

# “PLANNING AND SCHEDULING OF MULTI STOREY BUILDING USING BIM”

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## ABSTRACT

The following project deals with the planning, modelling, quantity estimation and scheduling of a multi storey residential building using advance civil engineering application as BIM which includes software like AutoCAD, Autodesk REVIT, Primavera and Microsoft Excel Spreadsheets. Project starts with planning of the building using AutoCAD, the modelling and quantity estimation will be carried out with the help of Autodesk REVIT and finally the scheduling will be done by using Primavera.

**Key Words:** Planning, Modelling, Scheduling, BIM, Primavera.

## 1. INTRODUCTION

The different phases of the project life cycle include planning, design, construction, maintenance and decommissioning. The construction phase can be divided into pre and post construction stages. The preconstruction stage includes resolving constructability problems, space conflict problems and site utilisation. During construction, post construction and maintenance still 2D drawings are most widely used. Thus, the uses of 3D model developed through BIM during different early stages of the life cycle is not in use after the preconstruction stage.

### 1.1 BUILDING INFORMATION MODELLING

BIM is a process which provides a framework to develop data rich product models and facilitates the realization of integrated benefits. In this process the real-world elements of a facility such as walls, doors, windows and beams are represented as objects in three-dimensional digital model. Thus, the model serves as a gateway to provide any time access to insert, extract, update or modify digital data by all the project participants involved in facility life cycle.

### 1.2 PRIMAVERA

Primavera As of 2008 Primavera Systems supported long-established products - P3 and Sure-Trak - and the newer P6 version. The long-standing P3 product in its various forms was used by 25% of the heavy construction industry, its predominant customer base; the next most popular software

was used by 11%. Nearly 40% of general contractors with an annual revenue of 5M dollar to 10M dollar used Primavera P3. In comparison, the P6 version did not register in a CFMA 2008 survey of the United States construction industry. The P3 version to P6 version change is based in a move from DOS-type shortcut keys to mouse-based icons. Thus, a software application that was once very fast to use but grounded in shortcut functions (which some users found difficult to master) moved to a mouse-based application that is quicker to learn, but once mastered never achieves the same speed of use.

### 1.3 PLANNING AND CONTROLLING

Project management follows the same methodology and purpose—to achieve each project goals, you need to plan them in advance. Good project management is no longer an option in today's corporate world. It is a critical tool to help your company stay on target and accomplish its goals. Simply stated, project management is the process of achieving set goals within the constraints of time, budget, and staffing restrictions. It allows you to get the most out of your available resources. Resources include

- ❖ Man power
- ❖ Material
- ❖ Money
- ❖ Machinery
- ❖ Information
- ❖ Facilities
- ❖ Role

Project portfolio management factors in all of these variables across multiple projects, enabling project managers and company executives to see an accurate picture of how each projects resource use affects other projects. The process of project management is guided by three key principles:

- ❖ Planning
- ❖ Controlling
- ❖ Managing

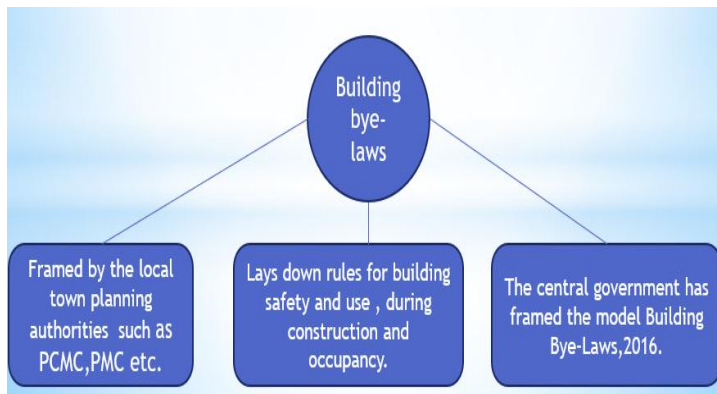


Fig 1.3.1 Planning using Building Bye-Laws

### 2. SCOPE OF WORK

- The scope of the study is to explore and evaluate the advantages of integration which will enable the ease of project.
- It is a viable career option as implementation of software is done for better development.
- BIM digitalizes the life of building which gives a solution to every phase of structure.
- BIM increases productivity, infrastructure value and quality.
- Reduction of cost and time.

