

# Planning, Scheduling and Resource Optimization for Road Construction



J.Kiran Kumar, K.Victor, K.Naomi Nischala

**Abstract:** In 1916, the construction of Railway station in Guntur was done at that time; there as was full of small fresh water rivers near Guntur bus stand and near railway station and flow of water from bus stand to railway station is known as pichukalagunta. There is a low level water passage below the railway track was established. After few years the area was developed and the low level passage was become used for traffic flow. But at the time of rainy season the water gets stagnated. And the route is in much usage in normal seasons because it is shortest route to go from bus stand to lakshmipuram and railway station.

We are not only giving the station for that low lying area sand also Estimating the cost that required for using porous material for reducing the Stagnant of water in that particular area.

During this study, we found that solution which we use percolate the water into the ground surface and also cost estimation in primavera software.

## I. INTRODUCTION

The development of infrastructure plays a main role for the development of country. The important part of economic growth of the country depends on the road transportation. The construction projects like road construction needs a careful attention while planning as well it requires a very huge amount of resources. As it's known the road construction projects is different from one another as there will be changes in place, situation, weather condition by seeing all this it is very tedious in planning and allocating resources as the resources are repetitively used in the execution of the project. The time taken for the construction of road projects at the beginning of 19th century took a very long duration because of lack in techniques used which leads to wastage of money, time as well as the resources used for construction.

As the days passed their we saw the improvement in the construction technologies used which could complete the project with the appropriate usage of money, time and resources for this improvements their comes the proper project management tools which would help in planning, scheduling and resource allocating one such tool is PrimaveraP6.

## II. PROJECT MANAGEMENT

Project management could play a very important role in the construction industry. By using these management tools it will be very helpful to execute the project in a very economical way as well with the limited duration with usage of optimum resources. This also enables to store the information and manage the project in a central location. The project management consist of balancing the needs which could be identifiable or unidentified expectation of the stake holders by giving the quality, scope, and time of the project.

The project management uses the information and turns it in a manner for execution in a skilled way with lot of strategies to satisfy the requirement of the construction projects. Every project has main goals to achieve that are

1. On time completion of the project
2. Optimum usage of the resources
3. Within the minimum investment

The goal of project planning is to create a work chart with the activities which should be done on after another with a proper date of start and completion. By scheduling we could know the activities which are in a crucial position where it should be started and completed within the duration so that it will not affect the project completion duration. The allocation of the resources required for the project activities will cut down the wastage of materials which could affect the funds that are allocated for the resources in a project.

## III. LITERATURE REVIEW

“Preplanning And Scheduling Of Road Construction By Using PPM” T Subramani, M.Shekar International Journal Of Application Or Innovation In Engineering Management Volume 4 Issue 5, May 2015. Planning project management is required to give complete project management solution , helps to schedules the working period in a proper manner and also purchase the goods at the right time. Advantages of using this software are having flexibility to manage multiple projects in centralized location and determine who can access each project.

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“Schedule and Resources Optimization Using Primavera In Metro Rail Project” T.Shiva Nagaraju And Sri Lakshmana Kumar IRF International Conference 22 May 2016 The main objective was to understand the role of scheduling and proper usage resources to timely completion of a construction project.

Results showed the drawbacks of the present project management system in station work project and the importance of efficient planning, as well as the need and effectiveness of project management software like Primavera P6 in a construction project.

“A study on resource planning in highway construction projects” k swarna kumari and j vikranth international journal of engineering research and application volume 2, required resource management. Which results in Lack of professionalism , training programs no real time records. equipment cost for any project comprises of mainly 20-30% of project cost. issue 4 july –august 2012 The present construction practices in India is still adopt the methodology of as and when man power planning is the process by which an organization ensures that it has the right number and right kind of people at the right place at right time. Which all should be controlled by proper allocation of resources so that effectively and efficiently works can be completed.

