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Delay Analysis of Highway Construction Using Primavera

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ABSTRACT

Delay in construction industry is a global phenomenon, especially in highway projects and there is no exception. It is widely accepted that a project is successful when it is finished on time and cost. Regrettably, large number of construction projects fails to follow the planned schedule due to many reasons and hence delayed. In any construction project, scheduling and delay analysis becomes an imperative in order to minimize delays. The application of construction schedule to predict the project completion time. Delay in completion of project can increase the price of the project. Project Management is the main key role in the construction industry. Small projects will be managed with efficiency manually; whereas massive projects aren't therefore massive projects will be better handled by the utilization of computers. Many varieties of software package are offered with the assistance of that project management will be done simply. In highway construction, entirely different resources are needed for execution and also the risk is additional during this form of projects. So, proper planning and scheduling are needed in massive projects to ensure that a construction project is completed on time and within budget. In our project an attempt is created in scheduling and delay analysis of varied activities concerned in highway construction in Thanjavur district, Tamilnadu by using primavera software. The length of the highway is 47.835 Kms. Four lane configuration of flexible pavement including construction of culverts, minor bridges, major bridges, Flyover, VUPs, PUPs etc., and its scheduled to 730 days. The primary goal of construction unit is to complete the work as specific on schedule with correct utilization of all the resources like manpower, materials, cash and machinery. To achieve the above goal is to execute the project most economically better in terms of money and time. The main objective of this study is to analyse the delays in construction of highway and also control the time and cost of the project.

Keyword: Delay analysis, Highway Construction, Primavera, Time and Cost

I. INTRODUCTION

1.1 General

The word "yield" refers to something that occurs sooner rather than later, either before or after the date that the parties decided would serve as the vehicle for an endeavor. The term "delay" refers to the ongoing interruption of work that can cause time to extend beyond the agreed-upon "arrangement date" or "delivery date." Deferrals are isolated into four classes: deferrals that are not compensable, sensible deferrals that are not compensable, conceivable deferrals that are compensable and synchronous deferrals.

In a construction project, delays can be a major problem for all parties involved, including clients, specialists, and temporary workers. Numerous unsettling effects may occur as a result of the deferrals. To decrease this issue from occurring, site the board should be made carefully. Our project took off because of other problems that arise in the same area as delays in development. There are a variety of approaches that can be observed by all parties to prevent unpleasant events. Delays are the level of need because they are developed projects.

II. OBJECTIVES OF THE STUDY

The main objective of this project is to analyse the delays in a construction project by detailed literature study, site activities, and observations made were as follows.

1. Detailed literature study to define the various reasons of delay in construction projects.
2. Study on ongoing Project site to observe the activities and to identify delay factors.
3. Determination of Critical Path using Primavera.
4. The analysis also involves the process of scheduling and tracking of a construction project activity in software and related catch up programs due to delays.

III. LITERATURE SURVEY

MuraliSambasivan and Yau wen soon (2007) attempted to separate the impact of specific causes and effects of undertaking delays using an organized procedure in their 2007 study, "Causes and effect of delay in Malaysian construction industry." They drove an especially organized review with clients, trained professionals, and enlist workers to recognize the fundamental drivers and effects of progress project concedes in Malaysia. In addition, they identified the ten most significant causes of delays and the six most significant effects of delays, and they established a test connection between them.

Abd El-Razek. et al (2008) in their research entitled “Causes of delay in Building construction Projects in Egypt, a questionnaire survey conducted and identified most important causes of delay in construction project. They concluded that owners and contractor’s parties do not agree on the relative importance of various factors of delay, mostly blaming each other of delays using importance index and spearman rank correlation. Survey results suggested that joint team effort is required to reduce delay.