### 3. METHODOLOGY

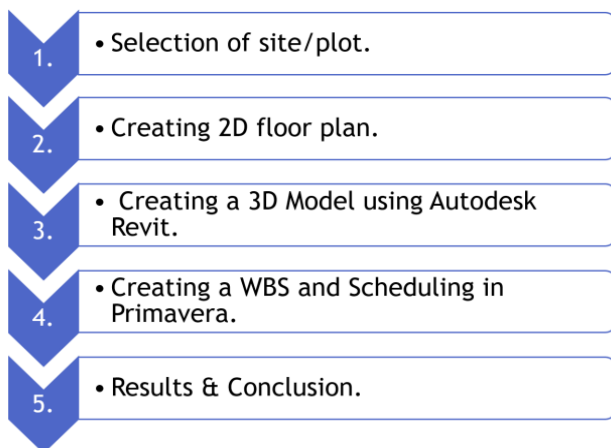


Fig 3.1 Methodology outline

#### 3.1 Project Details :

Name of project : Proposed Building

Structure Details : G + 7 Floor Building.

#### Site Details :

Plot Area : 1517 sq.m

Builtup area : 1292 sq.m

Permissible F.S.I : 3 m each side.

FLOOR	FLATS	AREA (Sq.m)
1 <sup>st</sup>	101,102,103,104	161.32
2 <sup>nd</sup>	201,202,203,204	161.32
3 <sup>rd</sup>	301,302,303,304	161.32
4 <sup>th</sup>	401,402,403,404	161.32
5 <sup>th</sup>	501,502,503,504	161.32
6 <sup>th</sup>	601,602,603,604	161.32
7 <sup>th</sup>	701,702,703,704	161.32
TOTAL	28	1129.24

Table-1 Description of Floors

### 3.2 Creating 2D Floor Plan

#### 3.2.1 Ground floor plan

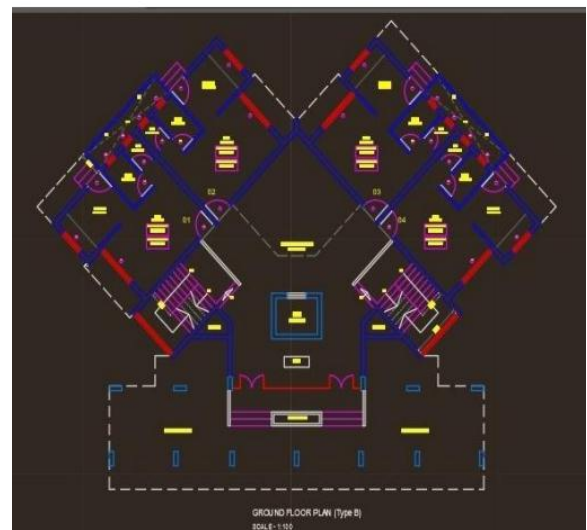


Fig no.3.2.1 Ground floor plan

• Ground floor consists of four flats with hall, kitchen and WC along with a passage for easy go and also an area which is open to sky.

• In order to avoid unnecessary chaos and disturbance enough entrance space and passage is provided.

• Server and Maintenance is provided for systematic monitoring of electricity and computer servers.

### 3.2.2 First Floor Plan

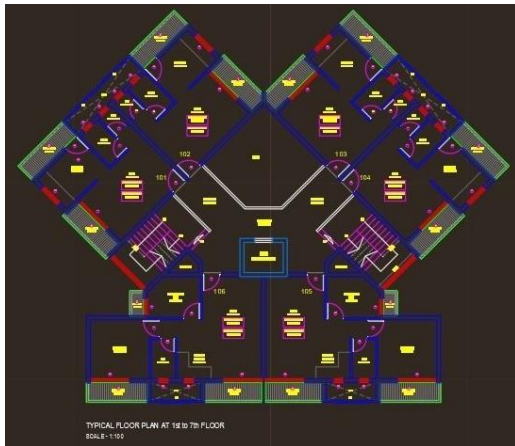


Fig no. 3.2.2 1<sup>st</sup> floor plan

- 1<sup>st</sup> floor plan is a floor of total 6 flats in which two flats with bedroom, kitchen, child bedroom, WC and balcony.
- Remaining four flats with hall, kitchen, WC and balcony.
- Passage in front of two flats each is about 1.5m and provided passage in front of an elevator is 2m for easy movement
- Open well staircase is provided throughout the building with Elevators on opposite sides.

