BIM ANALYSIS USING REVIT ARCHITECTURE AND RENDRING BY USING V-RAY AND LANSCAPE

Darshan K R[1], Abhishek L[2], Balaraj M[3],B R Archana[4], Jeevitha R H[5]
Departement of Civil Engineering, Jain Institute of Technology, Davangere.

***Abstract*—** Building information modelling (BIM), a high-tech approach for process transformation, handles project complexity and rapid evolution. A BIM-based project's digital assets alter how supply chain partners cooperate to improve the design and construction processes, enabling early problem identification and removal, producing cost and schedule benefits, and improving facilities management and operations after occupancy.

1 Introduction

Building information modelling tool Revit Architecture may take your profession in building modelling to the next level. Revit Architecture may help you get better in 2D drawing, 3D modelling, and digital presentations. In Revit Architecture's most thorough course, a reference manual has been made especially for students, architects, interior designers, building designers, and civil engineers. Parametric Component Creation.

- An Idea for The Non-Conventional Work Flow.
- Creating The Images and Walkthrough Animation for Presentation.
- Creating The Interior and Exterior Design of a Building.
- Making A Plan for Approval.
- Generating Automatic Estimation Schedules.
- Get Your Paper Ready Prior to Styling.

1.1 About BIM

Developing Information Modelling (BIM) is a model-based intelligent method that offers guidance for managing and developing projects more quickly, more affordably, and with less environmental impact.

The entire portfolio of design, visualization, simulation, and collaboration tools in the Autodesk BIM software makes use the rich data in the intelligent model to help client make better decisions and remove obstacles to better business.

Although BIM adoption is rising in rich nations, instances of it being used in developing nations are few and far between. According to research, construction companies face a number of challenges related to the socioeconomic and technological environment present in developing nations.

1.2 Why for Architects?

A virtual information model could be passed from the Design Team, which includes architects, surveyors, consulting engineers, and other professionals, to the contractor and subcontractors, and then to the owner. This would enable the addition of discipline-specific knowledge and the tracking of changes to each model. The product helps convey vast information to the owners of complex structures well beyond what are already accustomed to having, considerably reducing the information loss which occurs when a new team assumes ownership of the project. By enabling the use of conflict detection, which warns team members about certain portions of the building, BIM can significantly reduce the errors caused by both the Design Team and the Construction Team (contractors and subcontractors).

2. OBJECTIVE AND SCOPE OF THE WORK

- ❖ Describe Revit's parametric linkages and building information modelling.
- ❖ Learn about parametric objects, families, and the user interface, and begin projects with templates.

- Draw up a simple floor layout, update it, add and remove walls, compound walls, doors, and windows.
- Create elevation, section, and 3D views; duplicate and manage views; and regulate item visibility in views.
- In a building model, add floors and ceilings, add roofs and curtain walls, and work with stairs and railings.
- Produce timetables, room and room timetables, legends, and keynote speeches.
- Manage modifications, work with drawing sheets and title blocks, and use rendering, walkthroughs, and sun and shadow settings to present the building model.
- Create sun settings and a model walkthrough.
- Work with building cost estimates.
- Producing by V ray.

Scope

- Revit Can Be Used for A Wide Range of Bim Applications. Bim Uses 4d Simulations, Revit Families, Heat Load Calculations, And Clash Detection.
- Revit Is Currently Very Useful Software for The Construction Field, Specifically in The Building Information Modelling Sector.

3. METHODOLOGY

MODELLING WALLS

Walls are a fundamental aspect of a building model in Revit, and they are represented by predefined system family types that denote their various functions, compositions, and thicknesses. Users can customize these types by adding or removing layers, dividing them into sections, or modifying their thickness and material using the wall's type properties. To insert walls into the building model, users can simply click on the Wall tool and select the appropriate type before placing it in a 2D or 3D view. Once a wall is added to the drawing, users can also adjust, such as adding sweeps or reveals, editing the wall's profile, or inserting hosted components.

Revit Architecture offers three distinct family types of walls that commonly found in buildings, including doors and windows that are typically integrated into the wall systems.

