Analysis And Design of Multistoried Building by Using Revit BIM

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Abstract **- Building information modelling is an advanced technology which is nowadays becoming popular in India due its extensive utility in designing, analysis, planning, etc. This is a case study of a residential building based out in Pune region in the state of Maharashtra, India. The study is aimed at creating an intelligent model through designing, analysis, planning, estimation, clash detection using BIM based softwares. This software addresses project complexity and helps in managing the diverse demands and requirements of designers and contractors. This paper brings out detailed 3D smart model, its complete design report, complete scheduling and estimation along with clash detection if any in the project.**

Index Terms **- BIM (Building Information Modelling), MSP(Microsoft Project),AEC (architecture, engineering and construction).**

INTRODUCTION

For engineers the main part of work before the production itself was designing and then sketching the object. It is viral that the work is done precisely since it might be a matter of peoples' lives, especially, when the object itself is a building. Until recent past, architects relied mostly on hand sketching – the first program installed on PC for them was released only at 1960 (Smith, 2013). At 1974 Computer Aided Design became the essential program for architects and this was a groundbreaking moment. Nowadays, with the computing power skyrocketed among past two decades, engineering software developed and changed dramatically. Since CAD could not offer all the needed tools for architects, new class of software developed under the name of CAAD (Computer Aided Architectural Design). Revit, being one of the newest programs (initial release: 5 April 2000, latest stable release: April 2018 (The History of Revit - The Future of Design, n.d.)). The main goal of this work is exploring and testing Revit in comparison with already known AU-TOCAD.

1.1Background

The Revit software operates in a way that architects can manipulate the whole building or a chosen part of it. When it comes to designing, user can operate with so-called "families" (walls, ceilings, furniture, etc.) or import geometries. The "families" feature is what makes Revit one of the best software to use for a civil engineer.

1.2Objectives

Nowadays the dominant software in architectural design is AUTOCAD with 36.84% share of the CAD software market (Companies using Autodesk Revit, n.d.). There are number of options to substitute this arguably an outdated way to create architectural drawings, one of which is Revit. While Revit has share of only 1.03% of the market the interest in it is growing (Interest over time, n.d.). The main objective of this work is to familiarize with the software, compare it with conventional AUTOCAD and define the conditions under which this software is a better choice. This work of a student which main aim is to research of Revit software and focuses on three main objectives:

- Learning possibilities and techniques of Revit software.
- Creating D3 block of Arcada in Revit.
- Studying differences in drawing process and functionality between Revit and AUTOCAD.
- To study the challenges of applying BIM to a case project during its life cycle.

1.3Selection of Methodology

Research methods that were chosen for the final work are as follows:

- Interviewing of engineers working either with Revit and/or AUTOCAD to collect data regarding how the work is handled with mentioned software.
- Creating a D3 block model using Revit software in order to study software capabilities and difficulty.

II. FAMILIES IN REVIT

One of the features Revit stands out of the other CAD software is so called families. Families are the group of objects with similar parameters, identical usage and graphical representation. Different Revit families can be found on Interned and there are some pre-installed (About Families). It comes to Civil engineering; Revit is acclaimed to be one of the most powerful software on the market. User can create a sketch of the building from a scratch using Revit since it offers great amount of functions and pre-sets. Unlike AUTOCAD, Revit supports "family" features which saves great quantity of time for an architect. For exam-ple, the task to sketch a bathroom was given and engineer operates in a limited time. User do not need to draw each object of a bathroom manually (e.g. sink or bathtub) and then insert it into the program, he can either chose from pre-installed family, download it from the Internet or even import his own model. Outside of that, Revit supports parametric engine which means that every change made will be saved and held throughout the whole project automatically. The following examples of these element relationships are: The outside of a door frame is a fixed dimension on the side from a perpendicular partition. If the partition is moved, the door remains this relationship to the partition.

System families

Those are already-made and set into programs standard families that user cannot create as separate file. The properties and visual representations are untouched. User can transfer system families between projects (e.g. floors, walls, dimensions).

1.Loadable families

The user can load those kinds of families from templates into project, change its' properties and visual representation.

2.In-Place families

Custom geometries with a help of which user can set relationships between object. Those are of a limited use and cannot be duplicated as a family type to create several types.

3.Families out of the box

Families that are available straight from the purchased program, those are updated frequently (e.g. doors were updated in 2016).

4.Creating personal family

The family editor can be used to create personal family if suitable one was not found (About Families).

