# Scheduling and Estimation of Residential Structures using Primavera

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***Abstract*—This Construction Industry all over the globe is at its prime. Every year with every project executed a new benchmark is set up. Considering the augmented population there enhances a need in detailed, well executed projects completed within the time constraint. On the other hand, keeping in mind the complex construction the quality of the outcome cannot be neglected. Such an activity can only be executed under precise observations, accurate results and diligent work management. When such projects are undertaken there are a lot of things at stake. Traditional methods adopted for the construction can do very little to help with the cause. Such are the cases when high end software's come in hand. The success of any project lies in the efficient management of time, quality and cost. Primavera is such a software which helps us with the cause and resolves our problems regarding wastage of time, money, manpower and resources. On the other hand, it helps us compare multiple projects at the same time and helps us track progress of the same. In our project we use cases which include scheduling and estimation of residential buildings which will be observed and managed until its final execution based on scheduled activities and resources from time to time under precise observations.**

***Keywords–Project Management, Primavera p6, Work breakdown structure, Delay analysis; Extension of time; Scheduling; Estimation***

## I. INTRODUCTION

Construction Industry from all the corners and capitals of the world are working to provide majority of its clients with detailed and satisfactory projects. The major aim of these industries is to serve major amenities within feasible standards. In the process of executing and providing such facilities the construction Industries have started to compete in a race to acquire a place at the apex of major construction benchmarks. This to achieve however is not an easy task since the construction industries face various milestones which are a part and parcel of today's construction generation. It is a rapidly growing industry and attains the spot for the second largest industry in India. However, the execution of the activities included in this process is challenged when the project is to executed at small villages under traditional methods with rural habitats and mundane construction tools. This has to be resisted with proper use of software's, construction tools to uplift the economy generated with sufficient land use and to contain the overall time required to complete the project. This can be achieved with proper scheduling of the project followed with detailed estimation of the project to make sure majority of the tasks are in a sequential order and allow us to set up an overall economic constraint. The project must be planned properly followed with scheduling and estimation

## II. LITERATURE REVIEW

1) Vishal Annappa Nimbal, Prof. Balasaheb Jamadar (July 2017)After referring the study, we get to know various points related to scheduling under precise time constraint and how to execute them accordingly in medium to large scale projects with Primavera P6.
2) Unmesh. Y. Polekar and Rohit. R. Salgude, Dept. of civil engineering, Pune (May 2015)In this study we evaluate that various defects in planning, scheduling can be overviewed and organized with the help of Primavera p6.
3) P. Manikandan, Asst Prof. Dept of Civil engineering (March 2019)This study helps us understand how to contain construction disputes by reducing the time and preparing a cost effective project using primavera. It also gives information regarding scheduling of the project effectively.
4) P Raghunath Reddy, P. G Student Dept. of Civil engineering, Shri Sai Shirdi institute of science and engineering client's project to be completed
5) Prabhat Kumar Sinha (2013) This paper is a conceptual reference in which the author aims at completing project with in allotted time frame with minimal disputes and organized activites with minor or negligible economic loss followed with appreciable

profit gains. This is done by Primavera P6 with all available data from the sources.

6) T.Subramani, M.Muhammed Ansar , S.Priyanka3 - Prefabrication technology has not transferred as easily when compared with other technologies because it is a production technology or knowledge based and not a consumption technology or product based. A comparative survey found that prefabrication reduced activities associated with repetitive body movements, ergonomic challenges and ergonomic problems. The survey found that 92% workers reported that the use of MS Project 2007 and Primavera 6. The final result prefabrication! preassembly and precast would reduce hazards related to material handling on site and that the reduction of scaffolding through the use of prefabricated /pre-assembly or precast components would lead to less falls on sites.

7) T. Subramani, D. S. Stephan Jabasingh,, J.Jayalakshmi - The result shows a strong relation between each software. The final result gives more than 99.5% accuracy. A new parameter SV (t) (Schedule Variances respect to time) is identified and incorporated in developed software which is not in gives almost 100% accuracy.

