

# A Case Study on Planning and Scheduling of a Project PIPLMC of a Package - 6A using Microsoft Project 2016

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**Abstract:** *There have been many case studies/review papers in area of project planning and scheduling from last few years. Various construction activities are managed to achieve the profit within limited funds, resources, and time. In project management there are many techniques are used for scheduling and coordinating the various resources by controlled method. Management techniques such as Critical Path Method (CPM), Program Evaluation and Review Techniques (PERT) have been successfully implemented prior to the 1970's, in various construction projects in the countries like Canada, USA, Japan, Australia, etc. These techniques are helpful to manage in efficient and economic use of resources for completion of project objectives with limitless availability of resources, though it is observed that resources are limited in real time project scenario. While the focus of this paper will be on the project schedule of Polavaram Irrigation Project of Left Main Canal (PIPLMC) of Package-6A of 25.78KM from KM 111.000 to KM 136.780 (Part Work) by using MS Project 2016. This paper will briefly present an overview of the scheduling the project duration using software MS Project 2016. In this project, preparing an accurate and workable plan is very difficult. In this project by using project management technique like priority rule-based scheduling method used to resolve resource conflicts and useful in minimizing the project duration within limited availability of resources and time to make the project profitable and within project duration.*

**Keywords:** Planning, Scheduling, PIPLMC, MS Project 2016, Project Management, Gantt Chart, Project Management, Time, Activities.

## 1. Introduction

Scheduling is the process of arranging, controlling & optimizing work, and workloads in a construction project. Project management techniques like critical path method and program evaluation and review technique are useful in scheduling and coordinating various resources [1]. By using traditional software like Microsoft Excel for project planning, scheduling, and control is still used by 80% of India's construction industries, while 86% felt the need to adapt to new software. The results after using MPS in the project planning, scheduling, and control is achieved were far better than those obtained using traditional software [2,3]. Project schedule is considered as core of the project plan, and the purpose of the project schedule is to show the organization how the work will be performed to uncover the mistakes [4].

A schedule or a timetable, as a basic time-management tool, consists of a list of times at which possible tasks, events, or actions are intended to take place, or of a sequence of activities in the sequential order in which such things are intended to take place. The process of creating a schedule - deciding how to order these tasks and how to commit resources between the varieties of possible tasks - is called scheduling, and a person responsible for making a particular schedule may be called a scheduler [5].

Establishing a project management schedule involves listing milestones and activities with intended start and finish dates. The process schedule is used for the planning of the production or the operation, while a resource schedule aids in the logistical planning for sharing resources among several entities. Scheduling of projects, therefore, requires

the identification of all the tasks necessary to complete the project, and the earliest time at which each task can be completed. In creating a schedule, a certain amount of time is usually set aside as a contingency against unforeseen days. This time is called scheduling variance, or float, and is a core concept for the critical path method.

### *Importance of Project Management*

Project gets started at the right way but as it proceeds further, gets off the track. Owing to this it's important to manage the activities in the right way, thus project management plays a vital role in arranging the critical activities of the project which is called as task to function in the appropriate way. Project Management aid the project in better efficiency to deliver services.

### *Traditional Approach to Project Management in Construction Sector*

A traditional phased approach identifies a sequence of steps to be completed. In the "traditional approach", five developmental components of a project can be distinguished:

- 1) Initiation
- 2) Planning & Designing
- 3) Execution and Construction
- 4) Monitoring and controlling systems
- 5) Completion

### *Priority rule-based scheduling*

Project scheduling is the act of constructing a timetable for each project activity, respecting the precedence relations and the limited availability of the renewable resources, while optimizing a predefined scheduling objective. The presence of resources during project scheduling often leads to a complex scheduling process and hence, simple priority-based scheduling rules are used to facilitate this scheduling