### 3.3 Modelling

#### 3.3.1 Modelling of Ground floor:

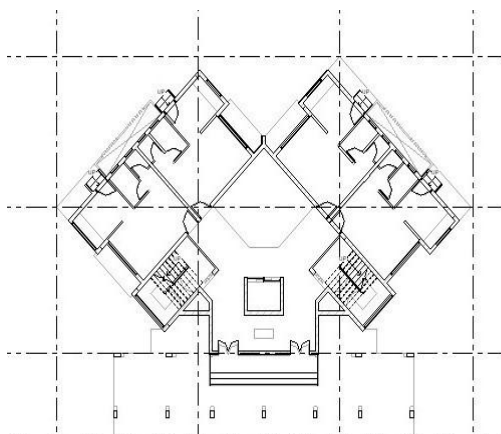


Fig no.3.3.1 Ground floor model plan

- Ground floor consist of four flats with hall, kitchen and WC along with a passage for easy go.
- An area is provided which is open to sky.
- Elevator is provided at the center for comfort.

### 3.3.2 Modelling of First floor:

This floor I being modelled as per the comfort of the people residing there. Floor from 2<sup>nd</sup> are replica of 1<sup>st</sup> floor.

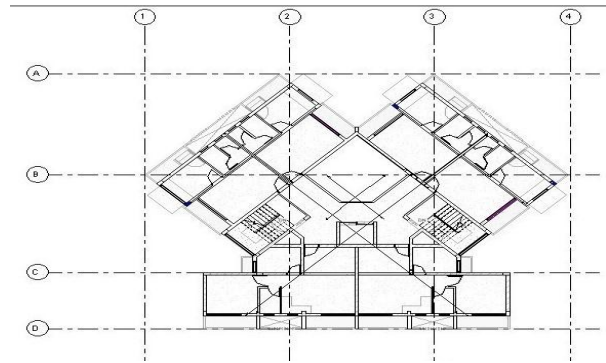


Fig no.3.3.2 1<sup>st</sup> Floor Model Plan

- 1<sup>st</sup> floor plan is a floor of total 6 flats in which two flats with bedroom, kitchen, child bedroom, WC and balcony.
- Remaining four flats with hall, kitchen, WC and balcony.
- Book shelves and study table is provided in the child bedroom.



Fig no.3.3.3 3D View

### 3.4 Creating a WBS and Primavera P6 R8.3 Schedule

. Activities are identified from the Autodesk Revit Architecture 2017 view and accordingly Work Break down Structure (WBS) is prepared to make a Construction schedule.