#### IV. OBJECTIVES OF THE PROJECT

The objective of the project is to complete the construction project as indicated time period with specified date and proper usage of funding and number of resources. to accomplish the project successfully some of the objective goals set are

1. Planning and scheduling of the activities of the project
2. To adopt the proper activity sequencing by assigning proper relationship between activities
3. To adopt the proper activity sequencing by assigning proper relationship between activities
4. Identifying the activities which could be start parallel so that the duration could be reduced
5. To allocate the resources effectively for usage of available equipment's and material's
6. To know the primavera is helpful in the construction and execution of project.

#### V. METHODOLOGY:

The methodology used in this project is divided into 3 main phases. By adopting planning and scheduling the activities critical path will be obtained by schedule reports by logical relationship which will be helpful in execution. Resource availability can be known and assigned, analysed and levelling will be done. The results obtained are concluded. The entire project is integrated with Primavera and reports are generated. Following flow chart explains the phases

#### VI. PLANNING

Data collections for the project involves collecting the data required like drawings and for each the quantities are

calculated are shown in below tables. The project which I have selected is construction of porous asphalt pavement in pichukulla gunta, donka road, Guntur and it includes construction of CC drain and service road..

#### VII. List Of Datas

##### Drawings

1. Cross section in front of road
2. Cross section in other location
3. Quantities of materials
4. Quantities of main road construction
5. Quantities of road furnitures
6. Quantities of CC drain
7. Quantities of service road
8. Scheduling details
9. Date of start
10. Date of completion
11. Duration of activities
12. List of resources used for the project

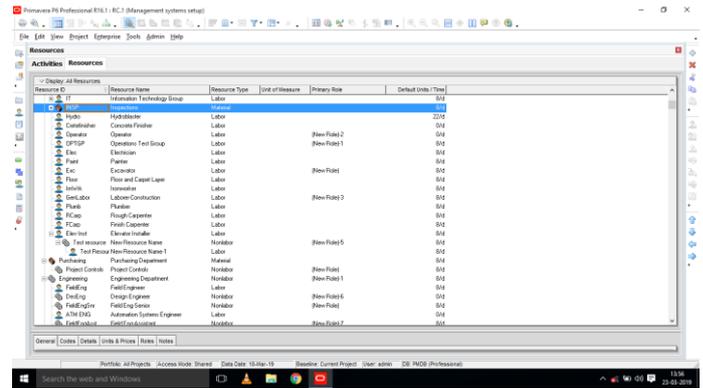
#### VIII. SCHEDULING

1. After collecting drawings and preparing quantities the activities are known. Now the scheduling is done in primavera software. The scheduling procedure in primavera is as follows
2. Creating Enterprise Project Structure (EPS)
3. Creating users and user preferences
4. Creating Organisation Breakdown Structure (OBS)
5. Creating Projects
6. Creating Calendar's And Assigning
7. Creating Work Breakdown Structure (WBS)
8. Creating Activities Under WBS
9. Creating activities
10. Establishing Relationship Between Activities
11. Scheduling of activities
12. Knowing Grand Summary with Gantt chart
13. One of the methods used for scheduling is critical path method (CPM) that which defines the project activities, activity duration and relationship between activities. The schedule of activities connects the activities in a project to calculate the total duration required to complete. by scheduling we could identify the reasons for delay which occurs in a project. It also makes easy for tracking a particular project which gives a legal proof.
14. A project scheduling is listing of milestones for project activities, milestones with intended start and finish dates which helps for the site engineers to execute the project easily by knowing the upcoming activity and requirements for the activity which makes the project to move on without any disturbance.

15. By adopting and executing proper scheduling predicting of the upcoming workloads can be known and handled accordingly to the situations. It's very useful in knowing the requirements of equipment's which are required for the upcoming activity
16. Primavera is a project management program which is designed to assist project managers in developing plans , assigning resources to tasks, managing budgets, tracking progress and analysing workloads . It also helps to effectively implement their strategies and can achieve the goal.
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**IX. RESOURCE OPTIMAIZATION:**

Resource includes personnel as well as equipment that work on an activity across the project. Resources can be created according to the organization resource structure which helps for assigning the resources for each activity. This enables to schedule as well as plan the cost by role at the planning level of the project. The resources can be groped based on the categories so which helps to find easily while assigning to the activity.



