

PLANNING AND SCHEDULING OF G+3 BUILDING CONSTRUCTION USING PRIMAVERA P6

S. Rajkumaar¹, P. Ram Pramoth², J. Sankaranarayanan³, R. Kalaivannan⁴

¹⁻³Student, Department of Civil Engineering, Sri Venkateswara College of Engineering, Tamilnadu, India

⁴Assistant Professor, Department of Civil Engineering, Sri Venkateswara College of Engineering, Tamilnadu, India

Abstract: Scheduling is an effort that requires extensive use and control of data. A project coding system such as a Work Breakdown Structure is a key element in developing and controlling schedule of a project. With the onset of High Rise Buildings in metropolitan cities, planning and scheduling has become a major concept to be considered for a smooth execution of construction works. Oracle's Primavera P6 is a management software which makes use of this Critical Path Method (CPM) logic to Schedule the project and the resources. This project discusses the importance of Scheduling and interrupts the software with the ongoing construction project of a commercial building. On daily basis the activities were observed and monitored through Primavera. All the important steps like creating an EPS, creating a WBS, linking of activities according to their interdependence and availability of resources, reduction of float values, and determination of Critical Path are clearly exhibited in this report.

Key Words: Planning, Scheduling, Primavera, Activity and delay

1. INTRODUCTION

The growth of building construction is increasing day by day. So there is a growing need for project control on today's construction projects. Nowadays many construction projects encounter events and/or changes that affect the original plan of executing a project. This delay in project completion happens due to various reasons such as shortage of labour, materials and also hikes in prices of the equipments. To overcome these types of errors, Construction companies are also narrowing their focus, becoming specialists in certain type of construction projects. This specialization requires more focused project planning and controlling techniques that prove to be better for certain type of projects while providing specialized construction services. The benefits of effective planning, scheduling and control of construction projects are: reduced cost overruns, reduced construction time.

Planning is the process of discovering all the activities necessary to successfully finish the project and it also aims upon the future course of action.

Scheduling is the process of determining the sequential order of the planned activities, assigning realistic durations to each activity and determining the start and finish dates of each activity. A time schedule outlines the project work program, it is a time table of work

1.1 Objectives

The primary objective of this project is

- ✓ To schedule the G+3 building construction project using primavera.
- ✓ To optimize the resources utilized in the project.

1.2 Need for the study

Construction projects have to be performed in complex dynamic environments that are often characterized by uncertainty and risks.

1) The introduction of a user friendly, time saving resources assessment method and resource database can persuade the construction project teams to go for a more quantitative resource assessments and hereby avoid recurring, time consuming efforts.

2) Projects in India are generally scheduled using PERT or CPM at present, but there are certain limitations or disadvantages of using these methods. CPM/PERT assume that unlimited resources exist in the organization so all the activities can be done as planned.

3) These limitations are corrected in the new software created for project management namely Primavera, MS Project and others.

4) Therefore, a detailed study was required for scheduling, with the help of new software like Primavera and hopefully allows the construction companies to reap the benefits of increased stability and performance.

2. METHODOLOGY

To meet the objective the following methodology is adopted and given as a flowchart in Figure 3.1

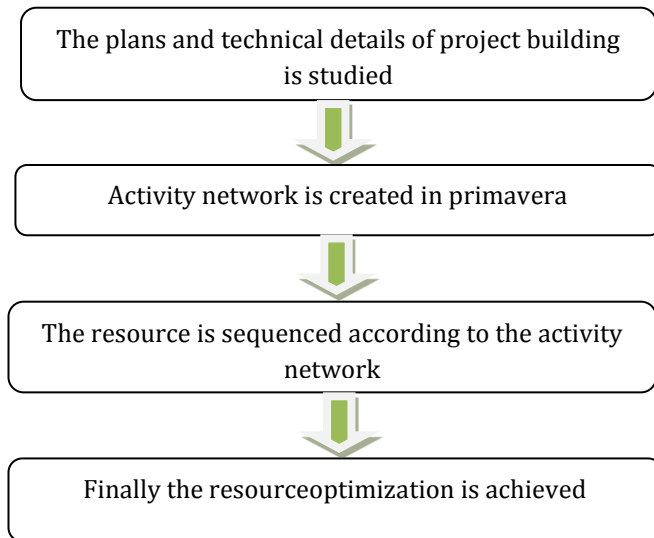


Fig 1 Methodology

3. DATA COLLECTION

This project is based on planning and scheduling of G+3 residential building. The observation gained out of construction scenario going in Tamilnadu Police Housing Corporation Ltd, which is located at Kilpauk, Chennai. Necessary data such as workmen force, labour charges, cost of equipment and materials has been collected for all references. Using these data, the work is scheduled.