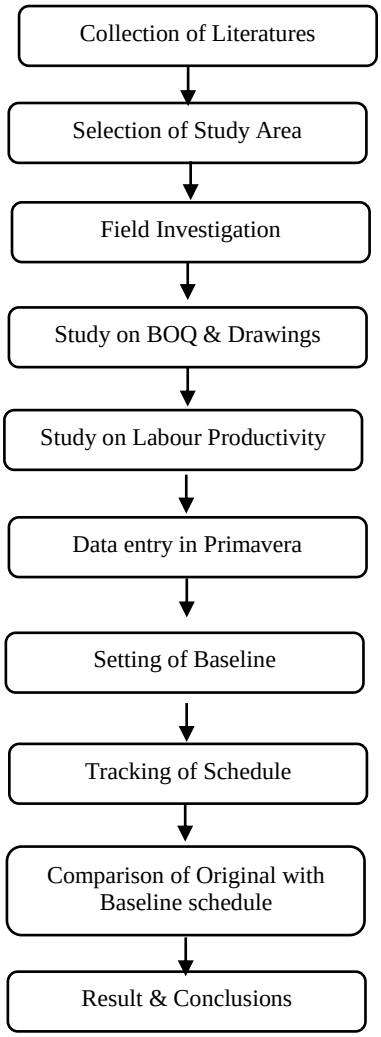
B. Indhu, P. Ajai (May 2014) identified the primary factors that prompted difficulty and the effect of concession on the project's duration in the circumstance study "Examination of defer the chiefs in an improvement project - A context-oriented examination," which was published in May 2014. Mishaps can be caused by a number of factors, including the

environment, a lack of a really helpful supply of financial plans and resources, connections between project workers and clients, and changes to the arrangement and drawing.

Keval J. Shah, Prof. M. R. Apte (2015) led regular site visits in a continuous platform upholds improvement project for the circumstance study titled "Purposes behind Postpone Being developed of Expansion Supports." For each activity in the development of an expansion support, they gathered data from the website and compared it to its organized range and real term. identified the major causes of delay and their effects on the duration of the project.

SreeLekshmi A, VishnUnnikrishan (June 2018) in research paper entitled "Planning and delay analysis of a residential complex : A case study" studied the planning, scheduling and tracking of an ongoing multi-storeyed residential building construction project. Schedule prepared by the consultants was studied explicitly and the data was entered into Project management software – Primavera P6 to create the schedule and new scheduling was done at a micro level by taking inputs from the contractor and considering actual productivity of labours and availability of resources.

IV. METHODOLOGY



V. ABOUT THE STUDY

Case study on, Fourlaning of Cholapuram – Thanjavursection of NH-45C highway construction project length is 47.835 kms. including 184 nos. structure works in the state of Tamilnadu.

Construction Period : 24 Months
Project Started : 06/09/2018
Client : NHAI
Location : Thanjavur

4.1 Project Specification

a) Roads(Flexible Pavement Crust)
Sub grade 500 mm thick
Cement Treated Sub base 200 mm thick
Wet Mix Macadam 150 mm thick
Dense Bituminous Macadam 50 mm thick
Bituminous Concrete 40 mm thick

b) Structures
Reinforced Concrete Structure

c) Concrete
M15 grade – Levelling course / P.C.C. below Foundations and approach slabs
M20 grade – Carriage waykerb
M30 grade – Approach slabs
M35 grade - Foundations, Piles, Pile caps, Abutments, Piers, Pier caps, Dirt Wall and Bracket.
M40 grade –Crash Barriers, Centre Median and RE wall panels.
M50 grade – PSC Girders.

d) Steel
High Yield Strength Deformed Bars Fe-500D

e) Prestressing
Post Tensioning with High Tensile Steel Wires/Strands

f) Expansion joint
40mm Strip Seal expansion joint system.

g) Bearings
Elastomeric Bearings
POT/PTEF bearings

VI.PROJECT PLANNING

A crucial and important step in completing any improvement project is organizing a task. Parts of arranging include posting projects or tasks as part of a project, stockpiling work, and requiring materials, equipment, and money to complete the tasks. Additionally, the organizing procedure is used to conduct the cost analysis.

A good planning process helps with planning, preparing, and scheduling the work. An essential goal of a project plan is to determine the various tasks required to complete a project and the appropriate amount of time required to complete each one, taking into account its relationship to subsequent tasks.

Creating a comprehensive plan is essential for any task. Real legitimization, time estimation, and booking are all kept in mind during project planning. The chief, representatives for enlistment, field planners, project chiefs, and assessment divisions will serve as sources of data for a sorting cycle. Proper preparation makes it simpler to provide sufficient resources and time to complete the tasks. These terms are associated with a strategy:

a. Budget
b. Estimate
c. Time schedule
d. Sequence of completion of each part of work
e. Cash flow budget
f. Manpower planning
g. Equipment and material planning.