## III. METHODOLOGY

Step 1: Literature review. Step 2: Problem statement Step 3: Data collection.
Step 4: Development of work breakdown structure Step 5: Software training of P6
Step 6: Data analysis using P6 Step 7: Result discussion
Step 8: Conclusion

The study has been done in two stages. In the first stage, using Primavera software, project schedule for various activities with their sequence for the construction of a requirements of human resources were carried out for the activities based on analysis of rates (2012) CPWD. Required manpower is the output quantity i.e., the measured quantity of work which can be done per day per person or unit of work done per person. The requisite data has been collected from detailed drawing, bill of quantities and prevailing site condition. In second stage, consumption of human resource analysis was carried out for the various activities by increasing resource with decreased duration. Based on data obtained, network diagram is prepared and relation are assigned to activities to calculate critical path. Finally, the total duration of the project is calculated by Primavera.

The major steps involved in our work using Primavera:

| SR NO | DAYS |
|---|---|
| SUB STRUCTURE | 166 |
| SUPER STRUCTURE | 275 |
| FINISHING WORK | 135 |

- ***Defining Project Calendar***

A working calendar is defined in which the working days in a week and the working hours are specified. In this study, the name given to the project calendar is BE Project and the timings are 8:00 AM to 17:00 PM with a lunch break of one hour between 12:00 AM to 13:00 PM. The calendar is 8 hours working per day, 5 working days in a week and 24 working days in a month.

- **Creating Work Breakdown Structure**

After the complete planning of a project, the next step is to create work breakdown structure (WBS) to define and organize the project elements at different levels. A WBS represents a hierarchical breakdown of a project into elements. At first level of work break down structure, a project with name Primavera is created. Inside this, Block B is created. Then inside this Block B, project break down structure like excavation and earthwork, substructure, superstructure, brick work including door frame, lintel work, internal plaster, waterproofing work, external plaster, finishing work and service work are created.

- **Scheduling the Project**

After all the tasks are entered along with their respective duration, the information of task dependencies is specified by specifying predecessor of each of the task. The information is entered using predecessor column of the software. The four types of task relationships or inter dependency are FS, SS, FF and SF. The default relationship in the software is finish to start with zero lead and lag.

- **Assigning Manpower**

A manpower can be defined as the number of people that is completed with the activities, duration, start and finish dates for each activity and for the whole project, next step is to define and assign resource to the activities then to find the estimated cost for the activities is required to complete the task and is assigned to an activity. It is suggested to create and allocate the minimum number of resources to activities. When the project schedule.

## IV. CASESTUDY

Scheduling of a G+4 residential structure using primavera. Primavera software has been extensively used for Scheduling of our project. The plan with an area of 580 m2 has been divided into two phases for RCC works. The schedule has been so constructed that the activities which are interdependent of one other start together, hence saving a commendable amount of time in the construction process. It has been looked after that activities like Brickwork, Plastering, Painting, Tiling, Sanitation and Electrical works are so linked that there is no considerable float or wastage of time. The

following Plan has been considered by us for Scheduling of Project via Primavera. We have made a list of all the activities by doing extensive surveys and interviews with the professionals.


Figure 1.FLOOR PLAN

| PROJECT DETAILS | DATA |
|---|---|
| NAME AND TYPE OF BUILDING | ATHARVA APARTMENTS. RESIDENT +COMMERCIAL SHOPS (GROUND FLOOR) |
| SPAN OF CONSTRUCTION | 1.5 YEARS |
| NO OF STORIES | GROUND+ 4 |
| START DATE | 10/09/2014 |
| END DATE | 13/03/2016 |
| CONTRACT VALUE | 1.6 CRORE |
| BUILDER DETAILS | NIRMAAN BUILDERS |