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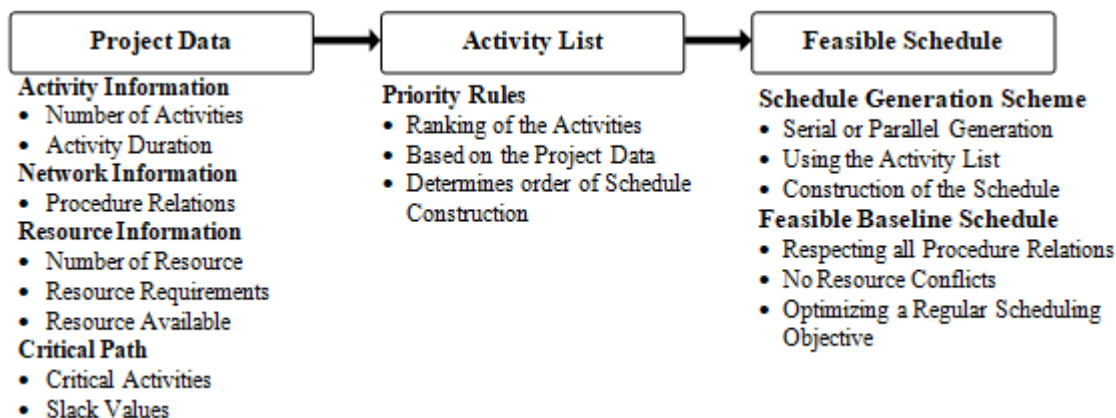
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process. The priority rule-based scheduling approach is discussed along the three following dimensions:

a) Priority rule-based scheduling: An overview of the general principle of this technique.

b) Priority rules: Assign priorities to project activities and create a ranking

c) Generation schemes: Assign start and finish times to project activities and construct a schedule.



**Figure 1** The priority rule-based scheduling approach to construct a feasible for any project schedule.

### Brief Overview of Microsoft Project

Microsoft Project is the world's most popular project management software developed and sold by Microsoft. This MSP tool is designed to assist Project Managers/Coordinator in developing plans, assigning resources to tasks, tracking progress, managing budgets, and analyzing workloads. MSP tool creates critical path schedules, although a critical chain third-party add-ons is available from Prochain and Spherical Angle. Schedules can be resource levelled. The chain is visualized in a Gantt chart.

Resource definitions (people, equipment, and materials) can be shared between projects using a shared resource pool. Each resource can have its own calendar which defines what days and shifts a resource is available. Resource rates are used to calculate resource assignment costs which are rolled up and summarized the resource level. Each resource can be assigned to multiple tasks in multiple plans and each task can be assigned multiple resources. MSP schedules task work based on the resource availability as defined in the resource calendars. All resources can be defined in an enterprise resource pool.

MSP tool creates budgets based on assignment work and resource rates. As resources are assigned to tasks and assignment work estimated, MSP calculates the cost equals the work times the rate. This rolls up to the task level, then to any summary tasks and finally to the project level. Schedules can be resource leveled, and task networks are visualized in a Gantt chart. Additionally, Microsoft Project can identify divergent classes of the users. These different classes of users can have differing access levels to projects, views, and other data. Customization of aspects in Microsoft Project such as calendars, views, tables, filters, and fields are stored in an enterprise global which is accessible by all users.

## 2. Literature review

*Shubham Laddha et, al (2017)* have studied about the planning and scheduling of project by using Microsoft project software, he said that the rational method of planning

of construction project is uneconomical and takes more time with many complications and error at execution of project so using MS project tool help for optimum and effective organization of activities which helps to give the vision to complete the project in planned duration and within economy.

*Rhuta Joshi, this et, al (2016)* author studied about "Resource Scheduling of construction project", the type of resource was labor. Lack of labor power on site will increase the project duration. So, as the duration of project increase cost will also increase. Thus, the scheduling of resources reduces the unexpected loss of project which may occur due to differences in utility of resources.

*Rathod Rajshekhar Gopal (2016)* a case study planning, scheduling, and delay analysis, his paper states that if proper controlling is done while planning, scheduling, and execution of work the delay cost can be minimized. The experience or well skill team or employee can reduce or minimized the delay cost, but the delay cannot be avoidable because of bad weather, lack of labor power on site, approval, or any other reasons. So, by proper planning, construction leads to lesser or minimized extra cost of delay.

*Abhishek Sharma et, al (2015)* his paper states that manpower planning, scheduling, and tracking of construction project by MSP. Many projects suffer from time and cost overruns due to improper planning, scheduling, and completing works that results in numerous issues like delay in providing facilities, development, cutback in quality of construction and making the project more expensive. A little consideration shows that the time required to complete the project is inversely comparative to the supply of manpower. As the manpower is increased, the completion time of the project is decreased and on the other hand if the manpower is decreased, the completion time of the project is increased. A comparison between the baseline duration and cost to actual duration and cost of manpower of project is also determined using project management software tool Microsoft Project.