5.1 Steps involved in Project Planning

A project planning involves following steps:

a. Define the scope of work
b. Preparing list of activities to be performed
c. Preparing network diagram or a logic to establish relationship among different activities
d. Analyzing the network diagram to work out project period, vital and noncritical activities during a project
e. Determine the critical path with the assistance of critical activities Establish standards for the resources (material, men, machinery and money)
f. Resources allocation
g. Forecasting budget allocation to achieve the target
h. Organization of project information
i. Recording the status report of every activity
j. Comparing the recorded report with the original plan

5.2 About Primavera

Primavera is a leadership portfolio the board (PPM) software. It consolidates project the board, booking, asset pioneers, and chance appraisal, notwithstanding different things. Additionally, it helps with project scheduling, control, and due dates. At the end of the day, a device helps you create a plan that adjusts activities and resources (such as materials, work, equipment, money, and time). In addition, it facilitates the development of reports like the Resources Histogram, Monthly Monetary Arrangement, and Overall Monetary Arrangement as well as the presentation of a secured worth assessment (when the project is in the process of being completed).

VII.CONSTRUCTION DELAY

This is especially evident on an improvement project: Time is money. When construction projects don't finish on time, both the available representative and the owner suffer because they can't start their new business on time, which means they don't get the benefits they

expected. The employed worker endures due to rising expenses and compensation, which reduces benefits. Tasks must adhere to their fundamental plans in this direction. Interestingly, delays on huge development projects are common due to their difficulty and large number of members. To avoid delays, everyone should take an interest no matter what. In a similar vein, when a project is completed, the first question that must be answered is who, if anyone, is responsible for the deferred costs. Typically, this will only be determined by the particulars of the task and the board arrangement.

1.1 Delay Analysis Results

The following reasons were determined throughout this project work, which may be control accountable for delays,

- Physical possession of the Project site/Land acquisition.
- Issuance of NOC by PWD/WRO, Govt. of Tamil Nadu.
- Shifting of High Voltage Transmission Line.
- Shifting of Water Supply Pipe Line.
- Unforeseen underground utilities shifting/diversion delay.
- Sudden Cyclone "GAJA" & Monsoon rain caused delay in project progress.
- Granting Permission for Extracting Soil from Borrow area.
- Corona Pandemic "COVID-19"

From this project study, the causes of the delay reasons can be listed as below table 1

Table: 1 Reasons for delay in our project

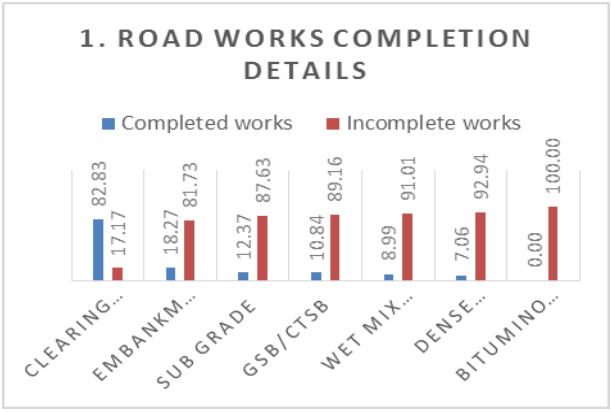
S.No.	Reason for delay	Delay in days
1	Physical Possession of the Project site/Land Acquisition	86
2	Issuance of NOC by PWD/WRO, Govt. of Tamil Nadu	51
3	Shifting of High Voltage Transmission Line	33
4	Shifting of Water Supply Pipe Line	39
5	Cyclone "GAJA" & Rain	26
6	Granting Permission for Extracting Soil from Borrow area	94
7	Corona Pandemic "COVID-19"	35
	Total	364

Work Completion Details as on Date:

1. Road Works as on Date

S.No.	Item of Works	% Complete	% Incomplete
1	Clearing & Grubbing	82.83	17.17
2	Embankment	18.27	81.73
3	Sub grade	12.37	87.63
4	Cement Treated Sub base	10.84	89.16
5	Wet Mix Macadam	8.99	91.01
6	Dense Bituminous Macadam	7.06	92.94
7	Bituminous Concrete	0.00	100.00