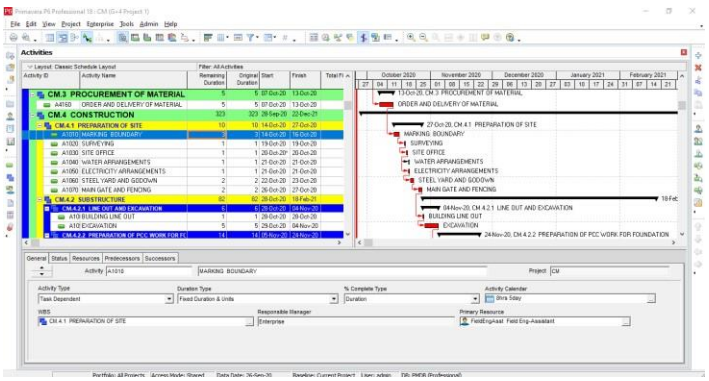
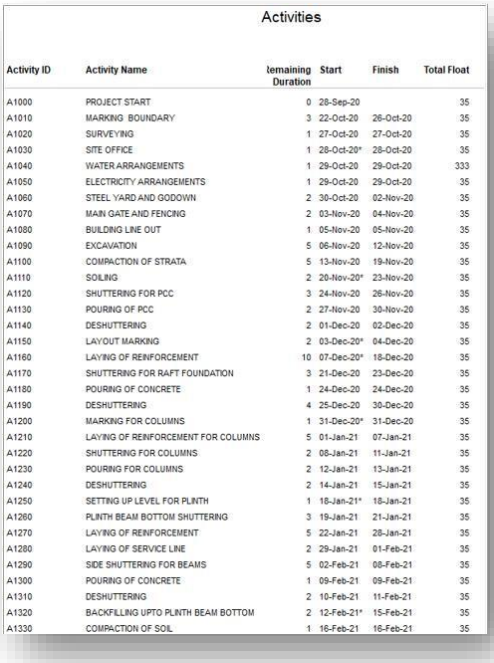


Figure 2 ACTIVITES

## V RESULT

1. The total duration of the 1st project which is a G+4 building is 456 days with a total of 288 activities
2. Costs were assigned to the activities on the basis of "state e-DSR for year 2017-18"
3. Estimates cost of the project is 1.6 CR



