



(A Monthly, Peer Reviewed, Refereed, Scholarly Indexed, Open Access Journal)



Impact Factor: 8.699

Volume 14, Issue 6, June 2025

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www.ijirset.com |A Monthly, Peer Reviewed & Refereed Journal| e-ISSN: 2319-8753| p-ISSN: 2347-6710|

Volume 14, Issue 6, June 2025

|DOI: 10.15680/IJIRSET.2025.1406079|

Modelling and Layout of Independent House using Revit

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ABSTRACT: The increasing emandforefficientandsustainableresidentialdesignhasemphasizedtheneedforadvanced architectural modelling tools. This project focuses on the digital modelling and layout planning of an independent house using Autodesk Revit, a Building Information Modelling (BIM) software. Revit enables architects and designers to create accurate 3Dmodels integrated with structural, architectural, and MEP (Mechanical, Electrical, and Plumbing) systems, ensuring a comprehensive approach to design and construction.

KEYWORDS: Revit, 3Dvisualization, architectural details

I. INTRODUCTION

AutodeskREVIT, REVIT is A Professional 3D Computer Graphics Program For Making 3D Models, and images.

It is developed and produced by Autodesk. It has modelling capabilities and a flexible plug in architecture and must beused on theMicrosoft platform.Itisfrequentlyused bystudios, andarchitecturalvisualization studios. Itisalsoused for movie effects and movie pre-visualization. REVIT features shaders (such as ambient occlusion and subsurface scattering), dynamic simulation, particle systems, radiosity, normal map creation and rendering, global illumination, a customizable user interface, and its own scripting language.

RevitInterfaceOverview

The Revit Interface Comprises Controls, Status Information, And Viewports, Where You Work And ViewYour Scene. One Autodesk Revit provides a user-friendly and highly integrated interface designed to support Building Information Modelling(BIM) workflows. The interface is organized to streamline the modelling, annotation, and documentation processes, allowing users to access a wider ange of architectural, structural, and MEP tools within a unified environment. Key components of the Revit interface

II. LITERATURE SURVEY

Theconceptofindependenthouses, also referred to as detached houses, has gained significant attention in architectural and urban planning literature. Unlike apartment living, independent housing provides a greater degree of freedom in design, privacy, and customization. With the rapid urbanization and increase in middle-class affordability, the demand for personalized, efficient, and sustainable housing solutions is growing. This review explores previous works related to independent housed esign, focusing on architectural principles, technological integration (e.g., BIM), sustainability, and user-centric planning.

The integration of BIM tools like Autodesk Revit has revolutionized how independent houses are modeled and visualized. Research by Eastman et al. (2011) shows that BIM enhances coordination between design, structure, and MEP systems. Independenthouse projects benefit from Revit's 3Dmodelling, rendering, quantityestimation, and clash detectionfeatures.Studiesalsorevealimproveddecision-makingandcostestimationaccuracywhenBIMisusedinearly design stages (Azhar et al., 2008).





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Emergingliterature includes the integration of smarthometechnologies in independenthousing. Studies by Al-Ali et al. (2015) suggest that IoT-based automation (lighting, HVAC, security systems) not only enhances convenience but also contributes to energy savings. Independent houses, due to their ownership model, provide greater flexibility for installing such systems compared to multi-unit residences.

Socio-culturalfactorsheavilyinfluencethedesignandad option ofindependenthousing.LiteraturefromIndianurban developmentcontexts(e.g.,Joshi&Sen,2010)highlightshowculturalpractices, familystructures,and economicstatus shapethedesign choicesandspatialarrangementsofindependenthomes.Customization tosuitmultigenerationalliving and region-specific aesthetics is a recurring theme.

Whileindependenthousing offers flexibility, challeng essuch as landscarcity, cost overruns, regulatory approvals, and lack of skilled labor are well documented. The literature suggests that combining digital tools like BIM with sustainable and cost-effective construction practices (like modular design and prefabrication) is keytoaddressing these issues in the future.

The literature emphasizes a multidisciplinary approach to independent house design—merging architecture, technology, sustainability, and socio-cultural awareness. Futureresearch mayfocus on affordable independent housing models, integration of AI in design automation, and lifecycle-based sustainability analysis. The reviewed literature provides a comprehensive foundation for exploring innovative, user-centric housing solutions.