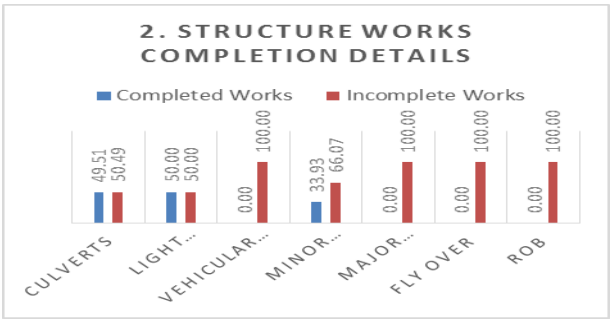
Table: 2 Road Work Completion Details



2. Structure Works as on Date

S.No.	Item of Works	% Complete	% Incomplete
1	Culverts	49.51	50.49
2	PUPs	50.00	50.00
3	VUPs	00.00	100.00
4	Minor Bridges	33.93	66.07
5	Major Bridges	00.00	100.00
6	Fly Over	00.00	100.00
7	ROB	00.00	100.00

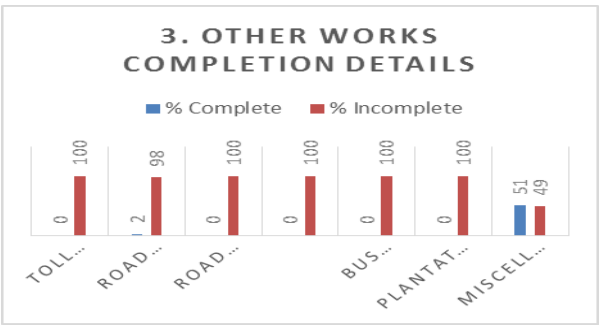
Table: 3 Structure Work Completion Details



3. Other Works as on Date

S.No.	Item of Works	% Complete	% Incomplete
1	Toll Plaza	00.00	100.00
2	Road Side Drains	1.57	98.43
3	Road Signs, Markings, Km Stones	00.00	100.00
4	Crash Barrier	00.00	100.00
5	Bus Bays Rest Areas	00.00	100.00
6	Plantations -Road Side	00.00	100.00
7	Misc. work	51.00	49.00

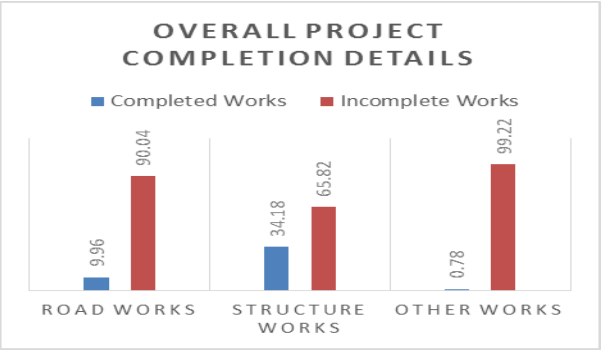
Table: 4 Other Work Completion Details



4. Overall Project Status as on Date

S.No.	Item of Works	% Complete	% Incomplete
1	Road	9.96	90.04
2	Structure	34.18	65.82
3	Other	0.78	99.22

Table: 5 Overall Work Completion Details



VIII. CONCLUSION

While finishing any task, Primavera Programming gives choices that are not difficult to understand. Despite the term, the cost of individual work separate can be known. Based on our investigation, it may have completed the development that began in September 2018. The project will take 730 days to complete in accordance with the standard schedule. The overall completion rate was 20.00% as of April 2020, with roadwork completing at 9.96%, development work completing at 34.18%, and other works completing at 0.78%.

The reasons for my task's postponement have been identified by direct visit, and I anticipate the anticipated completion date. The most important sources of concessions in our street project are consent to separate soil from the wheelbarrow district, actual responsibility for the acquisition of the task site and land, and the issuance of a NOC by the government and PWD/WRO. of Tamil Nadu, including the Moving of Utilities, the Cyclone "GAJA" or "Deluge," and the Covid Crown Pandemic.

The venture specialist has provided a revised development plan and mentioned a 364-day extension of the cutoff time in accordance with the terms of the agreement. There is no connection between the supported base Schedule and the reconsidered improvement plan.

IX. RECOMMENDATIONSFOR FUTURE STUDY

In this research, we have studied causes of delay in highway construction and claim for time extension have only been considered. It is recommended to further study and analyse the cost of delay in this project.

X. ACKNOWLEDGEMENT

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