

APPLICATION OF BUILDING INFORMATION MODELING FOR THE RESIDENTIAL BUILDING PROJECT

Prof. Abhijit .N. Bhirud ¹, Pravin B. Patil ²

¹Assistant Professor

Department of Civil Engineering, JSPM's Imperial College of Engineering and Research, Wagholi, Pune, India.

abhijitbhirud11@gmail.com

pravinpatil20@yahoo.com

Abstract— Building Information Modelling (BIM) is the latest technology in Architecture, Engineering, and Construction (AEC) industry. It is a multi-dimensional building model that acts as a communication and information resource over the lifecycle of a project. It consists of 3-dimensional design functions, quantity takeoff functions, and scheduling functions. BIM is model based design concepts, in which buildings will be built before they get built in the field. The goal of this paper is to understand the benefits of BIM for ACE industries and ideas to make 3D model using Revit Architecture 2014.

Index terms- Building Information Modeling, Benefits of BIM, 3D Modeling.

I. INTRODUCTION

Building Information Modeling (BIM) defined as a digital, reliable, three dimensional, virtual representation of the project to be built for use in design decision making, construction planning and scheduling, also maintenance and cost estimation of construction projects. The demand of BIM products has increased significantly as contractors begin to see the benefits of utilizing this technology.

According to the National BIM Standard, Building Information Model is “a digital representation of physical and functional characteristics of a facility and a shared knowledge resource for information about facility forming a reliable basis for decisions during life-cycle; defined as existing from earliest conception to demolition.” Building Information models are also used during the project lifecycle such as Contractors, Owners, Engineers, and Designers (Fig. 1).

For making a physical modeling became less popular. It takes more time to change the physical models when design changes were required. BIM is the next progression from CAD and the step into the future. The BIM model is used within the construction industry for numerous tasks such as three-dimensional (3D) modeling, scheduling and quantity takeoff.



Fig.1. Lifecycle of a building

II. BIM SOFTWARES

Building Information Modeling has different softwares. For example, Autodesk Revit Architecture, Graphisoft ArchiCAD, Bentley Architecture, Nemetschek Allplan Architecture, Gehry Technologies- Digital Project Designer, Nemetschek Vectorworks Architect, 4 MSA IDEA Architectural Design (IntelliCAD), CADSoft Envisioneer, Softtech Spirit, RhinoBIM (Beta) are some of software's that are used for architectural and engineering purposes.

In addition, Autodesk Revit Structure, Bentley Structural Modeler, STAAD and Prosteel, Tekla Structures, CypeCAD, Bentley RAM, Nemetschek Scia, that is used for structural purposes. Also, there is Autodesk Revit MEP (mechanical, electrical and plumbing) engineers.

III. BIM BENEFITS

The important benefit of BIM is its geometrical representation of the parts of a building with accuracy is as:

- 1) *More effective and faster processes* – information regarding project is more easily shared, can be value-added and reused.
- 2) *Better design* – the proposals of a building analyzed easily, simulations performed quickly and performance benchmarked, enabling improved and gives innovative solutions.
- 3) *Production quality is better* – output of documentation is flexible and exploits automation.
- 4) *Costs Controlled* – the performance against environmental is more conjecture, and it is better to understand building lifecycle costs.

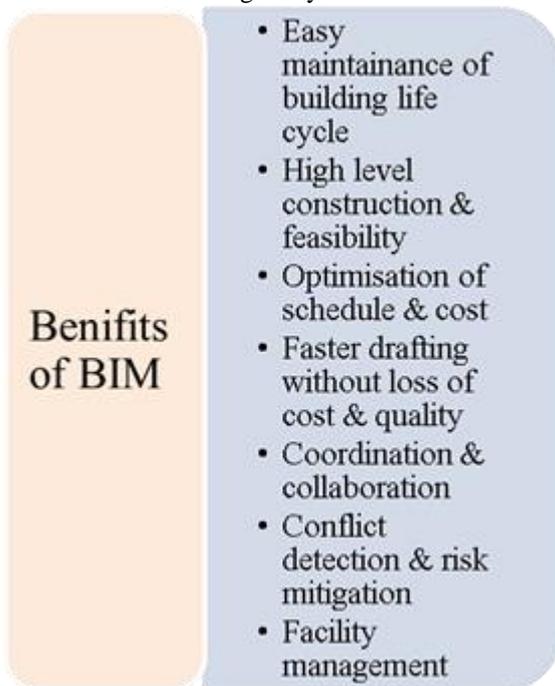


Fig.2. Benefits of BIM

- 5) *Assembly is Automated* – the digital data can be feated in downstream processes and also used in structural systems as manufacturing processes.
- 6) *Customer service is better* – the proposals are better understand through accurate visualization.
- 7) *Lifecycle data* – project requirements, design, construction and operational information can be used in facilities management.
- 8) *Better visualisation* – 3D visualisation is better in BIM.

IV. METHODOLOGY

The goal of this paper is to examine the uses and benefits of BIM in construction process and to generate the 3D model using Revit Architecture 2014. 3D drawing according to 2D drawing is prepared. Also, the building project drawings were

generated by using Autodesk Revit Architecture. Floor plans, side views, elevations, sections and 3D views were generated.