S Ragavi, et, al (2016) a review of project management software and primavera, according to study of author planning and scheduling helps in future situation and implementation of project. Primavera software provides user friendly options while performing any task. The cost of individual work break down can be known along with duration. Thus, decisions can be made sensible for proper management. In multiple projects resource leveling is very important to maintain proper resource allocation. For multiple projects is also an important standard for managing multiple projects. For resource constrained analysis resource leveling is arranged. Scheduling using Microsoft project software gives good controlling and clear schedule to a project, this project deals with scheduling using Microsoft project.

P.M. Wale et, al (June 2015) proposed the “planning and scheduling of construction project using msp”. Project not only need great deal and money, but it needs proper planning and execution. Author said that traditional method of scheduling is time consuming and tedious. So, the study proves 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 activities etc. Microsoft Project is the modern tool of Project Management that aid to overcome the obstacles faced project management system in station work project and the importance owing to traditional way of Planning and Management. It helps for the optimum and effective organization of activities which helps to give the vision to complete the project in planned duration and within the Economy.

Nikhil Mahajan et, al (January 2017), he states the study of resource scheduling in construction project by using MSP. Every work in need a proper planning, without planning we cannot achieve our goal. Scheduling of resources by traditional way is time consuming and costly. So, author highlighted the cost efficiency and time management at construction site by using this new technique of MSP.

### 3. Planning and Scheduling of Project

3.1 Scope of Project: Estimate for conducting detailed investigation preparation of hydraulic particulars, designs and engineering, preparation of estimates and excavation of

main canal, formation of banks including canal lining and construction of CM & CD works from Km 111.000 to Km 136.780 of LMC of Polavaram Irrigation Project package – 6 on EPC turnkey system – Entrustment of part of balance work to another agency under clause 60(C) of APDSS.

Table 1: A table containing value of work of all activities of the contract price at different stages of construction

Description of Work	Amount (Crores)	Bid %	Quantity (in m <sup>3</sup> )	Length/ No's
Earthwork Excavation	53.727	35.081	3993581	3455m
Canal Lining	10.611	6.929	38810	5728m
Structures	63.612	41.535	133100	50 No
Investigation, Design & drawing for Flumed Section	0.050	0.033	0	2000m
Retaining Wall	12.637	8.251	41068	2160m
Cut & Cover	11.494	7.505	17680	200m
Protection Works (Stone Pitching)	0.218	0.142	0	1800m
Additional Works	0.731	0.477	1551	355m
Maintenance	0.073	0.048	0	3455m
<b>Total</b>	<b>153.15</b>	<b>100%</b>		

3.2 Project Activities Details: In this project cumulative earthwork activity length consists of 3.455km out of 25.780km and the quantity of consists of 39,93,581 m3 and therefore, the detail partial length and quantity of earthwork activity is shown in table no 2 respectively. The cumulative canal lining length consists of 5.728km out of 25.780km and the quantity of consists of 38,810 m3 (excluding of retaining wall and cut & cover) and therefore, the detail partial length and quantity of canal lining activity is shown in table no 2 respectively. The total no. of structures yet to be construct in the project are 50 no’s (20 no’s of Super Passage, 14 no’s of Outlets, 6 no’s of Single Line Road Bridge, 4 no’s of Under Tunnel, 4 no’s Super Passage cum Single Line Road Bridge and 2 no’s of Cross regulator). The retaining wall, cut & cover and protection works are construction in flumed section region and therefore, the detail partial length and quantity of retaining wall, cut & cover and protection works activity is shown in table no 2 respectively.

Table 2: A table containing activities chainage details of part work of whole project.

