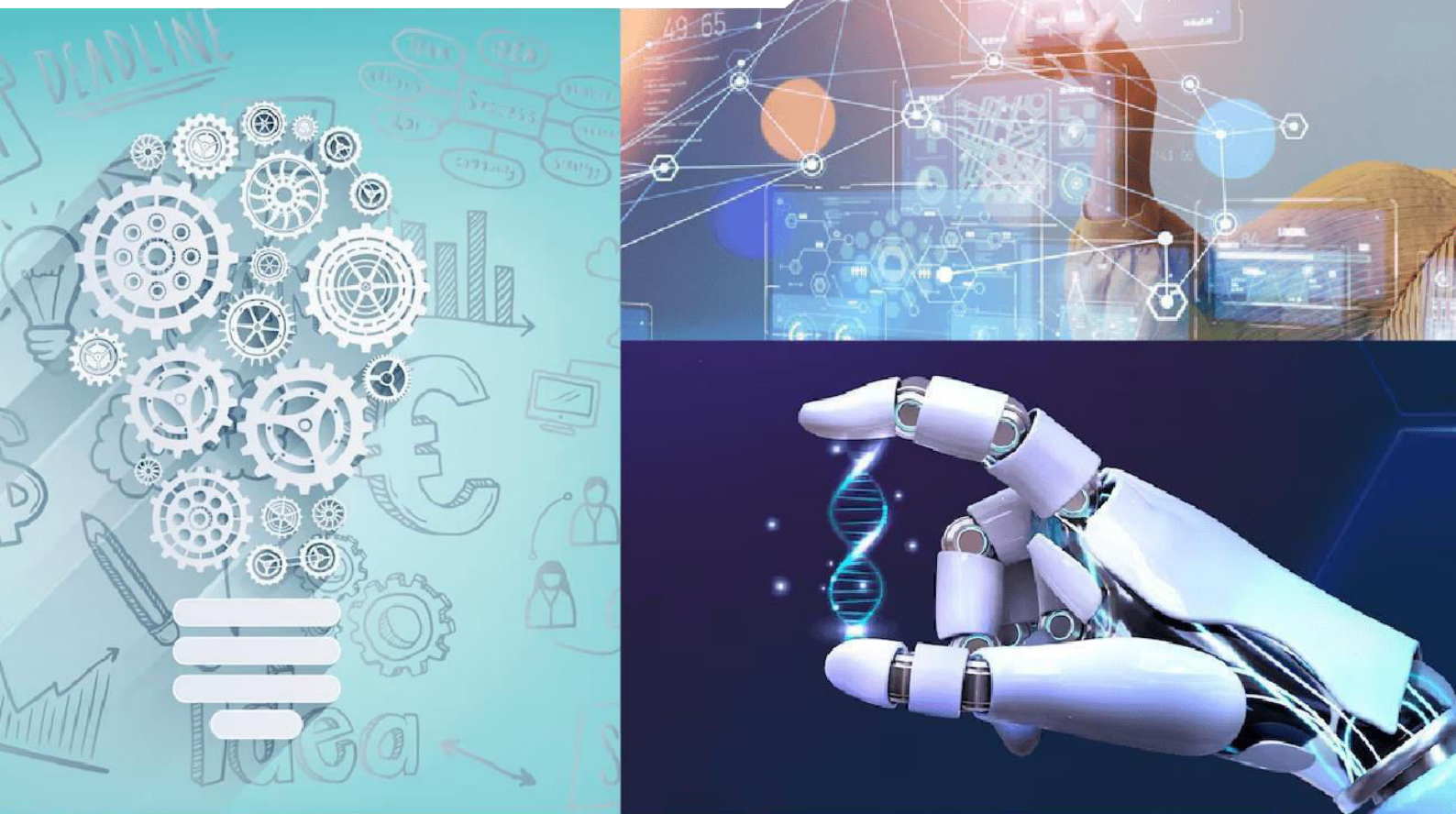




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Designing of Villa using Revit Software

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ABSTRACT: This project presents the architectural design and modelling of a two-storey residential villa using Autodesk Revit, a leading Building Information Modelling (BIM) software. The primary objective is to demonstrate how Revit streamlines the design process by allowing the creation of intelligent 3D models that are fully integrated with 2D documentation. Through this project, various architectural elements such as walls, floors, doors, windows, roofs, and staircases were modelled and detailed using Revit's tools.