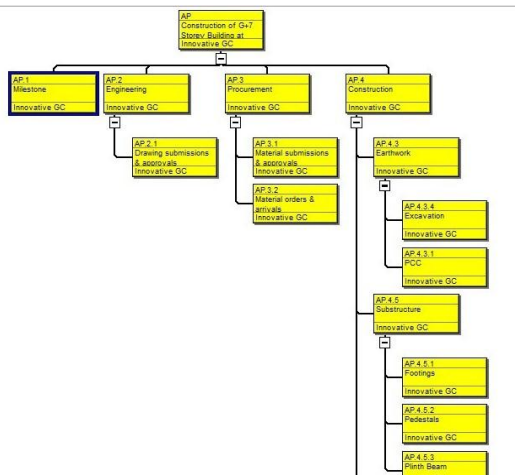


Fig no.3.4.1 WBS Structure

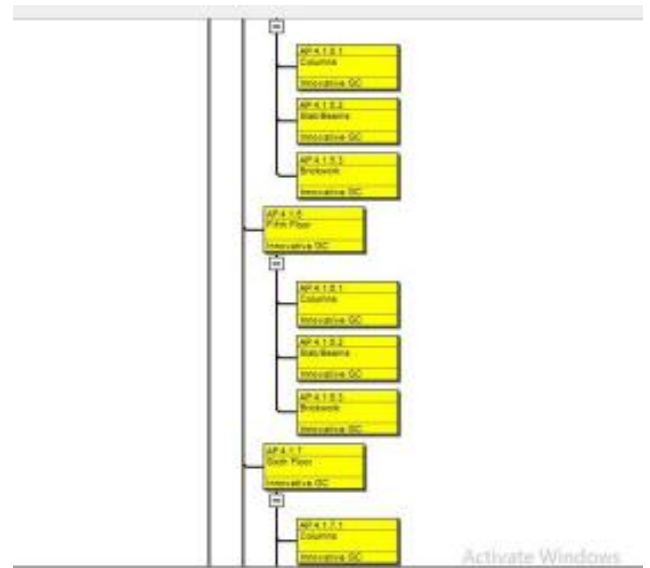


Fig no.3.4.4 WBS Structure

### 3.5 Primavera Scheduling Activities

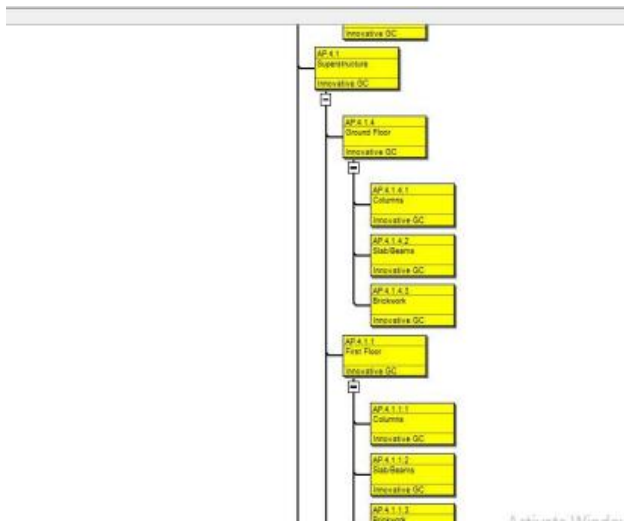


Fig no.3.4.2 WBS Structure

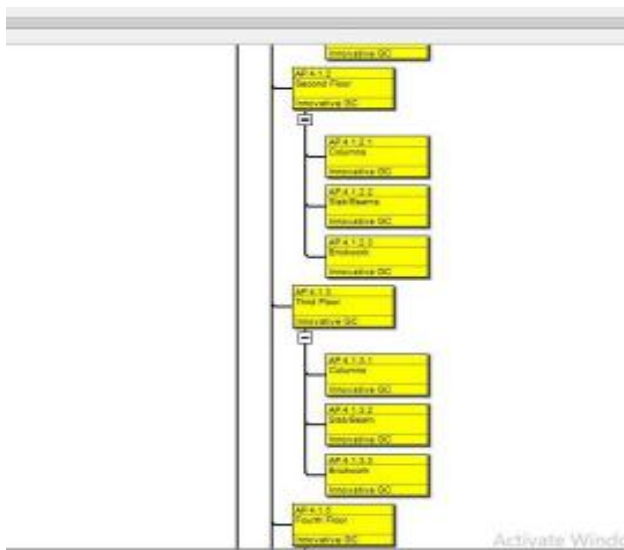
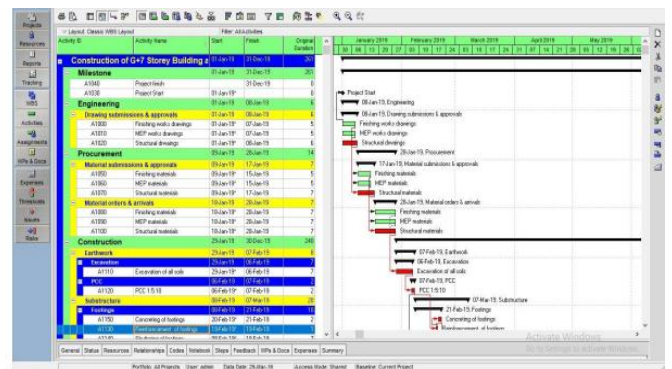