S.No	Name of Location	As Per 60(C)		Earthwork Details		Lining Details		Structures @ Chainage						Retaining Wall Details		Cut & Cover Details		Remarks						
		From	To	Length (in m)	From	To	Length (in m)	Quantity in m <sup>3</sup>	From	To	Length (in m)	SP	OT	SLRB	UT	SP Cum SLRB	CR		From	To	Quantity in m <sup>3</sup>	From	To	Quantity in m <sup>3</sup>
1	Flumed section	111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	Protection Works (Stone Pitching) From KM 111.000 to 112.500
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	
		111.000	113.000	2000	111.000	113.000	2000	3038475	111.280	111.000	280	111.825	111.65	111.533	111.544	-	111.02	111.280	111.000	280	112.600	112.800	200	





TOTAL	26																		
25780	53m Bed Structure gap	136.000	136.780	780	136.650	136.150	-	-	-	-	-	-	-	-	-	-	-	-	-
3455																			
3887725																			
5728																			
20																			
14																			
6																			
4																			
4																			
4																			
2																			
2160																			
200																			
25780																			

### 3.3 Strip Chart

The detail status of project activities of Earthwork, Lining and Structures in shown in below figure.

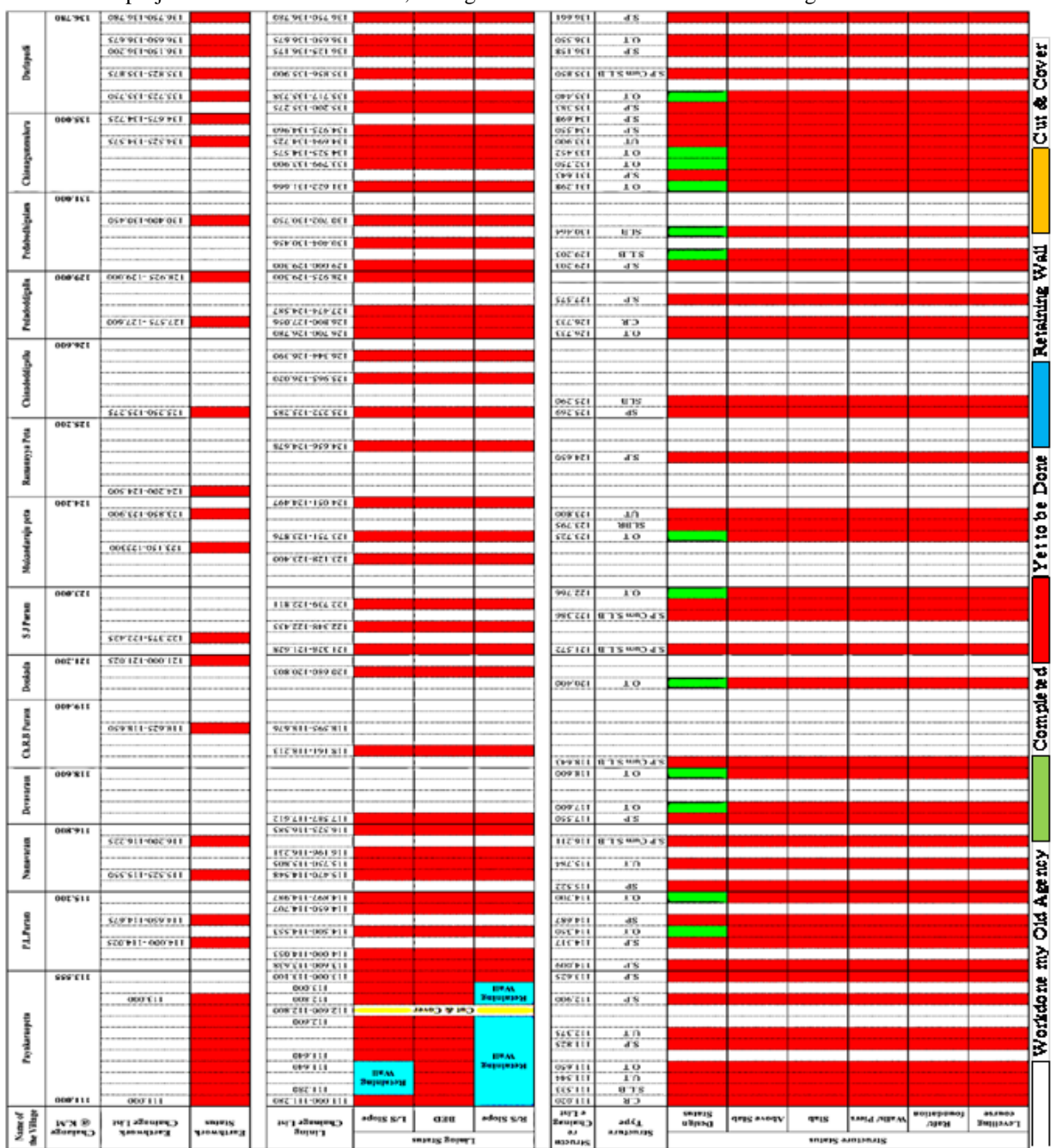


Figure 2: Strip Cart of Project

3.4 Project Milestone

site, machinery, manpower, etc., so in that case the 1<sup>st</sup> milestone of the project is scheduled in slow progress.