The software's dynamic update feature ensures that any changes in one view are automatically reflected across all related views, reducing errors and saving time. Additionally, the model provides accurate visualizations that enhance decision-making during the design and construction planning phases. This project highlights the advantages of BIM in creating efficient, accurate, and cost-effective architectural designs while improving communication and documentation throughout the project lifecycle.

I. INTRODUCTION

With the rapid advancement in digital tools, the construction industry has embraced Building Information Modelling (BIM) to improve accuracy, efficiency, and collaboration in architectural design. Autodesk Revit is a powerful BIM software that allows architects and engineers to create intelligent 3D models, which integrate both the physical and functional characteristics of a building. This project focuses on designing a two-storey residential villa using Autodesk Revit. The aim is to demonstrate how Revit can be used to visualize, plan, and document the complete design of a modern home — including floor plans, elevations, 3D models, and construction details. By utilizing Revit's tools such as walls, floors, roofs, staircases, and rendering features, we developed a realistic and functional architectural model. The project also highlights the advantages of BIM in minimizing errors, improving coordination, and enhancing the overall design process in real-world construction projects.

II. LITERATURE REVIEW:

J. VINOTH KUMAR (2009): The study concentrated on the deployment of the model to support model to support planning, scheduling tracking of the job site operation in India.

2. SAEED REZA MOHANDDES (2015-2012): Due to numerous steps of construction industry and its complicated and extensive structure, errors and reworks often might happen in this section. As such, BIM (Building Information Modeling) is regarded as a beneficial tool in minimizing the waste and improving the efficiency of building construction. This paper review sand summarizes a substantial design.

3. A. SACHIN G. MAHESH (2020): Predictability of building operations greatly improved. The includes utilization of BIM for visualization, 3d co-ordinates, planning and scheduling.

4. Mehmet F Hergunsal (2020): The project studied six BIM utilization activities: visual-ization,3D co-ordination, cost estimation, prefabrication, construction planning and

III. METHODOLOGY

Problem Identification & Objective Setting: Defined the scope to design a two-storey residential villa using BIM tools. Set the objective to create a realistic, functional, and detailed architectural model.

1. **Software Setup:** Autodesk Revit was selected for its robust BIM capabilities. Project units were set to feet and inches based on site dimensions (45 ft × 75 ft).
2. **Level Creation:** Created levels for Ground Floor, First Floor, and Terrace (each floor height: 10 ft). Grid and level setup to maintain alignment and structure control.
3. **2D Layout Planning:** Used wall tools to sketch the ground and upper floor layouts. Incorporated rooms like living, kitchen, bedrooms, bathrooms, staircases, and balconies.
4. **3D Modelling:** Developed 3D model from 2D plans using elevation and perspective views. Inserted doors, windows, floors, ceilings, and stairs.
5. **Detailing:** Added flooring, roofing (sloped with Roof by Footprint), and ceiling structures. Applied materials and railings (glass rail for balconies) to enhance realism.
6. **Rendering & Documentation:** Generated 3D views, elevations, and sheets for visual presentation. Annotated and dimensioned drawings to prepare for construction documentation.

IV. METHODOLOGY FOR MODELING A VILLA IN REVIT

1. Project Setup

- Launch Revit and create a **New Project**.
- Choose appropriate **template file** (Imperial or Metric).
- Save the project with a meaningful name.

2. Define Project Levels and Grids

- Create **floor levels** (e.g., foundation, ground floor, roof).
- Add **grids** to help align structural and architectural components.