Project details	Data
Type of project	Residential Building
No of stories	4
Contract period	11 months
Construction start date	30/Dec/2019
Contract value	1.88 crore
Nature of contract	Item Rate Contract
Proposed Builtup Area	940 sq.m

4. PLANNING

Planning is a general term that sets a clear road map that should be followed to reach a destination. The term, therefore, has been used at different levels to mean different things. Planning involves the breakdown of the project into definable, measurable, and identifiable tasks/activities, and then establishes the logical interdependences among them.

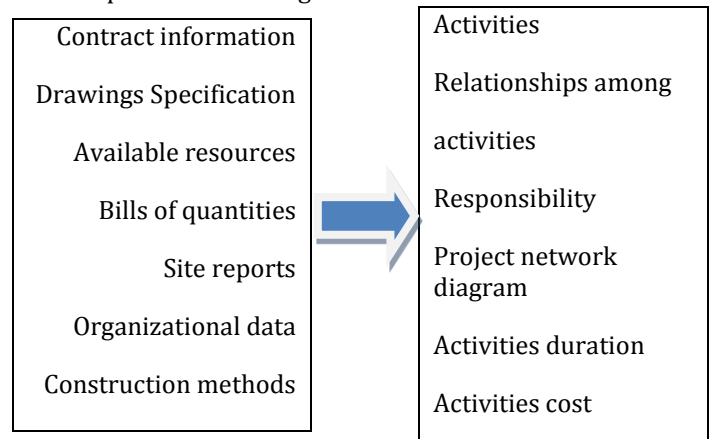


Fig 2 Planning In and Out

5. WORK BREAKDOWN STRUCTURE-WBS

The work breakdown structure (WBS) is a hierarchical system that represents a construction project in increasing levels of detail to define, organize and display the project work in measurable and managerial component. A project work breakdown structure is a deliverable or product oriented grouping of project work elements shown in graphical display to organize and subdivide the total work scope of a project. The WBS is a particularly important project tool.

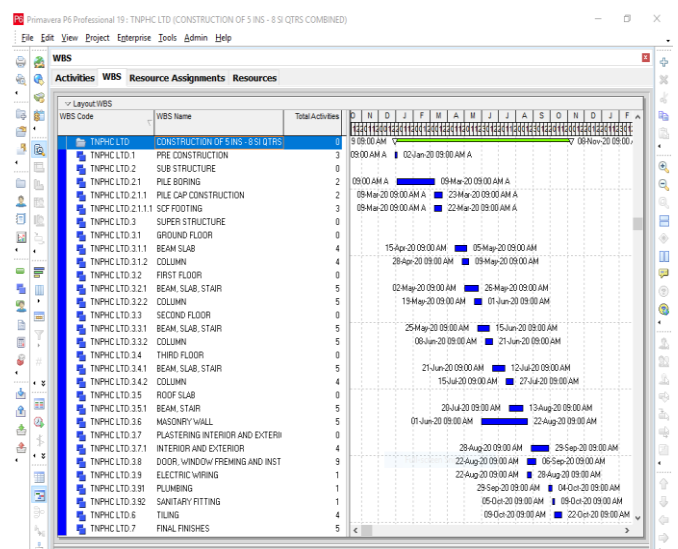


Fig 3 Work Breakdown structure

6. SCHEDULING

A schedule is a work program, set date-wise in a logical sequence. It's a timetable for action. Time scheduling is a process of developing a work program. It implies programming of the chosen work plan on a calendar basis and provides the base against which all progress is measured. The scheduling methodology varies with the planning technique and the nature of task to be performed. Simple projects can be scheduled using "Bar Chart methodology". The line of balance (LOB) technique is widely accepted for scheduling the repetitive work projects while network scheduling is suitable for all types of projects. There are many other scheduling techniques. Method of presentation of a schedule depends upon the scheduling techniques used. Generally all of them use time scale along the horizontal axis. This time scale mostly uses a 'week' as a unit of time.