As per contract agreement the project work is divided into 4 milestone for every three months. For the establishment of

Table 3: A table containing Project Milestone

Milestone	Months	Item Description as per Milestone	Quantity per Milestone (in m <sup>3</sup> )	Length/ No. of Structures	Milestone Bid % as per Milestone
1 <sup>st</sup> Milestone (Working period of 3 months)	February-2019 to April-2019	Earthwork Excavation	1424141	1232	12.510%
		Canal Lining	6105	901	1.090%
		Structures	10648	4	3.323%
		<b>Sub-Total</b>			<b>16.923%</b>
2 <sup>nd</sup> Milestone (Working period of 3 months)	May-2019 to July-2019	Earthwork Excavation	1765662	1528	15.510%
		Canal Lining	11688	1725	2.087%
		Structures	39930	15	12.460%
		Retaining Wall	13689	720	2.750%
<b>Sub-Total</b>			<b>32.807%</b>		
3 <sup>rd</sup> Milestone (Working period of 3 months)	August-2019 to October-2019	Earthwork Excavation	803778	695	7.061%
		Canal Lining	12867	1899	2.297%
		Structures	39930	15	12.460%
		Retaining Wall	23576	1240	4.737%
		Protection Works (Stone Pitching)	-	1800	0.142%
<b>Sub-Total</b>			<b>26.697%</b>		
4 <sup>th</sup> Milestone (Working period of 3 months)	November-2019 to January-2019	Earthwork Excavation	0.000	0	0.000%
		Canal Lining	8151	1203	1.455%
		Structures	42592	16	13.291%
		Retaining Wall	3803	200	0.764%
		Cut & Cover	17680	200	7.505%
		Additional Works	1551	355	0.477%
<b>Sub-Total</b>			<b>23.492%</b>		
<b>Total</b>			<b>100%</b>		

4. Results and Discussion

**Scheduling with Gantt Chart:** Microsoft project software is work on the Gantt chart concept and its allows for a clear understanding of the work's progress in relation to the time schedule. Gantt charts are a special type of view that are used extensively in project management.

In this project the earthwork is schedule in 232 days (7 months, 20 days), canal lining is schedule in 335 days (10 months, 29 days), structures are schedule in 335 days (10 months, 29 days), retaining wall is schedule in 260 days (8 months, 15 days) and cut & cover is schedule in 76 days (2 months, 15 days). The whole is scheduled excluding protection works and additional works.