1. Basic Wall
2. Stacked Wall

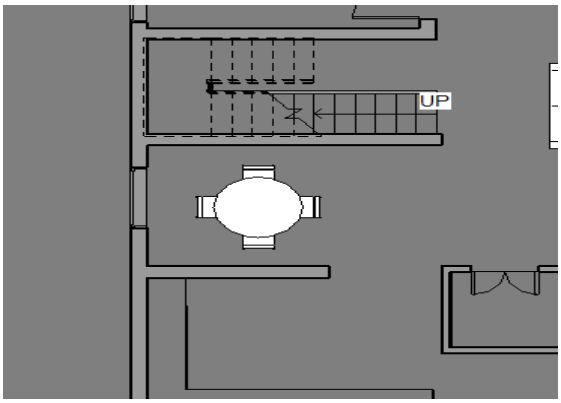


Fig 3.1: Wallls done in Revit

3.1 MODELLING OF WINDOWS AND DOORS

- Windows in Revit can be installed in plan, section, elevation, or 3D views, and they can be added to any kind of wall (or, in the case of skylights, to an existing roof).
- Visit OpenHouse.rvt
- From the Architecture tab, pick Door tool.
- To load the door, click Load family.
- From the library, choose Double Panel-1 in the Us Metric.
- Add a fresh Door Type.
- Change the name of the door to "D-1000x2100mm." Change the dimension value in the type properties box.
- After choosing the door, choose the temporary measurement that appears to secure the door's position to the wall.
- Click the dimension icon to permanently set the dimension. Lock the dimension as well.

3.2 MODELLING OF ROOF AND CEILING

A roof is a protective covering that creates or covers a building's top. Revit Architecture allows for the creation of numerous roof kinds. Extrusions, mass instances, or the building footprint can all be used to create a roof. Windows and doors cannot be broken through by a roof.

Adding Rood by Roof by Footprint

2D closed-loop sketch of the roof perimeter produced when walls are selected or lines are drawn in the open. Height is controlled by the Base Height Offset property; Openings are defined by extra closed loops; Created at the level of the view in which it was sketched

When you use a slope parameter on a line sketch, slopes are defined.

Adding a Roof by Extrusion

- Open-loop sketch of the roof profile is produced while drawing the profile in an elevation view using lines and arcs.
- The position of the sketch in elevation view determines height.
- Revit determines depth based on drawing size unless you provide start and finish points.

Adding Sloped Glazing

- The extrusion method or the footprint method can be used to make sloped glazing. Sloped glazing can join to curtain walls and common wall types and has one or more slope-defining lines.
- Construct a roof using the extrusion or footprint.

Fig 3.2: Exterior wall when rendered

3.3 RENDERING

You will want to portray your building model with real-world materials, texture, and lighting at various points throughout your projects. You will construct rendering in 3D views in Autodesk Revit Architecture to do this. You can produce realistic renderings from within the programmed since the Revit platform employs the Mental Ray render engine as a renderer.

Fig 3.3: Front Elevation

3.4 ESTIMATION OF BRICKS USING SOFTWARE

Find out the total volume of walls for each phase.

- Choose Schedule and Quantities » Wall should be chosen under Category, then New Construction should be chosen.
- Create a timetable for the current phase in the same manner. Discover differences
- To plan a wall demolition by yourself
- Make a phase filte r that displays destroyed elements.
- To the present view, apply the phase filter.
- When creating a wall timetable, choose Demolished as the Phase.

Fig 3.4: Rendered Front Elevation

3.5 WALKTHROUGH

A walkthrough is a camera that travels along a predetermined path. Frames and critical frames make up the path. A key frame is a frame that can be altered, allowing you to move the camera in any direction. Walkthroughs can also be made as an orthographic 3D view instead of the conventional series of perspective views.

Creating Walkthrough :

- Open a view in which to set the walkthrough path. • Open the project Home.rvt.
- Change to the ground floor plan.
- 4 View tab – Create panel – Drop down 3D view Choose Walkthrough.
- To build a tour as an orthographic 3D view, uncheck the Perspective option on the Options Bar as desired. Choose a view scale for the 3D view as well.
- Hover the mouse over a view, then click to add a key frame.
- To draw the path, move the pointer in the desired direction.
- To add an additional key frame, click once more. Key frames can be placed anywhere, but they cannot be changed once the path is created. Once the path is complete, you can edit the key frames.
- By positioning the camera at an angle relative to a chosen level, you can change its height. Choose a level from the From menu and enter a height in the Offset text.
- This can make it appear as • You can complete the walkthrough path by doing any of the following: Press Esc and then click Finish Walkthrough. though the camera is climbing a set of stairs.

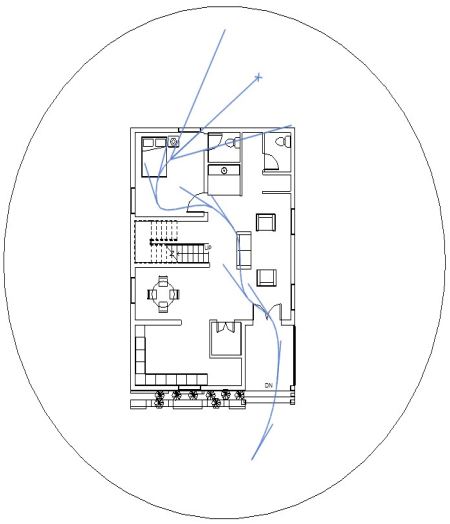


Fig 3.5: Walk Through Image

3.6 SOLAR STUDY

A solar study is darkened, three-dimensional view that shows how the building's shadows will change during a day or several days.

