Delay Recovery Analysis at ROB

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Abstract- *The case study considered here is a railway over bridge project at Akurdi, Pune. The site is lagging behind by 8 months according to the monthly progress report worked out by the contractor. Analysis has been done keeping in mind the equipments and manpower resources available at site. Cost estimates have been carried out for structural components remaining for completion of project. Also the quality control tests have been considered. Scheduling is done according the availability of resources in order to save time. 2 plans have been suggested in this paper for achieving delay recovery. Delay is quite comman hindrance in construction industry and also frequently expensive. There are many times loans involved, operating cost, inflation in wages and also material prices which affect the overall cost of the project.*

Keywords- Equipment management, manpower management, estimation, scheduling, quality.

I. INTRODUCTION

"Time is money" is the basic saying underlying disputes regarding delays to construction sites. A site that has experienced a delay in its expected completion date, whatever maybe the cause, incurs added costs as the end result. A significant part of the costs of the management and support of an ongoing construction site are directly tied to the overall duration of the construction work. The longer the work goes on, the higher the costs increases.

Whether studied from the point of the owner or the contractor, construction schedules serve many important purposes. Firstly, the schedule is the vehicle for planning, formulating and sequencing the work. Secondly, the schedule may protect any of the party from liability for delay costs. Thirdly, the schedule or timetable may allow any of the party to establish that it was delayed by another party or that another party was the cause of a claimed delay. To serve all these purposes, schedules or timetables should be constantly monitored and updated accordingly.

Contractors generally use finish date, bar charts and percentage of updated schedules to track progress, coordinate with the subcontractors and monitor the delays occurring. Owners need much more specific scheduling techniques such as Critical Path Method, Program Evaluation and Review Technique.

All the parties which take part in the construction activity like owners, contractors, subcontractors and suppliers have keen interest in on-time performance and also on-time payment. Construction projects consist of high cost equipments, huge overhead costs, significant manpower and large payrolls for owners as well as contractors. Due to the high costs of delayed performance, contractors and owners mostly require well planned schedules.

II. LITERATURE REVIEW

Disasters can be based on various reasons such as natural, technical etc. and question the risk estimation and analysis methods that had been planned at the start of project. A study aims to form a generic model that includes principles and processes, which can recover a construction project after a disaster. The results of this analysis are used for the formulation of the proposed model. The efficiency of the formulated model for a wide amount of projects was tested via a survey.

Techniques used for investigation of delay are called as 'delay analysis methods'. Process control of construction sites usually relies on CPM programming which works on the network modelling technique. Using mathematics as a formal language to explain delay analysis methods should make to reduce the degree of vagueness of delay analysis methods and so the possibility of argument occurrence. It aims to formalising delay analysis methods commonly applied in practice by using the mathematics as language.

Another study explores the causes of delay in construction projects in Ernakulam, Kerala and determines the most important factors affecting construction project. Analysis of survey was done using SPSS software. Various case studies have been conducted in the locality as an approval for the results obtained in the survey. The factors from case study showed maximum similarity with the survey result. Implementation of a six dimensional ERP system is suggested as the most efficient remedy to control delay where this statement is supported with the comparison on a normal project and ERP implemented project.

The reduction of delays was stated by application of knowledge management and project learning. The feedback gives important information related to the reduction measures considered for application. The prevention of delay can be worked out by reduction and/or acceleration. It is important to plan and formulate the requirements in detail.

III. SITE DETAILS

The work site is a railway over bridge project connecting the two main areas i.e. Bhakti Shakti and Ravet. It comprises of in total 31 piers, its cost estimated as around seventy seven crores. For this project, PCMC is the client. The contractor chosen is B G Shirke Construction Technology Pvt Ltd whereas STUP Consultants as consultant. The site is lagging behind by eight months. The main reason for delay is land acquisition issue. According to the tender, project must be completed till 22nd August 2018.

IV. METHODOLOGY

The main concern regarding recovering the delay is on managing the equipments and manpower effectively in order to save time and also control cost. Also the quality control tests need to be kept in mind so that no compromise with quality takes place. Two plans can be thought of for working out the recovery on site. First plan will mainly consist of utilizing the on site available resources by simultaneous scheduling and working in double shifts. Second plan shall be of including new equipments on site and extra manpower.