3. Site and Plot Layout

- Input **plot dimensions** (e.g., 44' x 43', total area: 1892 sq. ft).
- Include features like **parking areas, ramp, and open-well staircase**.

4. Create Building Elements

a. Walls

- Use the **Wall Tool** to draw exterior (9") and interior (6") walls.
- Select appropriate wall types (e.g., Retaining Wall: Concrete).

b. Floors

- Use **sketch tools** (Pick or Draw) to define and place floors.
- Ensure all floor outlines are closed loops.

c. Roofs

- Design **pitched or flat roofs** based on site and building type.
- Attach walls to the roof for continuity.

d. Doors and Windows

- Load door/window families from Revit library.
- Place doors (e.g., D1 – 3'6" x 8', D2 – 3' x 8') and windows (e.g., 3' x 6').
- Use alignment and dimension tools for accurate placement.

e. Stairs and Railings

- Add **interior stairs** between floors.
- Use railing tools to add and modify handrails and guards.

5. Interior Layout

- Divide rooms with interior walls.
- Add elements like **kitchen, bedrooms, bathrooms, and verandas**.

6. Annotation and Documentation

- Add **tags** for doors, windows, and rooms.
- Create **schedules** for doors and rooms.
- Add **dimensions and annotations**.

7. Views and Visualization

- Generate 2D views: **floor plans, elevations, sections**.
- Use **3D view** for full model visualization.
- Enable **shadows and lighting** for presentation quality.
- Compare **before and after rendering** for visual improvements.

8. Project Finalization

- Attach all building elements to ensure integrity.
- Update **view range** to ensure visibility of elements.
- Add landscaping, cladding, and architectural features as needed.
- Save and export the final project for rendering or presentation

V. FLOOR PLAN

Ground floor plan:

This is a ground floor plan of a residential building with dimensions of 8.5 feet by 11.5 feet. Below is a detailed description of the layout:

The layout optimizes functionality and efficient use of space area, suitable for a small family.

1. Ground Floor Plan: 1. Living Room Size: 3.5m × 4.0m Well-positioned near the entrance. Connected directly to the staircase and dining area.

2. Dining Area Size: 3.5m × 4.0m Centrally located. Accessible from both kitchen and living room.

3. Kitchen Size: 3.5m × 4.0m L-shaped counter for efficient working space. Position adjacent to the dining area.

4. Bedroom Size: 3.5m × 4.0 m
Near the bathroom, suitable for elderly or guests.

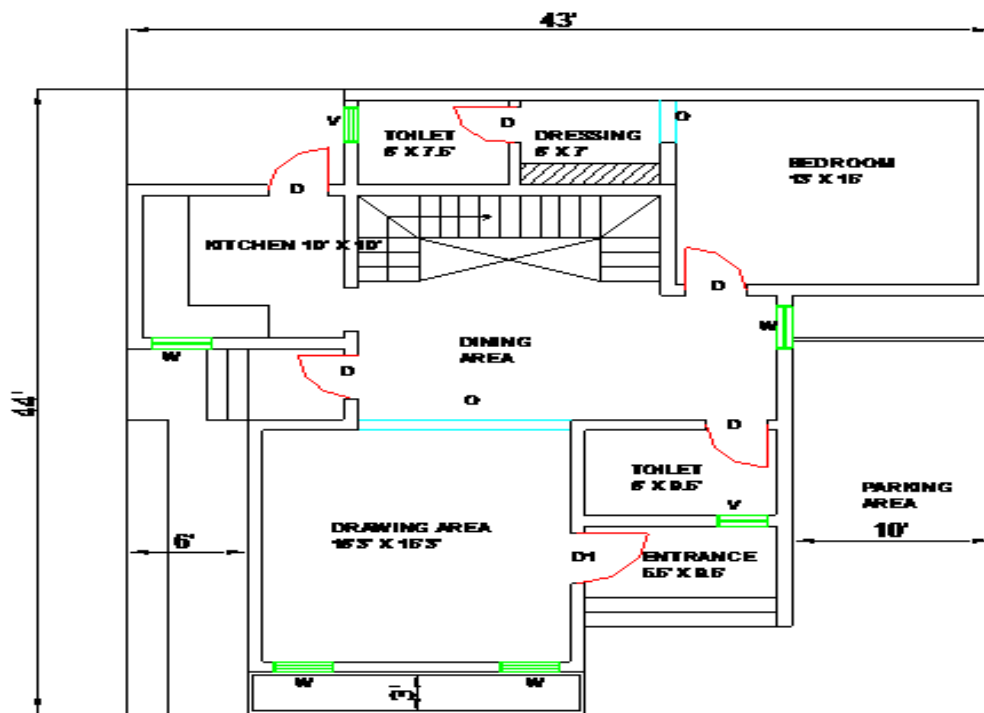
5. Bathroom Size: 1.4m × 2.2m Common toilet, accessible to guests and bedroom users.