Creating and Setting Up a Solar Study Indicate the Project Location Use the nearest big city's address, the project's street address, or the latitude and longitude to describe its exact position. This project-wide setting helps create site-specific shadows for views that require them, such walkthroughs and solar studies.

All 3D views, with the exception of those that employ the Wireframe or Consistent Colours visual Creating Views for Solar Studies style, can display the sun's path and shadows. The sun path is visible in floor plans, elevations, sections, and reflected ceiling plans in 2D views. Use 3D views of the building model to provide the best possible representation of light and shadow on a project.

When Project North diverges from True North, rotate the view to True North to create solar studies that appropriately depict the sun's location in reference to the project. As an alternative, you can define where the sun is in relation to the view when creating a lighting solar study.

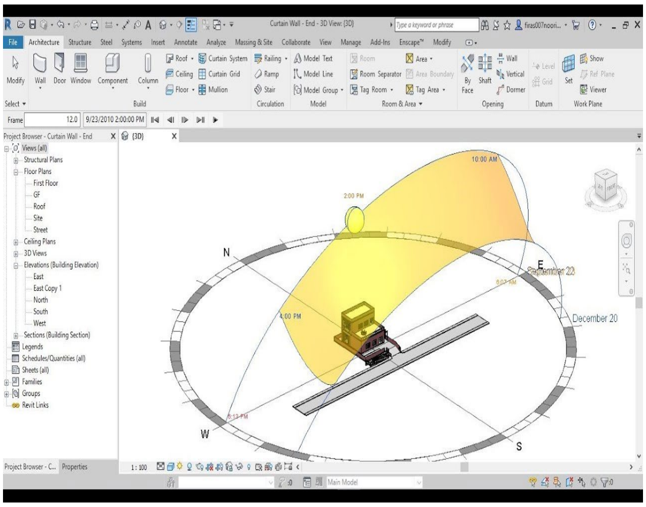


Fig 3.6: Solar Study Image

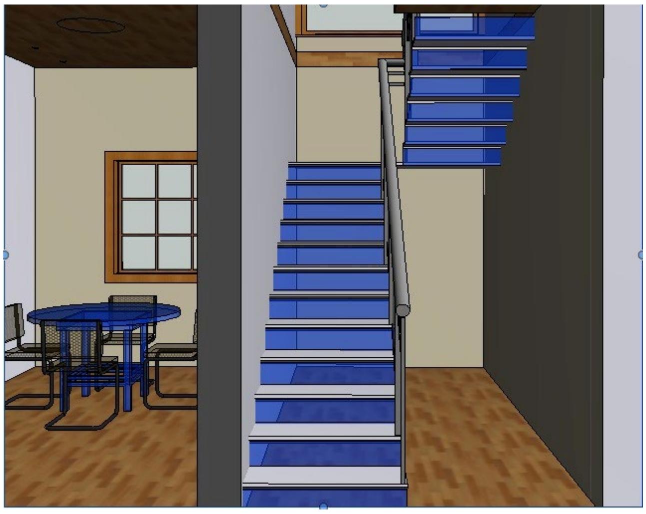
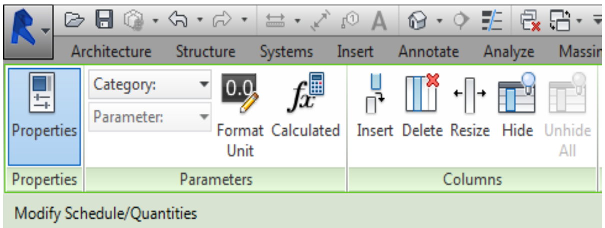


