (Preliminary): Begin incorporating basic interior design elements like wall finishes, flooring patterns, and ceiling types.

6. **Integrate MEP Systems (Collaboration is Key):**

Link MEP Models (if applicable): If MEP engineers are using Revit, link their models into the architectural model to coordinate the placement of ducts, pipes, and electrical fixtures.

MEP Space Allocation: Collaborate with MEP engineers to allocate necessary spaces for mechanical rooms, electrical closets, and vertical shafts.

Clash Detection: Utilize Revit's clash detection tools to identify and resolve potential conflicts between architectural and MEP elements.

7. **Develop Site Plan:**

Model Site Elements: Create a detailed site plan in Revit, including landscaping, hardscaping (walkways, parking), sports fields, and other site features.

Topography Modeling: Accurately model the site topography using survey data.

External Circulation and Access: Refine the design of vehicular and pedestrian access, parking layouts, and drop-off zones.

Phase 4: Construction Documentation and Detailing

8. **Generate Construction Drawings:**

Detailed Floor Plans: Produce final, dimensioned floor plans with room tags, material indications, and annotations.

Detailed Sections and Elevations: Create comprehensive building sections and elevations with detailed material callouts, annotations, and levels.

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Wall Sections and Details: Develop detailed wall sections and other construction details to clearly communicate how different building components are assembled.

Schedules and Quantity Takeoffs: Generate accurate schedules for doors, windows, finishes, and other building elements. Utilize Revit's quantity takeoff features for material estimation.

9. **Annotation and Dimensioning:**
Consistent Annotation: Apply consistent annotation styles and practices throughout all drawings.

Accurate Dimensioning: Provide clear and accurate dimensions for all building elements.

10. **Sheet Organization and Management:**
Create Drawing Sheets: Organize all drawings onto appropriately sized sheets with title blocks.

Sheet Index: Generate a comprehensive sheet index for easy navigation.

Phase 5: Presentation and Visualization
11. **Create Visualizations:**
3D Views and Perspectives: Generate realistic 3D views and perspective renderings to communicate the design intent to the client and stakeholders.

Walkthroughs and Flythroughs: Utilize Revit's animation capabilities to create virtual walkthroughs and flythroughs of the building.

Presentation Drawings: Prepare presentation-quality floor plans, elevations, and sections with enhanced graphics.

Phase 6: Collaboration and Iteration
12. **Collaboration and Communication:**
Utilize Revit's Collaboration Tools: Leverage Revit's worksharing features for efficient collaboration among team members.

Regular Reviews and Feedback: Conduct regular design reviews with the client, consultants, and stakeholders to gather feedback and iterate on the design.

BIM Coordination Meetings: Participate in BIM coordination meetings to ensure seamless integration of all disciplines' models.

13. **Design Iteration and Refinement:**
Incorporate Feedback: Address feedback from reviews and make necessary revisions to the Revit model and drawings.

Maintain Design Consistency: Ensure that all changes are consistently applied throughout the model and documentation

IV. CONCLUSION AND FUTURE WORK

The design and layout of a school building using Revit offer a modern and efficient approach to architectural planning, ensuring a well-structured and functional educational environment. By utilizing AutoCAD for initial 2D planning, a clear blueprint of the school layout is developed, defining spaces such as classrooms, administrative offices, laboratories, libraries, and recreational areas. This step allows for precise spatial organization and adherence to building regulations before transitioning to 3D modeling in Revit.

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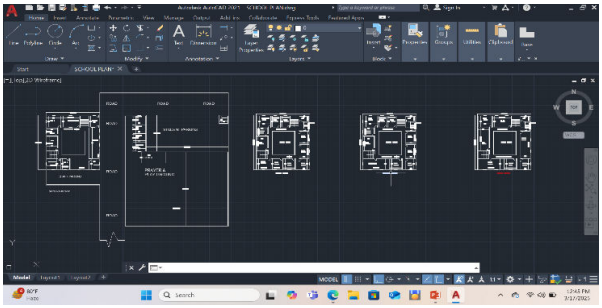

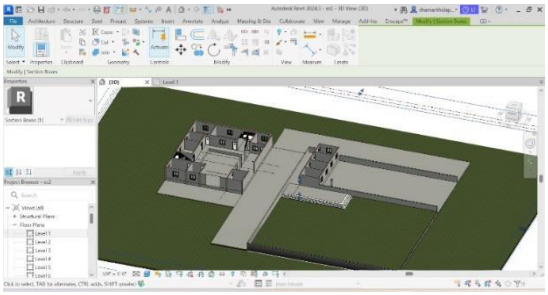

Auto cad drawing and under construction in revit

Final view of school

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