PLANNING AND SCHEDULING OF CONSTRUCTION PROJECT BY CRITICAL PATH METHOD WITH MS PROJECT

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***Abstract*—This article evaluates about determining the planning and scheduling of construction project. This estimates duration labors of the particular work and finishing date of project. Using this details network diagrams are determined. Networks were analyzed using three methods: manual critical path method scheduling calculations using MSP, Primavera Project Management software (p5). MSP project allows us to determine critical path, resource allocation, His software works on the multiple task simultaneously without effecting the other task. Resource allocation gives the clear idea about the workers requirement for the particular task.**

***IndexTerms*—Microsoft project, Planning, Scheduling, Resource allocation, Critical Path Method, Project management, Gantt chart.**

I. INTRODUCTION

Managing and running organizations is an evolutionary process over the ages. Such processes have been undergoing many structural changes. Organizations have shifted from functional managed structures to project based organizational structures. Consequently, project management in organizations is becoming increasingly important. Indeed, it is critical for the success of the company. Most of the above mentioned process changes have occurred in the last three decades. Irrespective of the type of industry or the domain, the need for managerial and structural change is being observed.

Now a day's project management concept is not only limited for high scale and high budget construction projects it has been slowly gaining its adoptability in small scale and small budget projects also. Since time, cost and resource are the main constraints in running any project it's very important that they must taken care. In order to do that everything must be started from the scratch First and foremost thing in any project is planning and scheduling it accurately. So one of the effective methods of doing this is critical path method (CPM). So the study is based on comparing CPM method of planning a construction project with other methods of planning.

A. History:

Critical path method is nothing but the technique which was developed in 1956/1957 by Remington Rand and Du-Pont to help schedule maintenance in various construction projects. Critical path method is a systematic scientific method base on principle of time estimates to perform a detail analysis of network in an application of project management. Time estimates in CPM relate to estimating the time for the events of the network diagram. Since the event signifies the status of the project at a point of time, the time estimates in term signify the status of the project at different point of the time. There are two important time estimates:
(1) Earliest starting time (2) latest finishing time.

B. Critical path method:

The critical path method (CPM) is a step-by-step project management technique for process planning that defines critical and non-critical tasks with the goal of preventing time-frame problems and process bottlenecks. The CPM is ideally suited to projects consisting of numerous activities that interact in a complex manner.

C. *Methods of construction planning:*

Construction planning is a fundamental and challenging activity in the management and execution of construction projects. It involves the choice of technology, the definition of work tasks, the estimation of the required resource and duration for individual task. A good construction plan is a basis for developing the budget and schedule for work. Construction engineers use various methods of planning the project. Most common is Microsoft Project and Primavera. The construction planning engineers visualize the sequence of executing the project and present them in graphical or table, Presentable format.

D. Microsoft project:

It is designed to assist a project manager is developing the plan and assigning the resources to each activity such that the budget is being maintained. Resource can be assign to each and every activity depending on the type of work. The execution of the schedule task work based on the resource availability as defined in the resource calendar.Project panning using Microsoft project

software includes generating a network diagram of these activities and finding the critical path and hence finding the total duration of the project.

The Microsoft Project Database includes the following features:

- Microsoft project stores the details about your project in its database as it uses that information to calculate and maintain the project's schedule, cost and other elements.
- The more information you provide the more accurate the plan.
- Like a spread sheet Microsoft project displays results of its calculation immediately.
- Microsoft project keeps the information it calculates in fields, which contain specific type of information such as task name and duration.
- The project data base contains a lot of information, but at any given time you only need a portion of it. To get the information use these tools.
  - Gantt chart displays basic task information in columns and a bar graph.
  - Tables define the columns displayed.
  - Filters define the columns displayed.
- Changing views, tables, or filters may hide information, but it doesn't delete it. It's still in the data base and is still updated.

II. LITREATURE SURVEY

- *R. Prabhahar and G. Ravichandran (2014)* analyzed Completion of many of the projects is not in estimated duration. It will not only reduce the expected revenues but also will affect the reputation of the contractor.
- *P.M.Wale (2015)* observed that traditional way of planning doesn't sub divide the main task which future gets the hurdle of over allocation of resources, improper judgment of resources for particular activities etc. Microsoft Project is the modern tool of Project Management that aid to overcome the obstacles faced owing to traditional way of Planning and Management.

III. CASE STUDY

The case study is a site where a commercial building is being constructed which is a small scale government project in Udupi, Karnataka, India having G+2 floors. Basement being for parking, ground floor for shops, first floor for library and a small hall and second floor for hall.