Fig no.3.4.3 WBS Structure

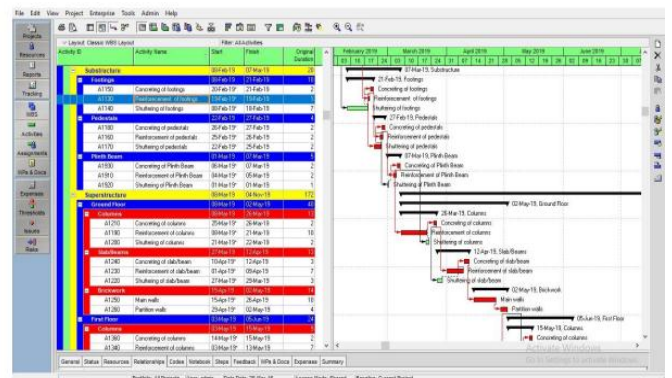


Fig no.3.5.1 Scheduling Activities

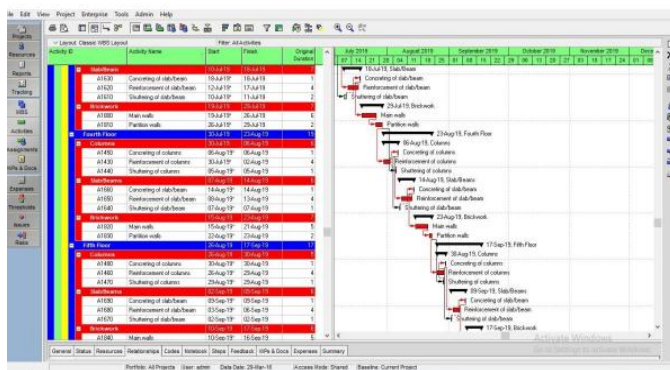
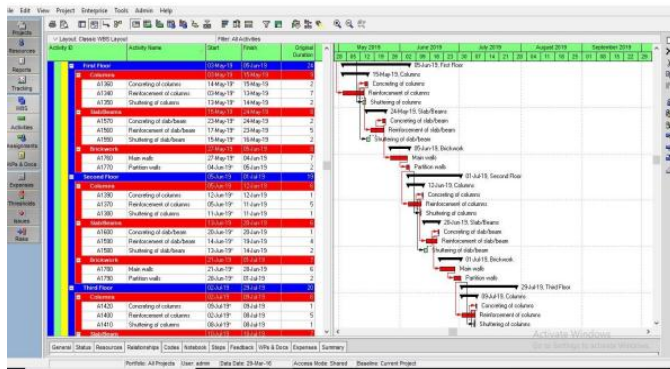


Fig no.3.5.2 Scheduling Activities

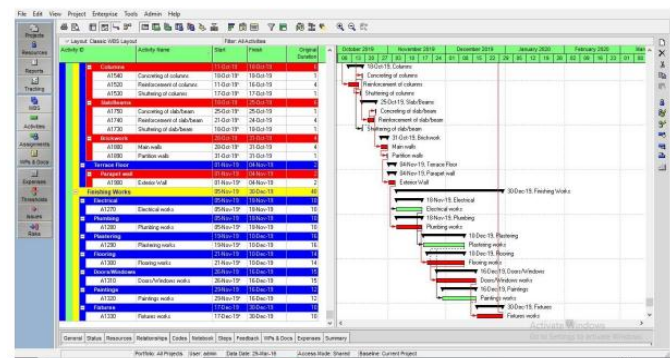
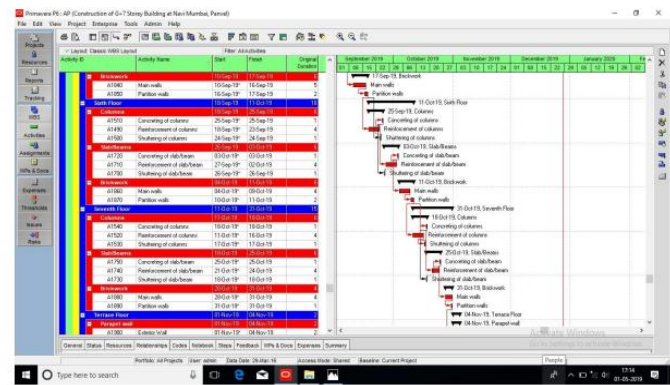