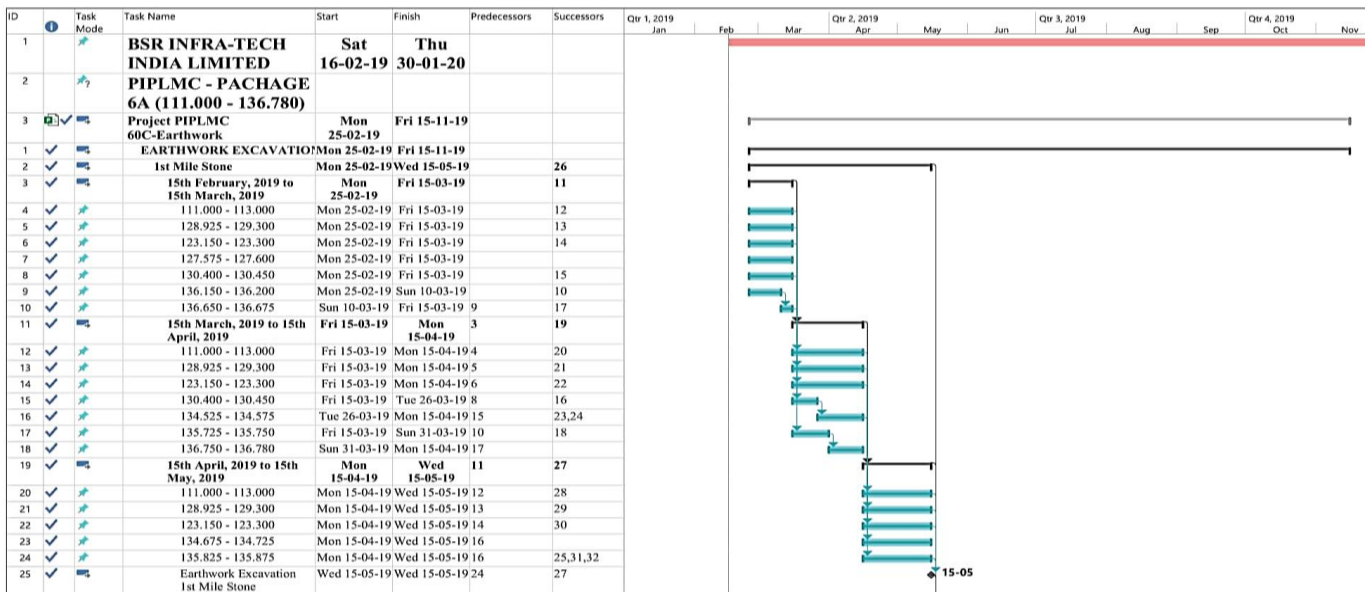


Figure 3.1: MSP Gantt Chart Screenshot (Conti 1.)