6. Car Garage: Covered parking for one vehicle. Direct access to the house through the main entrance.

7. Staircase: Positioned near the entrance. Connects ground to first floor efficiently.

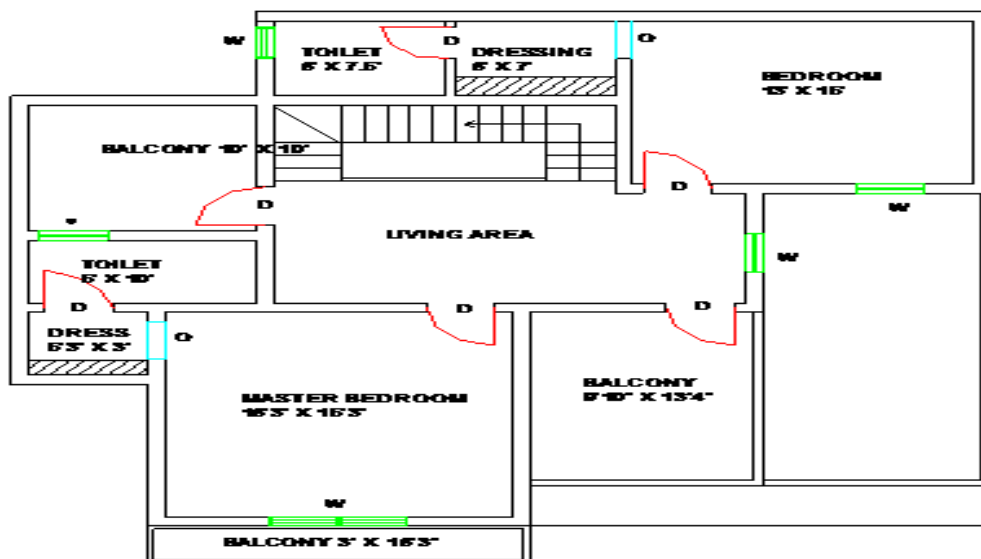
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GROUND FLOOR PLAN

Ground floor plan:



FIRST FLOOR PLAN

First floor:

DIMENSIONS: -

- Area of plot 44' x 43'
- Total 1892sft
- Open well staircase-15' x 6'
- Walls thickness – interior-6', exterior-9'
- Doors- D1 – 3'6" x 8', D2- 3' x 8'
- Openings- O – 3' x 8'
- Windows- W- 3' x 6'
- Ventilation- V-1.5' x 3'
- Parking area 10' wide.

3D View:



VI. CONCLUSION

In this project, we successfully designed a two-storey residential villa using Autodesk Revit, demonstrating the practical application of Building Information Modeling (BIM) in architectural planning. The software enabled us to visualize, model, and document every aspect of the villa — from floor plans and elevations to 3D views and construction details. Revit streamlined the design process by ensuring accuracy, consistency, and real-time updates

across all views. This project not only enhanced our technical skills but also reinforced the importance of digital tools in modern construction. Overall, the use of Revit significantly improved the clarity, efficiency, and effectiveness of our architectural design process.

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