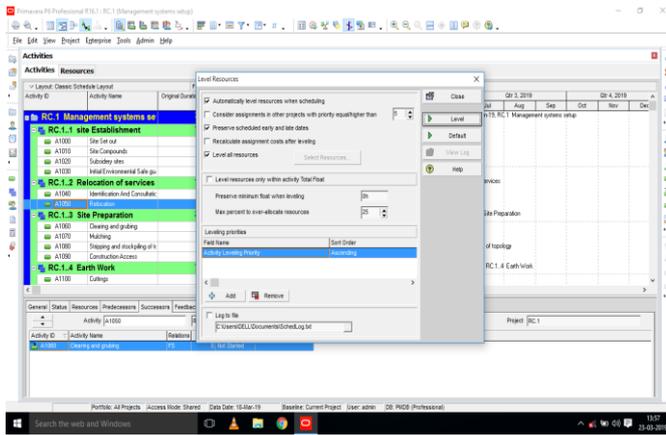
Window Showing the Resource Sheet

The resource calendars can also be assigned and define contact information, price over time for resources and roles. Unlimited resource coding can be done. Team leaders, resource manager and project managers of teams in and enterprise should jointly establish the resources required for the project. The project control co coordinator needs to participate in the process to make sure resources are distributed accordingly based on the availability. The resources window can also be opened at global level without opening any project to know the availability of resources in company. Using unit and piece tab we can specify available quantities for the resource for the work. Setting up the limits helps you quickly identify the area where the resources are overloaded and can be handled easily. The units for the resources can be set by adding the required units in admin categories which appears with a tab when clicked on admin column. By selecting each activity the required resources are added with the quantity required for each activity. After assigning the required resources the resources should be levelled to know the requirement and the resources which are over allocated. It helps to manage the resources while execution of activity. Once the levelling is done recalculation should be done. If activity is not progressed the planned cost, remaining cost and completion cost all will be equal. Recalculating cost option will be used when resources costing increases during execution.

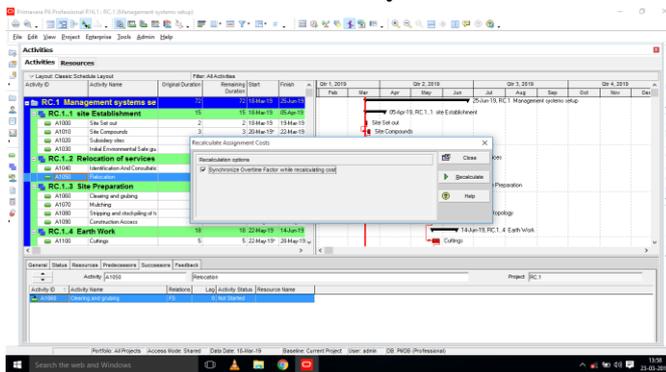
**X. RESULT AND DISCUSSION:**

In this road construction project some of the results obtained from the software are listed below.

1. Gantt chart
2. Resource graph
3. Reports



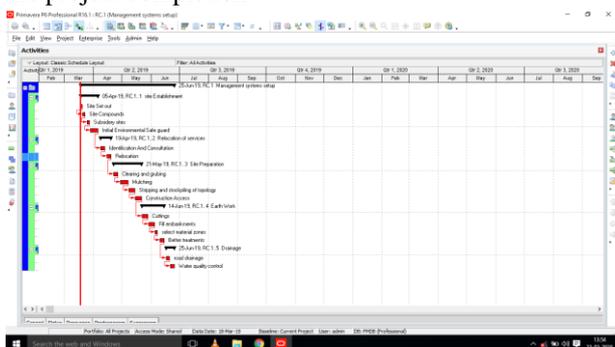
**Window Showing the Assigning Of Resources for Each Activity**