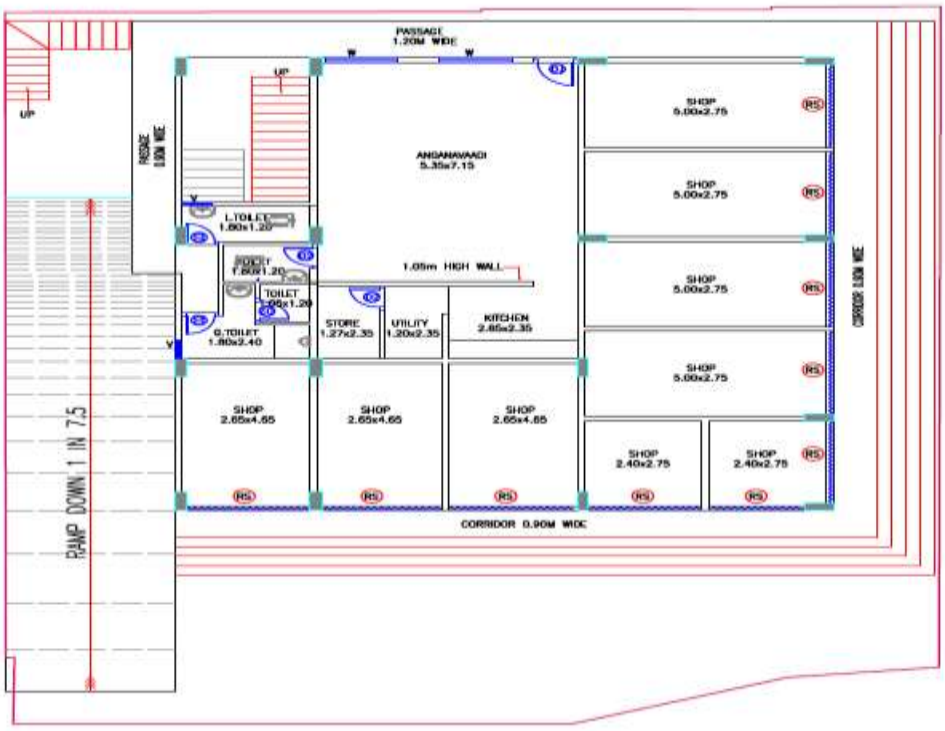

Fig.1: Proposed plan

IV. METHODOLOGY

Initially entire project is divided into manageable activities such that they are logical choices to stand alone. That means project is broken into manageable activities and they arranged in hierarchy. According to project break down the entire project is divided into two parts being substructure and superstructure and activities below this are arranged based priority of construction. Once the dividing of the works based on the priority is done the labor resource have been assigned to each activity depending on the estimated quantity of work and productivity of the labor teams.

A. Work breakdown structure:

Work breakdown structure makes complex projects more manageable. It is the pictorial representation of the entire activity or work. It is a flowchart illustrating how the supporting objectives go together to ensure the attainment of the major activities. It can also be defined as a tool which is used for representing hierarchical breakdown of in a project. Generally, the upper components are the deliverables and the lower level elements are the activities that create deliverables. It helps with assigning responsibilities as well as explain the project scope stake holders. The work breakdown structure of case study is shown below:

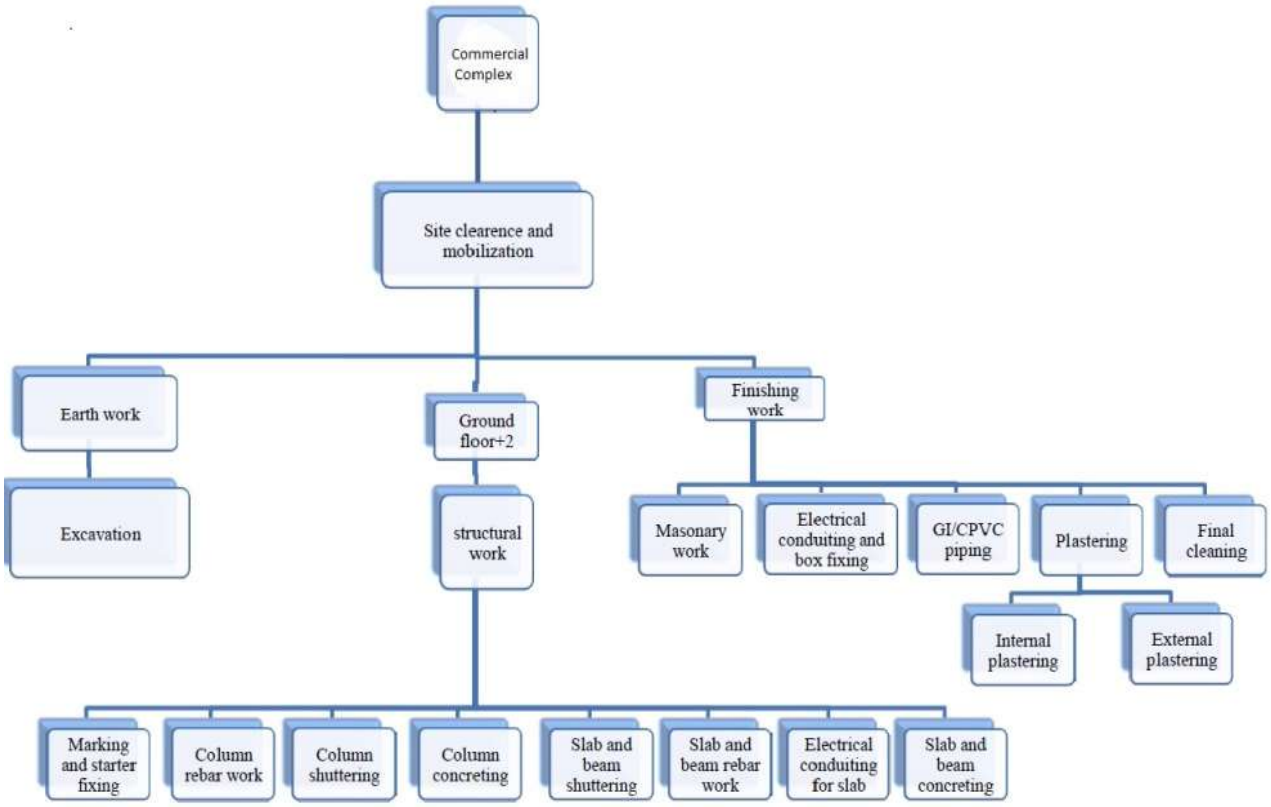

Fig.2: Work breakdown structure

B. Productivity chart:

The productivity is nothing but efficiency of labor team of particular activity on daily basis. The productivity chart prepared by taking in to consideration efficiency of labor team in previous constructions under the contractor in that region.

Table 1 Productivity Chart

Description		Quantity per day				Manpower per day		
Sl.no		***cum***	***Sqm***	***Kg's***	***flat***	***Equipment***	***Skilled***	***Helpers***
1	***Excavation***	73				2		
2	***PCC***	61					1MS	4
3	***foundation***							
	Shuttering		33.33				1CP	4
	Reinforcement			515			1B	9
	Concreting	11.24					6 MS	30
4	***Columns***							
	Shuttering		8				1CP	8

	Reinforcement			270			1B	8
	concreting	4.47					1MS	7
5	***Beam***							
	Shuttering		75.25				1CP	6
	Reinforcement			855			1B	6
	Concreting	19					1MS	15
6	***Slab***							
	Shuttering		21				1CP	8
	Reinforcement			265			1B	7
	Concreting	33					1MS	35
7	***Masonry work***		40				1MS	4
8	***Internal Plastering***							
	Ceiling		40				1MS	8
	Wall		90				1MS	8
9	***Externalplastering***		35				1MS	8
10	***Flooring work***		26				1MS	5
11	***Wood work***							
	Frames	0.5					1CP	6
	Shutters	0.5					1CP	6

In order to calculate the duration of work for each activity it is essential to prepare the productivity chart which is as mentioned above. The duration of work can be calculated by using the formula

$$\text{Duration} = \frac{\text{Total work}}{(\text{Productivity} \times \text{man power per day})}$$

Examples:

1. For foundation shuttering

$$D = \frac{100}{(33 \times 1)} = 3.03 \approx 3\text{DAYS}$$

2. For foundation reinforcement

$$D = \frac{3600}{(515 \times 1)} = 6.99 \approx 7\text{DAYS}$$

C. Network diagram:

As per the case study network diagram can be defined as the time between the earliest start and the latest start time or between earliest and latest finish time. In this network diagram we will get to know which is the critical path and what are the critical activities of the project.

V. CONCLUSION

The proposed site which is at Udupi takes nearly 365 days i.e. 1year approximately but as per CPM we can complete the project within 300 days along with 15 days buffer period. Where the cost of labors as well as the cost of the material will also be saved. It will also help in avoiding the delay of each activities.

The critical path network provides the order in which certain activities must be performed and the information provided there will help in addressing

- The amount of delays that can be tolerated for a particular activity without delaying the project completion.
- It will also help to know the critical bottleneck activities where any delays must be avoided to prevent the project completion time.
- By CPM of planning we get to know which are the critical activities and those activities will be given extra attention and care so that there won't be delay of whole project duration.
- By proper planning efficiency of work will be high and also good communication between varies departments of construction team.

VI. ACKNOWLEDGMENT

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