Activities

| Activity ID | Activity Name | Remaining Duration | Start | Finish | Total Float |
|---|---|---|---|---|---|
| A1000 | PROJECT START | 0 | 28-Sep-20 | | 35 |
| A1010 | MARKING BOUNDARY | 3 | 22-Oct-20 | 26-Oct-20 | 35 |
| A1020 | SURVEYING | 1 | 27-Oct-20 | 27-Oct-20 | 35 |
| A1030 | SITE OFFICE | 1 | 28-Oct-20* | 28-Oct-20 | 35 |
| A1040 | WATER ARRANGEMENTS | 1 | 29-Oct-20 | 29-Oct-20 | 333 |
| A1050 | ELECTRICITY ARRANGEMENTS | 1 | 29-Oct-20 | 29-Oct-20 | 35 |
| A1060 | STEEL YARD AND GODOWN | 2 | 30-Oct-20 | 02-Nov-20 | 35 |
| A1070 | MAIN GATE AND FENCING | 2 | 03-Nov-20 | 04-Nov-20 | 35 |
| A1080 | BUILDING LINE OUT | 1 | 05-Nov-20 | 05-Nov-20 | 35 |
| A1090 | EXCAVATION | 5 | 06-Nov-20 | 12-Nov-20 | 35 |
| A1100 | COMPACTION OF STRATA | 5 | 13-Nov-20 | 19-Nov-20 | 35 |
| A1110 | SOILING | 2 | 20-Nov-20* | 23-Nov-20 | 35 |
| A1120 | SHUTTERING FOR PCC | 3 | 24-Nov-20 | 26-Nov-20 | 35 |
| A1130 | POURING OF PCC | 2 | 27-Nov-20 | 30-Nov-20 | 35 |
| A1140 | DESHUTTERING | 2 | 01-Dec-20 | 02-Dec-20 | 35 |
| A1150 | LAYOUT MARKING | 2 | 03-Dec-20* | 04-Dec-20 | 35 |
| A1160 | LAYING OF REINFORCEMENT | 10 | 07-Dec-20* | 18-Dec-20 | 35 |
| A1170 | SHUTTERING FOR RAFT FOUNDATION | 3 | 21-Dec-20 | 23-Dec-20 | 35 |
| A1180 | POURING OF CONCRETE | 1 | 24-Dec-20 | 24-Dec-20 | 35 |
| A1190 | DESHUTTERING | 4 | 25-Dec-20 | 30-Dec-20 | 35 |
| A1200 | MARKING FOR COLUMNS | 1 | 31-Dec-20* | 31-Dec-20 | 35 |
| A1210 | LAYING OF REINFORCEMENT FOR COLUMNS | 5 | 01-Jan-21 | 07-Jan-21 | 35 |
| A1220 | SHUTTERING FOR COLUMNS | 2 | 08-Jan-21 | 11-Jan-21 | 35 |
| A1230 | POURING FOR COLUMNS | 2 | 12-Jan-21 | 13-Jan-21 | 35 |
| A1240 | DESHUTTERING | 2 | 14-Jan-21 | 15-Jan-21 | 35 |
| A1250 | SETTING UP LEVEL FOR PLINTH | 1 | 18-Jan-21* | 18-Jan-21 | 35 |
| A1260 | PLINTH BEAM BOTTOM SHUTTERING | 3 | 19-Jan-21 | 21-Jan-21 | 35 |
| A1270 | LAYING OF REINFORCEMENT | 5 | 22-Jan-21 | 28-Jan-21 | 35 |
| A1280 | LAYING OF SERVICE LINE | 2 | 29-Jan-21 | 01-Feb-21 | 35 |
| A1290 | SIDE SHUTTERING FOR BEAMS | 5 | 02-Feb-21 | 08-Feb-21 | 35 |
| A1300 | POURING OF CONCRETE | 1 | 09-Feb-21 | 09-Feb-21 | 35 |
| A1310 | DESHUTTERING | 2 | 10-Feb-21 | 11-Feb-21 | 35 |
| A1320 | BACKFILLING UPTO PLINTH BEAM BOTTOM | 2 | 12-Feb-21* | 15-Feb-21 | 35 |
| A1330 | COMPACTION OF SOIL | 1 | 16-Feb-21 | 16-Feb-21 | 35 |

## VI. CONCLUSION

Primavera is tool is applied for the planning, scheduling and resource allocation for the G+4 building construction project. Thedata was collected from Mumbai and nearby region for the development of successful estimation and scheduling purpose. The estimation and scheduling of this study provides the duration of completion of project along with all the float values. Proper scheduling relationships between the tasks is carried out for the task dependency purpose. The resource allocation is carried out for each and every activity which are defined at the planning stage.

Based on the analysis following conclusions are drawn and same can be used by the civil engineering professionals in the construction industry for decision making during construction phases. The proper project management by using Primavera can helps in adequately estimation, scheduling and allocation of resources with minimum time required for the completion of entire project. The most substantial design parameters are identified, those influences on the construction management;

1. Duration of completion.
2. Resource allocation and their management.
3. Proper measures in case of any issue in the resources or external conditions if any.
4. Cost of project.

Primavera serves as an effective tool for generating Gantt chart for the schedule of a High Rise construction.

- Effectively links all the activities involved in the construction of the project.
- Determine the total duration required for the construction of the different phases involved.
- Determine the Critical Path of the schedule of the project.
- Its easy to track the project visually with the help of Gantt chat
- Can further update the project progress effectively which can help identify the possible cost and time overrun
- Both the sites had less time over run.

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