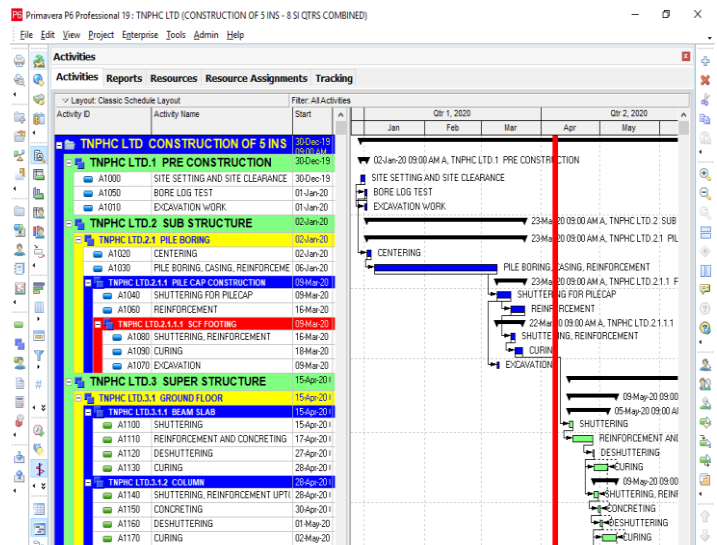


Fig 5 Gantt Chart for activity

Activity ID	Activity Name	Remaining Duration	Start	Original Duration	Finish	Activity Status	Total Float	Predecessors	Successors	Resources
TNPHC LTD. CONSTRUCTION OF 5 INS										
TNPHC LTD.1 PRE CONSTRUCTION										
A1000	SITE SETTING AND SITE CLEARANCE	0:00d	30-Dec-19	2:00d	01-Jan-20	Completed	0:00d	A1010, A	A1020, A	Male Mazdoor, Field
A1050	BORE LOG TEST	0:00d	01-Jan-20	1:00d	02-Jan-20	Completed	0:00d	A1010	A1020, A	Excavator, Compac
A1010	EXCAVATION WORK	0:00d	01-Jan-20	1:00d	02-Jan-20	Completed	0:00d	A1000, A	A1050	Mason, Mason, Exc
TNPHC LTD.2 SUB STRUCTURE										
TNPHC LTD.2.1 PILE BORING										
A1020	CENTERING	0:00d	02-Jan-20	2:00d	04-Jan-20	Completed	0:00d	A1050, A	A1030, A	Scalldor, Mason, I
A1030	PILE BORING, CASING, REINFORCEME	0:00d	05-Jan-20	6:00d	09-Mar-20	Completed	0:00d	A1020, A	A1040, A	Mason, Steel Fixer,
TNPHC LTD.2.1.1 PILE CAP CONSTRUCTION										
A1040	SHUTTERING FOR PILECAP	0:00d	09-Mar-20	14:00d	23-Mar-20	Completed	0:00d	A1030, A	A1060, A	Scalldor, Mason, I
A1060	REINFORCEMENT	0:00d	16-Mar-20	7:00d	23-Mar-20	Completed	0:00d	A1040, A	A1090, A	Male Mazdoor, Mas
TNPHC LTD.2.1.1.1 SCF FOOTING										
A1080	SHUTTERING, REINFORCEMENT	0:00d	16-Mar-20	2:00d	18-Mar-20	Completed	0:00d	A1060, A	A1050, A	Male Mazdoor, Mas
A1090	CURING	0:00d	18-Mar-20	4:00d	22-Mar-20	Completed	0:00d	A1080, A	A1100, A	Male Mazdoor, Site
A1070	EXCAVATION	0:00d	18-Mar-20	1:00d	19-Mar-20	Completed	0:00d	A1040, A		Excavator, Male Me
TNPHC LTD.3 SUPER STRUCTURE										
TNPHC LTD.3.1 GROUND FLOOR										
TNPHC LTD.3.1.1 BEAM SLAB										
A1100	SHUTTERING	2:00d	15-Apr-20	2:00d	17-Apr-20	Not Starte	20:00d	A1090, A	A1110	Mason, Scalldor, I
A1040	REINFORCEMENT AND CONCRETING	10:00d	17-Apr-20	10:00d	27-Apr-20	Not Starte	20:00d	A1100, A	A1120	Male Mazdoor, Site
A1120	DESHUTTERING	1:00d	27-Apr-20	1:00d	28-Apr-20	Not Starte	20:00d	A1110, A	A1130, A	Male Mazdoor, Scal
A1130	CURING	7:00d	28-Apr-20	7:00d	05-May-20	Not Starte	187:00d	A1120, A		Male Mazdoor, Site
TNPHC LTD.3.1.2 COLUMN										
A1140	SHUTTERING, REINFORCEMENT UPTI	2:00d	28-Apr-20	2:00d	30-Apr-20	Not Starte	20:00d	A1120, A	A1150, A	Mason, Mason, Ma
A1150	CONCRETING	1:00d	01-May-20	1:00d	01-May-20	Not Starte	20:00d	A1140, A	A1160, A	Compactor, Concret
A1160	DESHUTTERING	1:00d	01-May-20	1:00d	02-May-20	Not Starte	20:00d	A1150, A	A1170, A	Mason, Site Superi
A1170	CURING	7:00d	02-May-20	7:00d	09-May-20	Not Starte	183:00d	A1160, A		Male Mazdoor, Site