**Window Showing the Recalculation after Resource Levelling**

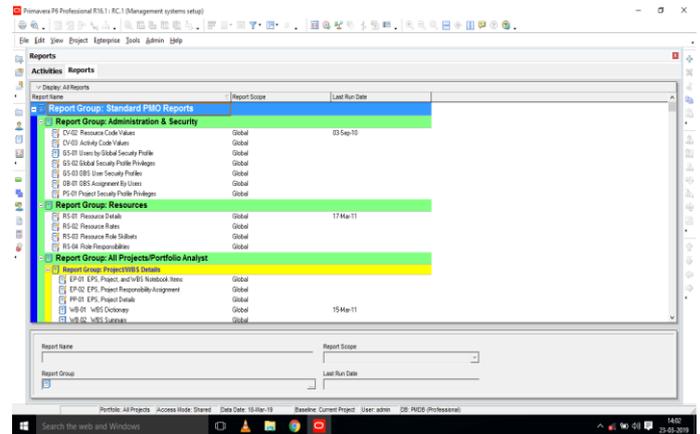
## XI. GANTT CHART

Gantt chart can be said as the graphical representation of the activities with duration which shows the inter relationship between each other. It is very helpful in planning, scheduling and monitoring progress in a project. Detailed Gantt chart view represents the schedule that which is done in proper planning and co-ordination in between the activities. Mainly in this we could know the activities which are critical which can be taken care in the stage of execution. In this the highlighted red colour shows the activities which shows critical path and which should be taken extra care while execution so that it doesn't delay the project by providing the resources required so that it does not affect the project completion.



**Gantt chart view of the current project in primavera**

## XII. REPORTS



**List of Reports Which Could Be Taken In Primavera**

The purpose of report documentation of the project is to provide a monitoring guidance for the project manager and site engineers for easy execution. Each report in the software generated will have the overall view of the project with the requirements needed. Reports are grouped so that it helps to view and take the print of the required report document. By collecting all the reports it will be easy to maintain the documents of the project and helps for execution.

## XIII. CONCLUSION

In the present scenario there is an immensely increase in demand for the road construction projects due to the rate of development in India which is increasing day by day. In India as we have observed there are many underperforming projects which is effecting on time and cost. To overcome all the facts that are effecting the construction of project with poor performance there we should include proper planning and scheduling techniques to have a good and effective performance of the construction economically. So to include the best planning and scheduling techniques we can use Primavera P6 for the minimum duration construction of road construction. Primavera P6 gives a proper project management solution for the planning and scheduling team of the enterprise. Some of the points for the conclusion are following

contractor which plays a vital role in execution of project interrelationship between the activities the project duration can be managed without any delay. Engineers for the easy execution of activity and have a prepared for the upcoming activities. Whereas CPM is chart based representation which gives easy representation of critical activities scheduling very high. Sources as needed for the activity wastages of resources can be avoided. Will help the contractor to manage the material requirements for the activities.



**XIV. FUTURE SCOPE :**

1. Planning, scheduling and resource optimizations can be used for all construction work which helps for the economical and proper execution.
2. The control over resource wastage and loss in budgets could be identified.
3. By using Primavera software tracking, cost management and much other helpful management can be adopted.
4. By using primavera multi projects could be handled in a centralized location by developing security passwords.
5. This also helps in analysing the risks in the projects



**K.Victor** working as Assistant Professor in KKR&KSR Institute o technology and Sciences. .As coming to my working Experience it was Fourth year heading towards my academic profile. Detailing in to it published one international journal.



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**J.Kiran Kumar** working as Assistant Professor in kallam Haranadha Reddy Institute Of Technology and Sciences. As coming to my working Experience it was sixth year heading towards my academic profile. Detailing in to it published four international journals and written 30 news articles regarding curriculum and non-curriculum and also attended 12 conferences. Adding to it successfully organized three workshops as Assistant Professor.