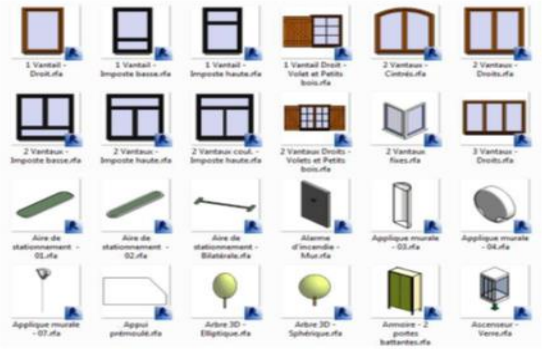

Figure 1: Revit families example (Revit families)

Each family has different objects and each object has its own parameters. For example, the walls parameters include Analytical properties (ones related to material it is made of such as heat transfer coefficient, thermal resistance, absorbance, thermal mass and rough-ness), Identity data which is identifies object as a product manufactured by a specific company and includes property such as manufacturer, model, price, URL of the company this object was made by etc. Constructional properties are related to width and its function (exterior or interior) while graphics parameters specify object's pattern and color.

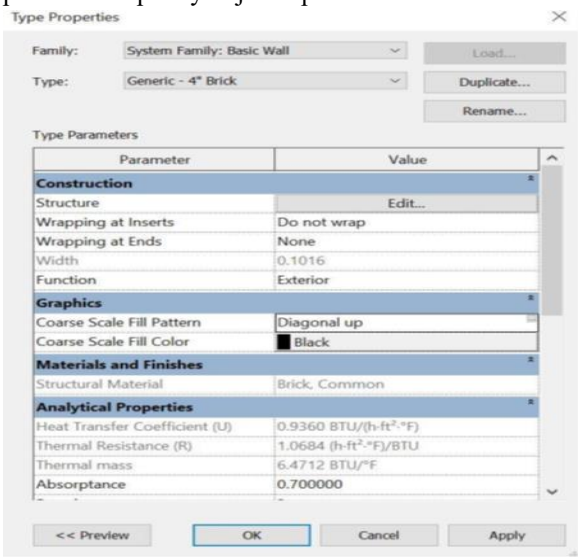

Figure 2: Basic Wall properties

Family feature offers a customization out of the box. Even if the family does not come out-of-the box, users can create their own 3D object inside family builder, download or buy them online.

III. METHODOLOGY

For this case study Revit softwares were used in order create an intelligent 3D model with analysis and planning.

Example

Construction of "SUN-SHINE" building with "WELLNESS CLINIC" at mauje Wagholi gaonthan in Gut no. old-2328, New- 1342, at PALM CITY, wagholi, ubale nagar, tal.- haweli, dist.- Pune, 412207

OWNER – 1) DR. SWATI ARUN SURADKAR

2) DR. ARUN KISAN SURADKAR

NOTE.