III. METHODOLOGY

The methodology outlines the step-by-step process adopted in planning, designing, and digitally modelling an independentresidentialhouseusingarchitecturaldesignprinciplesandBuildingInformationModelling(BIM)tools. The focus is on achieving spatial efficiency, functional zoning, and environmental responsiveness.

- SiteAnalysis:Aspecificplotwasselected, and its dimensions, orientation, climate conditions, and surroundings were documented.
- User Requirements: A client profile was created to determineroom requirements, number of floors, lifestyle needs (e.g., elderly-friendly, working professionals, etc.), and aesthetic preferences.
- **RegulatoryStandards**:Buildingbye-laws, setbackrequirements,andfloorarearatio(FAR)werereviewedas per the local municipal corporation.
- **ZoningandSpacePlanning**:Spaceswerefunctionallyzoned into public(living,dining), semi-private (kitchen, guest room), and private (bedrooms, toilets) areas.
- **OrientationPlanning**:Roomswerearrangedbasedonsunlight direction, windflow, and privacy considerations.
- **PreliminarySketches**:Handsketchesandconceptualdiagramsweredeveloped before moving to digital platforms.
- **BIMToolUsed**:AutodeskRevit wasselectedforitscapabilityto managearchitectural, structural, and MEP design in a single environment.
- FloorPlanDevelopment: The2Dfloorlayout wasfirst createdbasedonspatialanalysis and user inputs.
- **ElevationandSectionViews**:Automaticgenerationandrefinementofelevationand sectional views were done for visualization and detailing.
- **3DModelling**: The structure was model in 3D to study form, materials, lighting, and massing.
- MaterialandComponentSpecification:Walls,doors,windows,roofing,andflooring were specified with realistic materials from the Revit library.
- **StructuralLayout**:Basiccolumn-beamlayoutwasintegratedforstructuralstability (optional if structural analysis was not the focus).
- **MEPCoordination**:PlumbingandelectricalplanswereaddedusingRevit MEPtools for a complete representation.
- **NaturalVentilation&Lighting**:Placementofwindows, skylights, and open spaces ensured passive cooling and daylighting.
- WaterManagement: Provisions for rainwater harvesting and drain agesystems were incorporated.
- MaterialSelection:Eco-friendlyand locallyavailable materialswereconsidered for walls, roofing, and flooring.
- **Rendering**: 3Dviews and photorealistic rendering swere generated to visually communicate the design.
- $\bullet \quad Working Drawings: Plans, elevations, sections, and schedules we reextracted for construction documentation.$





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• WalkthroughAnimation:Anoptionalvideo walkthroughwascreatedtogivearealistic experience of the house design.

Thismethodologyensuredasystematic, user-centric, and regulation-compliant approach to designing an independent house. The use of Revit streamlined the modelling process and helped visualize and document the design effectively.

IV. EXPERIMENTAL RESULTS

Figure shows the result of the layout of Independent House using Revit Software.



. Figure shows the interface of Revit Software..

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Fig, Show the interior sample designs of the our project





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Final Fig. Shows the exterior relevation of the independent house







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V. CONCLUSION

The independent house project showcases a successful blend of modern design, sustainable practices, and functional living spaces. By incorporating cutting-edge architectural elements, efficient building techniques, and eco-friendly materials, this project sets a benchmark for future residential developments.

The development of the independent house has been a comprehensive exploration of architectural design, functionality, and modern residential needs. Through the planning and modelling process, careful consideration was given to spatial organization, ventilation, natural lighting, The project's focus on sustainability reduces environmental impact and promotes eco-friendly living. The design prioritizes functionality, comfort, and aesthetic appeal, creating a desirable living space.

The use of modern material sand technologies enhances the project's efficiency, durability, and overall value

REFERENCES

Here are some references on independent houses: Books

1. *"The Not So Big House" by Sarah Susanka*: A book that explores the concept of smaller, more sustainable homes.

2. *"The House Book" by Phaidon*: A comprehensive guide to house design, featuring examples from around the world.

3. *"The New Small House" by Katie Hutchison*: A book that showcases small house designs that are both functional and stylish.









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