3D MODELING

3D modeling is used to create a visualization of the building and one of the most basic uses of BIM. The plans are drawn in three dimensions, which add perspective to the drawing and allows for different views and angels to be displayed. In the world design, Revit Architecture is mainly used to design buildings - walls, floors, column, beam, footing, ceilings, and doors etc. However, it is require adding site and structural information in to the software model, which provide tools to create topographic surface for site work. Revit Architecture is very easy tool uses for modeling and parametric design, not only for the building itself, but also for the site condition also.

For the site model, Autodesk Revit Architecture massing and site tools enable the user for conceptual design; it is used only in building as landscape environment. The toposurface, contours in is created and it also has the functions like split or merge the surface, grading region, draw property lines, create building pad and other site components such as parking lot, daylights, trees, plants and so on. In addition, since most of the 3D building models are created by Revit Architecture, simply import or link the two Revit file together will get you the final site-linked 3D model.

BIM software creates 3D models using Revit Architecture is shown in below figure 3.

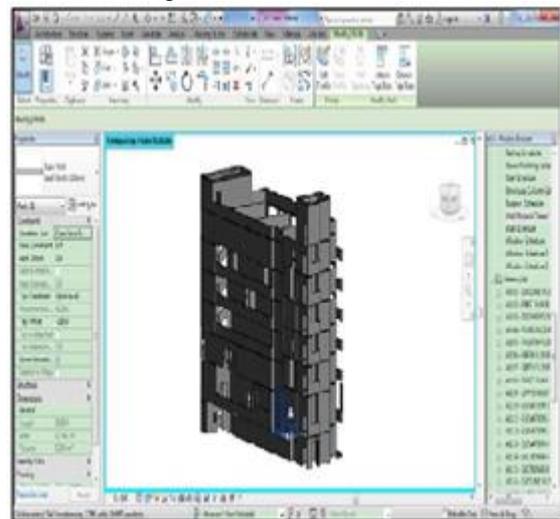


Fig.3. Revit 3D model

V. CASE STUDY

The case study is a prototype residential building project having parking plus eleven floors.

Details of project:

Building type: Residential building

Company Name: Durvankur Vastu Nirmiti Pvt.Ltd. Pune.

Number of stories: Parking + 11.

3D MODELING

Student license version of Revit Architecture 2014 was downloaded from Autodesk's student community website to develop a 3D house model. The project template is created first then scale of the project is fixed for the drawing. Then, the perimeter walls were created. Once the perimeter walls were completed, the interior walls are created. Then, the foundation walls, flooring, doors windows, roof, stairs, deck were created. Furthermore, the rooms were tagged.

The software contains Revit Architecture and structural function. MEP tool is separated by the Autodesk. When we started the software it shows drawing area, project browser, property palette and tool bars. By using different tools the drawing of the building is drawn in plan level 1. Drawing foundations, column, beam and wall a 3D view is created also ceiling plan and structural plan automatically shown in the drawing. A 3D model of a project is shown in figure 4.

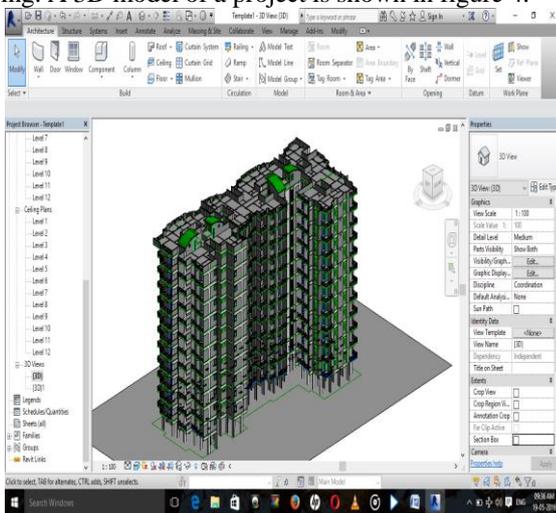


Fig.4. Revit 3D model of a project

The interior of a building such as bed, chair, dining, sofa, kitchen etc are arranged according to room of a building. In project browser floor plan, structural plan, ceiling plan and families are visible. From floor plan screenshot of level 1 is captured which same up to eleven floor plan is shown in below figure 5.

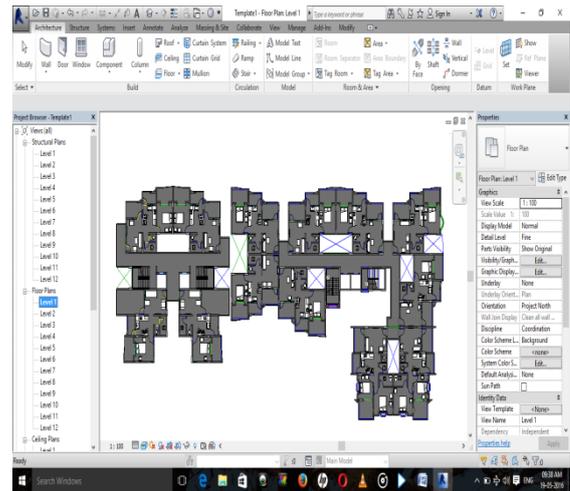


Fig.5. Level one of a project

VI. CONCLUSION

This paper shows the main aspects of BIM including BIM activities such as visualization, 3D modelling and study of Revit Architecture 2014. The visualization is the simple use of a Building Information Model such as renderings. BIM is a powerful tool to revolutionize the building industry not only the cooperation between designers, but as well as contractors, engineers, and owners etc.

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