Fig no.3.5.3 Scheduling Activities

#### 4. Result & Discussion

In this project we have successfully planned and scheduled a multistorey building with the help of Building Information Modelling. The project which started from 1<sup>st</sup> of January 2019 and its estimated scheduled time of completion is 31<sup>st</sup> December 2020 which is of 12 months. The project has been planned and scheduled as per conventional method. In this project we have generated logic report of our project. It shows some of the reports generated in Primavera P6 including the start and finish dates of activities.

#### 5. ADVANTAGES

- Improve Onsite Collaboration and Communication.
- Visualize Projects in Preconstruction.
- Improved Scheduling/Sequencing.
- facilitates visibility of potential problem areas and allows errors to be corrected
- Keeping real-time check of not only time but also allotted budget.

#### 6. Literature Review

##### 6.1.1 Performative Computation-aided Design Optimization By Ajla Aksamija (2011)

Parametric design offers some advantages over traditional modelling methods, since it allows adaptation of an object by rules and constraints or "Parameters" to influence the object's properties.

##### 6.1.2 Building Information Modeling Implementation- Current and Desired Status by Pavan Meadati, Amin Akhnoukh (2011)

The paper presents the techniques to produce the 3D as-built model and steps to associate facility maintenance information to it. BIM provides the means to facilitate an integrated and coherent information management strategy. BIM eliminates fragmentation and provides seamless flow of facility information among the planning/design, construction, and operation and maintenance phases.

##### 6.1.3 The project benefits of Building Information Modelling (BIM) By David Bryde , Marti Broquetas, Jürgen Marc Volm (2013)

The authors described the benefits of Building Information Modelling as senior managers in construction companies will need to invest in BIM education and training of staff. Practitioners also need to see the potential of BIM in the wider context. A set of project success criteria were generated and content analysis was used to establish the extent to which each individual project met a criterion.

### 6.1.4 Modelling and Project Planning of a Residential Building by Implementing 5D BIM Technique by M.Subhi , R.N.Uma (2017)

Based on authors description, they described that BIM is a perfect visualization tool to monitor progress. All the steps of construction could be modified and managed at any point of time by simply clicking on the element and activity. Using this technology, time cost and labour becomes smooth and feasible. In order to reduce the cost, time, rework 5D BIM techniques can be used in their project.

### 6.1.5 A Comparative Study on Various Stages of Level of Details in Advanced 3D Building Construction Using BIM Tools By Venkumahanti Tejaswini , Rajiv Kumar , P. Kesava Rao , G. Ravishankar (2020)

The author describes the BIM's six technical characteristics pointed out the essence of BIM technology describes the development tools and implementation feasibility of technical route of other technology integration and development to show consistency of BIM life cycle strategies and methods.

## 7. Scope of Future Work

- Current model can be further enhanced by adding Mechanical, Electrical and Plumbing features.
- The Quantity Estimation and Costing (5D) can also be done in Autodesk Navisworks.
- The 3D model was linked with time as 4th dimension so as to create 4D modelling projects, the same can be further worked on other dimension like cost, resources, materials and labors. Thus, making a 5D model
- The project Tracking and Updating can also be done in Primavera P6
- Resource Allocation can be done to optimize the resources to achieve a quality product for economic construction.

## 8. CONCLUSIONS

1. Application of BIM with the currently used tools like Primavera P6 R8.3 helps in linking of the activities with the corresponding elements of a Three-Dimensional (3D) Model.
2. The proposed methodology utilizes the dynamic linkage between the activities in the schedule and corresponding 3D components, and help to detect the incompleteness and logical errors in the schedule sequence
3. BIM, thus is not only a visualization tool but can be utilized as a project scheduling and monitoring tool at any stage of the project in which the schedule and the 3D components can be manipulated in a single BIM environment.

4. The schedule in BIM allows easier understanding of the project as well as helps to detect possible problems in it.

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