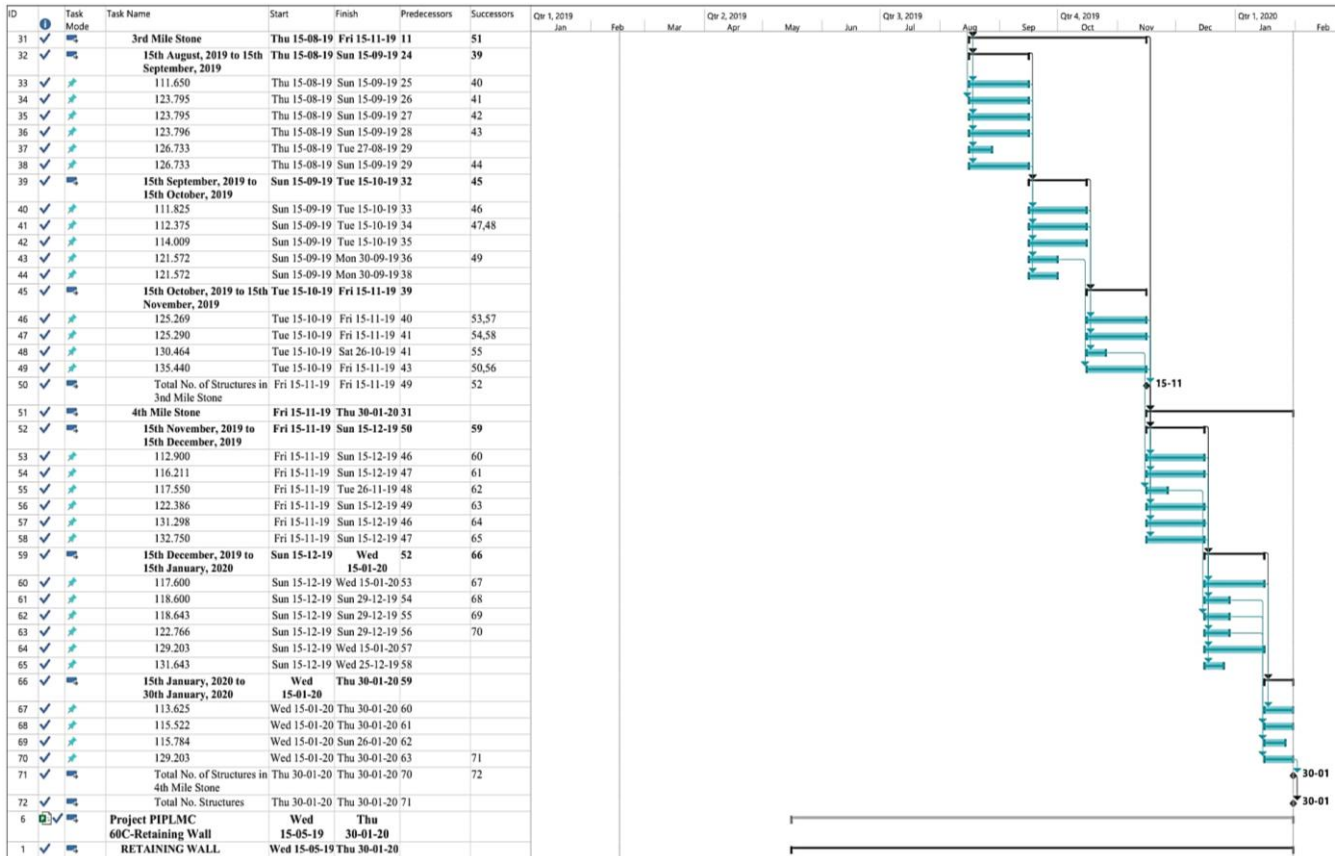


Figure 3.8: MSP Gantt Chart Screenshot (Conti 8.)

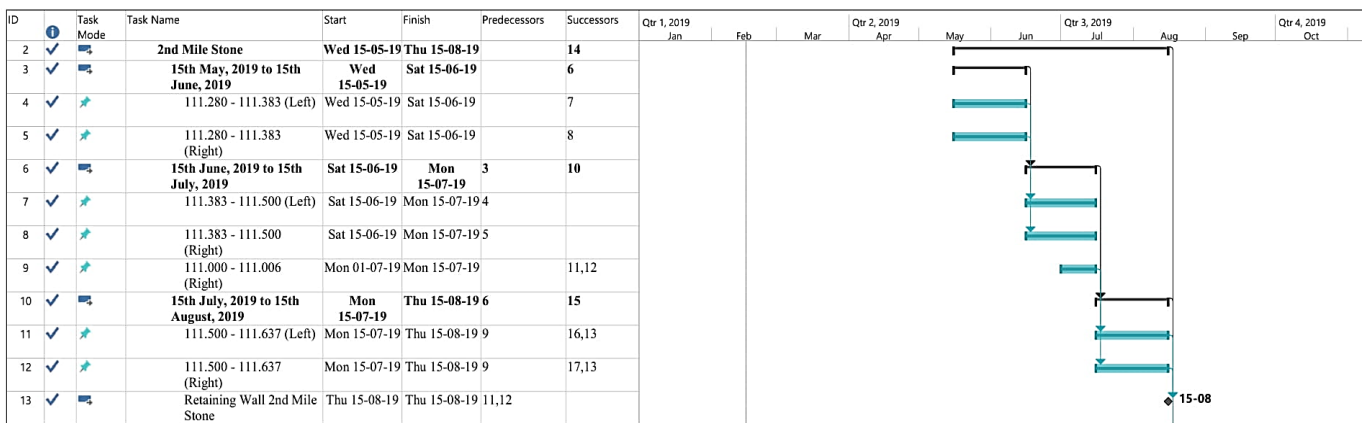


Figure 3.9: MSP Gantt Chart Screenshot (Conti 9.)

5. Conclusion

In this project of planning and scheduling selected the project of PIPLMC of package – 6A, site located near Tuni, Andhra Pradesh, India.

- Proper planning and scheduling are very important to ensure that the project should be completed within a given period duration. MSP helps for this project to optimum and effective organization of activities which helps to give the vision to complete the project in planned duration. In this project every activity is scheduled as per site and weather conditions by using priority rule-based scheduling method.
- In the table no. 1 statement showing that the project value of work is divided into activities of the contract price at different stages of construction and in the table no. 2

statement showing the project activities details and it is represented in strip chart figure no. 2 statement showing with detail chainage locations.

- Programmer for completion of work as per milestone is shown in table no. 3 and it will plan for monthly wise activities as shown in table no. 4 to complete of project in a project duration.
- The programmer for completion of work is scheduled by using priority rule-based scheduling method in MS project 2016 and the result shown in MSP Gantt Chart figure no. 3 screenshots. The time calculated for the construction of PIPLMC of package – 6A with the help of MSP is 350 days (11 months, 15 days).
- Activities that may cause delays to the project were identified and rescheduled appropriately. The traditional way of construction shows more time with several

complications and large errors that actual project execution.

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