Fig 4 Classic activity for scheduling

7. BAR CHART

In the bar chart method, works are first split into activities. These activities are then listed in order of construction priorities, generally on the left hand side column, while the time scale is plotted horizontally on the top and/or bottom of the chart. The bar against each activity represents its schedule of work. The start of the bar marks the commencement of the activity and the end of the bar, its completion. The length of the bar on the calendar scale represents the duration of the activity. Horizontally, each row depicts the activity description, activity data and rectangular shape bar represents the activity schedule

8. RESOURCES LEVELLING

The resources required for the execution of each activity is classified under three categories namely labour, non-labour and material. The manpower assigned for the activity is categorized under labour, equipment that are used for execution is categorized under non-labour, materials like cement, bricks, steel etc. are categorized under the Material. In dealing with project resources, two main types of techniques have been used: resource allocation and resource leveling. Figure: 7.1 Table displaying the list of all the resources divided into Management and executives, labour, machinery and materials involved in the project.

Activity ID	Activity Name	Remaining Duration	Start	Planned Duration	Finish	Activity Status	Total Float	Resources
A1380	SHUTTERING	2:00d	21-Jun-20	2:00d	23-Jun-20	Not Started	13:00d	Male Mazdoor, Mason, Scal
A1400	STEEL REINFORCEMENT	10:00d	23-Jun-20	10:00d	03-Jul-20	Not Started	13:00d	Steel Fixer, Mason, Male Ma
A1410	CONCRETING	1:00d	03-Jul-20	1:00d	04-Jul-20	Not Started	13:00d	Male Mazdoor, Mason, Conc
A1420	DESHUTTERING	1:00d	04-Jul-20	1:00d	05-Jul-20	Not Started	13:00d	Mason, Male Mazdoor, Site
A1420	CURING	7:00d	05-Jul-20	7:00d	12-Jul-20	Not Started	107:00d	Male Mazdoor, Site Superio
TNPHC LTD.3.2 COLUMN								
A1440	STEEL REINFORCEMENT	3:00d	15-Jul-20	3:00d	18-Jul-20	Not Started	3:00d	Steel Fixer, Male Mazdoor, I
A1450	CONCRETING	1:00d	18-Jul-20	1:00d	19-Jul-20	Not Started	3:00d	Mason, Male Mazdoor, Conc
A1460	DESHUTTERING	1:00d	19-Jul-20	1:00d	20-Jul-20	Not Started	3:00d	Male Mazdoor, Mason, Site
A1470	CURING	7:00d	20-Jul-20	7:00d	27-Jul-20	Not Started	104:00d	Male Mazdoor, Site Superio
TNPHC LTD.3.5 ROOF SLAB								
TNPHC LTD.3.5.1 BEAM, STAIR								
A1480	SHUTTERING	3:00d	20-Jul-20	3:00d	23-Jul-20	Not Started	3:00d	Scalldor, Male Mazdoor, I
A1490	STEEL REINFORCEMENT	12:00d	20-Jul-20	12:00d	04-Aug-20	Not Started	3:00d	Mason, Steel Fixer, Male Ma
A1500	CONCRETING	1:00d	04-Aug-20	1:00d	05-Aug-20	Not Started	3:00d	Male Mazdoor, Mason, Conc
A1510	DESHUTTERING	1:00d	05-Aug-20	1:00d	06-Aug-20	Not Started	3:00d	Male Mazdoor, Mason, Site
A1520	CURING	7:00d	06-Aug-20	7:00d	13-Aug-20	Not Started	3:00d	Male Mazdoor, Site Superio