Fig 3.7: Revit Image of Stairs

Fig 3.8: Revit Image of Stairs



<Wall Schedule>

A	B	C	D	E
Area	Volume	Width	no of brick	prize of brick
29 SF	21.75 CF	0' - 9"	307.945707	3079.457067
1 SF	0.84 CF	0' - 9"	11.94617	119.461697
39 SF	29.44 CF	0' - 9"	416.788586	4167.885858
274 SF	205.50 CF	0' - 9"	2909.555987	29095.559873
253 SF	189.75 CF	0' - 9"	2686.56082	26865.608204
179 SF	134.25 CF	0' - 9"	1900.768327	19007.683275
353 SF	264.44 CF	0' - 9"	3744.01806	37440.180603
97 SF	72.37 CF	0' - 9"	1024.715886	10247.15886
122 SF	91.25 CF	0' - 9"	1291.956126	12919.561258
132 SF	98.75 CF	0' - 9"	1398.1443	13981.443005
82 SF	61.25 CF	0' - 9"	867.203427	8672.034269
56 SF	21.09 CF	0' - 4 1/2"	298.654241	2986.542414
50 SF	18.59 CF	0' - 4 1/2"	263.258183	2632.581832
42 SF	15.70 CF	0' - 4 1/2"	222.331491	2223.314908
50 SF	18.59 CF	0' - 4 1/2"	263.258183	2632.581832
97 SF	36.24 CF	0' - 4 1/2"	513.076773	5130.767731
56 SF	20.94 CF	0' - 4 1/2"	296.441988	2964.419878
54 SF	20.16 CF	0' - 4 1/2"	285.38072	2853.807196
1 SF	0.23 CF	0' - 4 1/2"	3.31838	33.183805
25 SF	9.42 CF	0' - 4 1/2"	133.398894	1333.988945
10 SF	3.59 CF	0' - 4 1/2"	50.881834	508.818337
57 SF	42.81 CF	0' - 9"	606.157497	6061.574974
41 SF	30.44 CF	0' - 9"	431.014342	4310.143417
28 SF	20.63 CF	0' - 9"	292.01748	2920.174805
103 SF	76.09 CF	0' - 9"	1077.367523	10773.675227
236 SF	177.28 CF	0' - 9"	2510.02298	25100.229799
294 SF	220.53 CF	0' - 9"	3122.372583	31223.725834
115 SF	85.97 CF	0' - 9"	1217.181953	12171.819527
215 SF	161.58 CF	0' - 9"	2287.689285	22876.89285
100 SF	74.69 CF	0' - 9"	1057.45724	10574.572399
235 SF	176.30 CF	0' - 9"	2496.151494	24961.514941
132 SF	98.75 CF	0' - 9"	1398.1443	13981.443005
129 SF	96.88 CF	0' - 9"	1371.597257	13715.972568
94 SF	70.63 CF	0' - 9"	999.938645	9999.386453
91 SF	67.97 CF	0' - 9"	962.330333	9623.303334
80 SF	60.31 CF	0' - 9"	853.929905	8539.29905
49 SF	36.56 CF	0' - 9"	517.667352	5176.673518
99 SF	74.27 CF	0' - 9"	1051.484155	10514.841551
115 SF	86.53 CF	0' - 9"	1225.146066	12251.460658
87 SF	65.34 CF	0' - 9"	925.164472	9251.644722
137 SF	103.03 CF	0' - 9"	1458.76005	14587.600502
93 SF	69.67 CF	0' - 9"	986.443898	9864.438981
46 SF	34.13 CF	0' - 9"	483.156195	4831.56195
135 SF	101.56 CF	0' - 9"	1437.964866	14379.64866
46 SF	34.38 CF	0' - 9"	486.695801	4866.958008
84 SF	84.18 CF	1' - 0"	1191.859816	11918.598164
1 SF	0.57 CF	0' - 5"	8.111597	81.115967
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	1.99 CF	0' - 5"	28.128579	281.285788
5 SF	2.25 CF	0' - 5"	31.917711	319.177109
4946 SF	3503.38 CF	35' - 2"	49602.377513	496023.775125

Fig 3.9: Revit Calculation of Quantity of Wall

Manual Estimation of Bricks

BRICK ESTIMATION

SL.No.	PARTICULARS	No's	L	B	D	Qty	UNIT	NO OF BRICK	AMOUNT
1	9" BRICK WALL								
		1	298.00	0.75	10.00	2235.00			
		1	165.00	0.75	10.00	1237.50			
						3551.81	CFT		
	DEDUCTIONS								
	DOORS	10	3.00	0.75	7.00	157.50			
	WINDOWS	14	4.00	0.75	4.00	157.50	CFT		
	NET 9" BBM WALL QUANTITY					3394.31	14	47520.38	475203.75

Fig 3.10: Manual Calculation of Quantity of Wall

References

1. **Karen Kenseket al., (2015):** Throughout the life of a building, a building information model (BIM) holds data that may be accessed and exported with various purposes, particularly for operations and facilities management (FM).

2. **Mary ShickAlshabab et al., (2019):** The Autodesk Revit and Autodesk Navisworks Manage BIM-based quantity takeoff functionality was researched to provide design and takeoff solutions for engineers and surveyors to extract the amounts of materials without deviating from actual values.

3. **Malik Khalfan et al., (2012)**: BIM, also known as n-D modelling or virtual prototyping technology, is a ground-breaking innovation that is rapidly changing the architecture, engineering, and construction (AEC) sector.

4. **Salman Azhar, PH.D., A.M. ASCE et al., (2011):** One of the most promising recent advancements in the architecture, engineering, and construction (AEC) sector is building information modelling (BIM).

5. **Shih-Ping Ho et al., (2013):** enhancing knowledge management using BIM technology in the building industry.