1) PLAN DRAWN AS PER CLIENT REQUIRMENT

2) CLIENT IS RESPONCIBLE IF THERE IS ANY CHANGES IN PLAN AND CONSTRUCTION

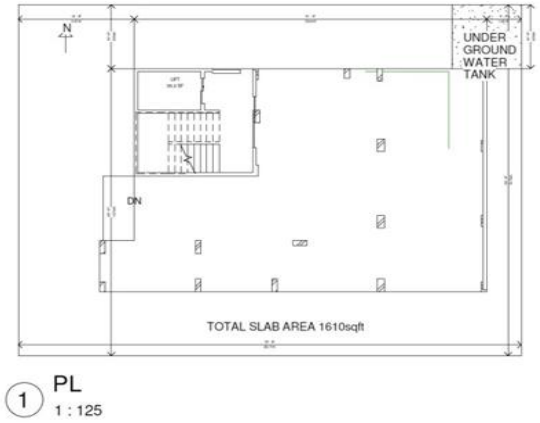

Figure 3: PL

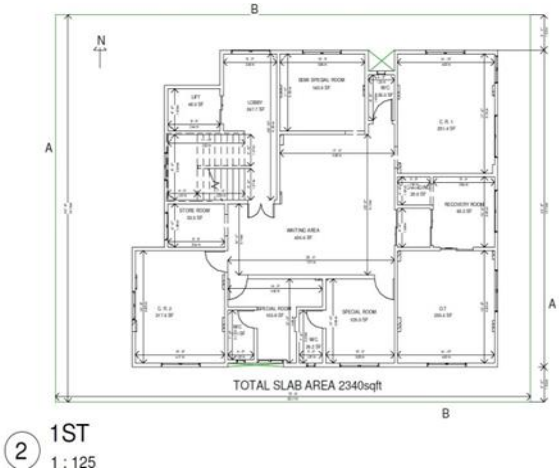

Figure 4: 1ST FLOOR PLAN

Figure 5: 2ND FLOOR PLAN

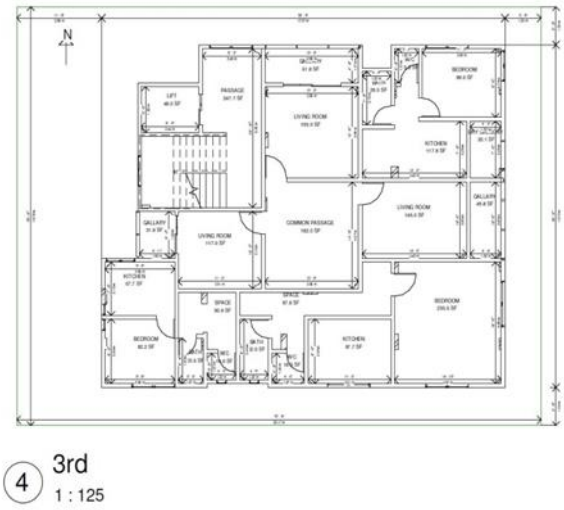

Figure 6: 3RD FLOOR PLAN

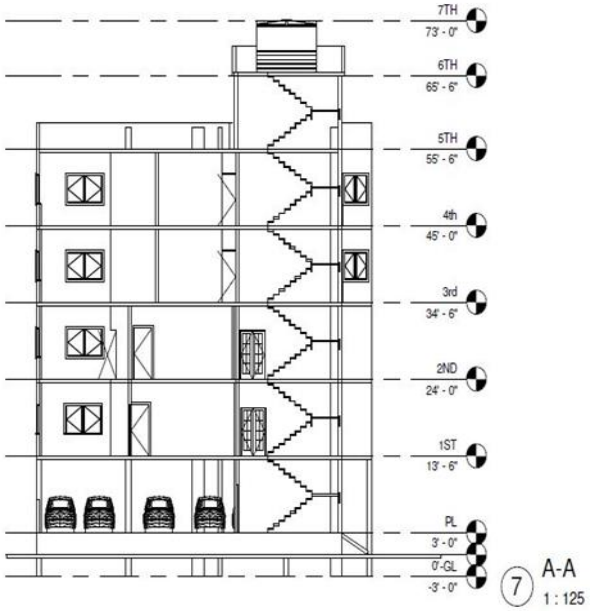

Figure 7: SECTION PLAN (A)

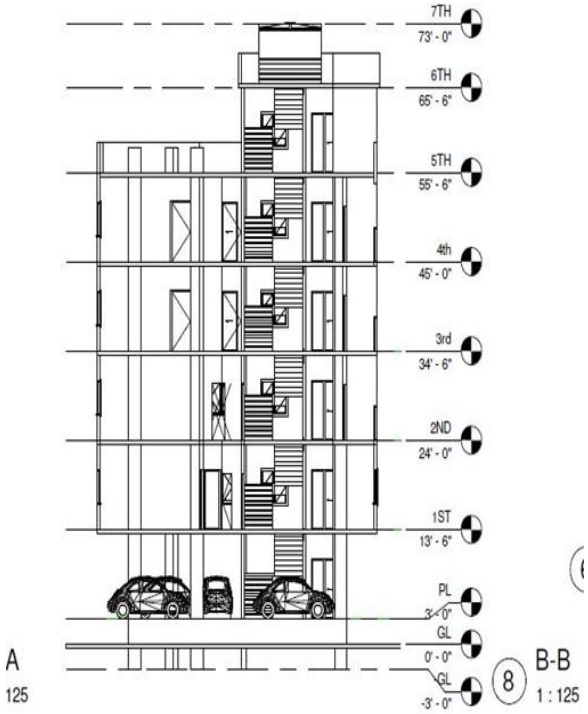

Figure 8: SECTION PLAN (B)