Resource ID	Name	Units	Original Lag	Start	Finish	Budgeted Units	Actual Regular Units
R-2	Asst Egg	1.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	1.00	0.00
M3	Concrete	3.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	3.00	0.00
E4	Concrete Vib	1.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	1.00	0.00
L3	Male Mazdoor	4.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	4.00	0.00
L2	Mason	5.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	5.00	0.00
R	Site Superior	1.00d	0:00d	03-Jul-20 09:00	04-Jul-20 09:00	1.00	0.00

Fig 6 Resources allocation details

9. RESULT AND DISCUSSION

After analysis on Primavera P6, It was observed that after planning and scheduling, the time duration of the building completion was reduced by nearly 1 month. Hence after careful studying this software one can control the project in terms of duration hence leading to cost optimization.

10. CONCLUSIONS

Primavera is an ideal tool for anyone who is involved in planning, monitoring and reporting on the progress of projects both large and small. It also means that all parties can be kept updated within one system, reducing duplicate information and keeping everyone in the loop. This project emphasizes the use of project management software precisely primavera on construction. By tracking a stimulating project, the various interpretations of activities and resource relation using software were explained in detail.

Primavera software helped us in Fast tracking of each activity in the project and there by reducing the time consumption as compared to manual scheduling. We could sort the exact activity or sub-activity that caused delay in the project and we could optimize the duration with respect to it. When compared to manual scheduling this was very useful for us to optimize and allocate the resources which was time saving and accurate.

REFERENCES

- [1] Subramani T. et al, June 2014 Int. Journal of Engineering Research and Applications, "Planning and Scheduling of High Rise Building Using Primavera", ISSN: 2248-9622, Vol. 4, Issue 6 (Version 5), pp.134-144.
- [2] P Raghunath Reddy, B. Harish Naik "Planning and Resource Scheduling of Residential (G+7) Project Using Primavera" International Journal of Innovative Research in Science, Engineering and Technology (An ISO 3297: 2007 Certified Organization) Vol. 5, Issue 10, October 2016.
- [3] Unmesh. Y. Polekar, Rohit. R. Salgude "Planning, Scheduling and Tracking of a Residential Project using Primavera Software" International Journal of Advance Research in Computer Science and Management Studies, Volume 3, Issue 5, May 2015.
- [4] BSK Reddy "A Study on Resource Optimization for Multiple Projects using Primavera" journal of engineering science and technology, vol. 10, no.02 (2015) 235-248.

- [5] Chitkara K.K. "Construction Project Management Planning, Scheduling and Control" Tata McGraw Hill publishing company limited, New Delhi.
- [6] V. Dhanalakshmi, "High cost infrastructure report monitoring by p6 software", international conference on engineering innovations and solutions (ICEIS - 2016).
- [7] Hitanshu Saini, Khushpreet Singh, Uma Malik, Project Management Using Primavera International Journal of Civil Engineering and Technology (IJCIET) Volume 8, Issue 8, August 2017.