V. DATA AND DATA ANALYSIS

According to the monthly progress report of February, the work remaining is formulated in the table below:

TABLE NO. 1

Work remaining

Sr no	Task	Units	Duration per unit
1	Foundation	4	20 days
2	Pier	7	20 days
3	Pier caps	7	13 days
4	Span	22	72 days
5	Painting work		150 days
6	Electrification work		60 days
7	Plantation work		60 days
8	Bituminous concrete		80 days
9	Expansion joints		80 days
10	Pavement marking and signage		40 days

The manpower details available on site are as follows:

TABLE NO. 2

Manpower details

Sr no	Particulars	Units
1	Labours	36
2	Carpenters	32
3	Fitters	38
4	Masons	5

The equipments needed for the completion of foundation, substructure and superstructure are as follows:

TABLE NO. 3

Equipment details

Sr no	Particulars	Units
1	Excavator	3
2	Dumper	2
3	Hydra	3
4	Concrete pump	2
5	Transit mixer	4

The cost estimation calculated according to the labour rate given in tender and also considering equipments' operating cost are stated in the table below:

TABLE NO. 4

Total cost including manpower and equipments

Sr	Part	Cost	Total cost
1	Foundation	1999890/-	
		26660/-	
		640412.80/-	
			2666962.80/-
2	Pier	663360/-	
		1894895/-	
		413872.48/-	
			2972127.48/-
3	Pier cap	194134.50/-	
		332352.16/-	
			526486.66/-
4	span	496809/-	
		357851.50/-	
		4080375/-	
		758250/-	
		481050/-	
		489210/-	
		725492.25/-	
		940326/-	
		727040/-	

		455940/-	
		508905/-	
		390894.75/-	
		7870453.36/-	
			18282596.86/-
	Total		24448173.80/-

The quality control tests performed on site are stated below:

1] embankment and subgrade
2] gsb (grading 1:coarse, grading 2:close)
3] wmm
4] bbm
5] prime coat
6] bm
7] dbm
8] bc
9] coarse & fine aggregate
10] concrete
11] water
12] bitumen
13] cement
14] ht strand
15] pot bearing
16] hdpe duct
17] steel
18] fly ash
19] admixture
20] re wall back filling material
21] rcc hume pipe
22] cable grout
23] bearing grout
24]expansion joint
25] filter media
26] geotextile
27] geostrap
28] coal tar
29] anticarbonation

The scheduling according to plan A will require 84 days for completing 4 foundations, 7 piers and 7 pier caps. The total number of days required for completing one single span in double shifts will require 44 days. According the availability of manpower and equipments, 2 spans can be carried out simultaneously. So the total number of days required for completion of spans is 484 days.

According to the schedule given, the duration of remaining activities can be reduced to half by continuing the work in 2 shifts.

It can be tabulated as follows:

TABLE NO. 5
Duration scheduled

Sr no	particulars	Duration given	Duration scheduled
1	Foundation	80 days	84 days
2	Piers	140 days	
3	Pier caps	91 days	
4	Spans	1548 days	484 days
5	Painting work	150 days	75 days
6	Electrification	60 days	30 days
7	Plantation	60 days	30 days
8	Bituminous concrete	80 days	40 days
9	Expansion joints	80 days	40 days
10	Pavement marking and signages	40 days	20 days

The cost estimate stated above will not change as the contract being lump sum contract, the rates are decided according the measurement of work done.

VI. RESULTS AND CONCLUSIONS

After comparing the results of both plans' cost estimates and also considering the time saved, profitable plan can be used.

Parameters	**Plan A**	**Plan B**
Cost	Rs 2,42,48,678.80/-	Rs 3,51,06,274.60/-
Quality	Same tests to be performed	Same tests to be performed
Time	847 days	421 days
2365 days total	64.18% time saved	82.19% time saved
		Cost decreases by 20.88% than plan A
Duration	1 March 2018 to 17 August 2020	1 March 2018 to 24 May 2019

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