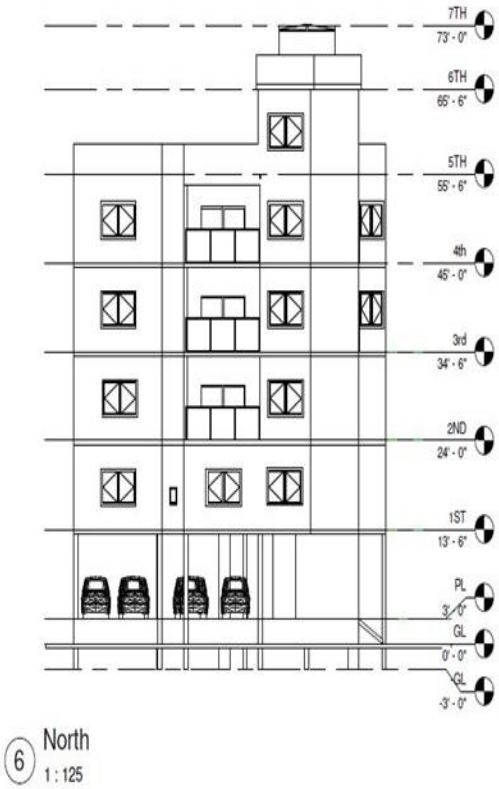

Figure 9: ELEVATION PLAN (NORTH)

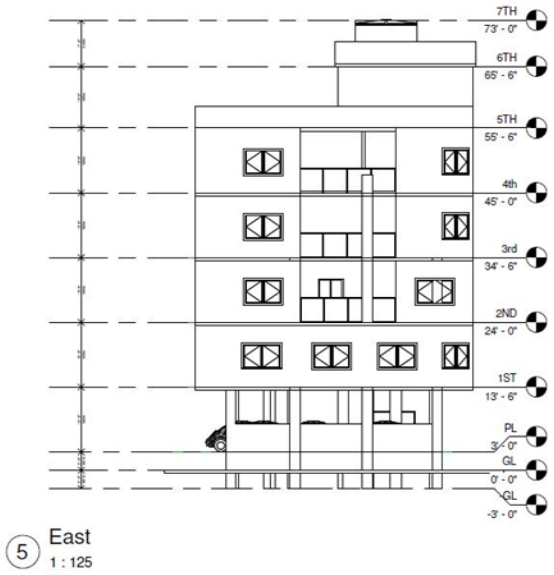

Figure 10: ELEVATION PLAN (EAST)

DOOR SCHEDULE

DOOR SCHEDULE			
TYPE MARK	WIDTH	HEIGHT	COUNT
D	4’-0’’	6’-7’’	2
D1	3’-0’’	7’-0’’	16
D2	2’-6’’	6’-8’’	18
O	3’-0’’	7’-0’’	9
SD	5’-0’’	7’-0’’	5
SD1	4’-0’’	7’-0’’	7
SD2	8’-0’’	6’-7’’	4

Table 1: DOOR SCHEDULE

WINDOW SCHEDULE

WINDOW SCHEDULE			
TYPE MARK	WIDTH	HEIGHT	COUNT
V	1’-4”	2’-0”	9
W	6’-0”	4’-0”	29
W1	4’-0”	4’-0”	15
W2	1’-6”	4’-0’’	4

Table 2: WINDOW SCHEDULE

IV. RESULT AND DISSCUSSION

I’ve found Revit is hugely important for coordinating in the design phase as well as providing a platform for providing consistency in drawings. We not only do our drafting in Revit but use it as (or in conjunction with)

analytical tools. I use Revit everyday at my architecture firm and will never go back to CAD. I use it to make both construction documents and renderings Revit does require the user to have a higher understanding of the way the program works than cad does – with cad you can jump on and pretty much start drawing whatever. But on Revit, you need a decent family library and a fairly good un-derstanding of how these interact in the model environment. CAD is, at worst, digitally drawing lines like you would doing drafting by hand. It gets the job done. Revit is BIM. It's a great tool but requires significantly more knowledge of construction, in my opinion, to be used effectively. I don't prefer it for design phases, but for documentation it offers incredible value for systems integration, and making sure your skin wraps the required structure. Revit does require the user to have a higher understanding of the way the program works than cad does – with cad you can jump on and pretty much start drawing.

The main purpose of the research was to test Revit compared to well-known BIM software for interior design and architecture purposes. The key points of using Revit are shown in this work will focus on the close comparison between software.

V. CONCLUSION

BIM is an innovative way to virtually design and manage project. Predictability of building performance and operation is greatly improved.BIM accelerates collaboration within project teams which lead to improved profitability. In this Project we have done planning, modelling, scheduling of Doors and we have created families also for this commercial building.

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