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Performance Evaluation of Kollam Bypass Road Construction Kavanad to Kallumthazham Stretch

Dr. Sudhi Mary Kurian
Professor
Civil Engineering dept.
TKMCE

Anjali Surendran
PG Student
Civil Engineering dep
TKMCE

***Abstract*: Performance evaluation of Kollam bypass road construction is done by using primavera p6 software and survey and questionnaire method. Bypass road under construction in the NH 66, 13.141 km long bypass starts at kavanad in the north to mevaram in the south via Aravila, Kadavur, Kallumthazham and Ayathil. Constructions of three bridges are going on – a 900 m one at kandachira, 600 m one at Aravila and a 100 m one at Kadavur. The importance of kollam bypass is, it will touch 3 major National Highways , NH 66(Panvel to Kanyakumari), NH 183(Kollam to Dindigul) and NH 744(Kollam to Madurai) passing through the state of Kerala. Firstly collect the required information from PWD and then schedule the project by using primavera and do the performance evaluation by survey and questionnaire method. The performance evaluation includes whether the project is on schedule or behind the schedule or ahead of schedule and also the project is on budget or under budget or over budget.**

I. INTRODUCTION

Construction planning is a fundamental and challenging activity in the management and implementation of construction projects. A good construction plan is the base for developing the construction activities, schedule and the budget for projects. The necessary aspects of construction planning include the generation of required construction activities and the choice among various alternatives for performing the activities. Schedule gives an overview of expected progress of the project. Without schedule, it is very difficult to explain to someone who is unfamiliar with the project what is going on and what is expected to take place. Primavera is a project planning software used for getting a perfect planning schedule. Construction of three bridges is going on of spans 620 m at Kandachira, 95 m at Aravila and of 826 m at Kadavur. Construction of road pavement and 3 bridges are taken for study and performance evaluation is done in terms of schedule and cost by using primavera software and direct interview with the concerned authority of the project.

Construction of "Project Highway" is 13 km in length which includes

- Widening of existing alignment 4.5 km length
- New alignment with paved shoulders of 4.58 km length
- Three bridges of 1.54 km length
- New alignment with RE (Reinforced Earth) wall of 2.37 km length

II. OBJECTIVES

The main objectives are,

- To identify the construction sequence for bridge and road construction
- To work out the practical duration required to carry out the activities
- To develop schedule using primavera project planners software
- To evaluate the project by direct interview method and analyze the reason for delays and variations in estimated budget
- To suggest suitable measures for improvement

III. METHODOLOGY

1. Site investigation
2. Collect the required information from authorities
3. Schedule the project by using primavera
4. Updating the schedule
5. Performance evaluation in terms of schedule and cost by Direct interview method
6. Suggest suitable measures for improvement

IV. SCHEDULE USING PRIMAVERA

a. Creating OBS**:** The organizational breakdown structure (OBS) is a global hierarchy that represents the managers responsible for the projects under construction. Organizational Breakdown Structure for the bypass project is constructed with the organizers in their hierarchical order such as CEO, engineer, assistant engineer, quantity surveyor and site supervisor.

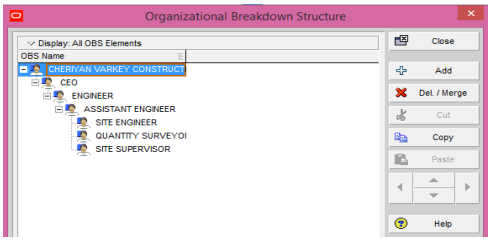

Fig. 1 Organizational Breakdown Structure

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b. Creating EPS**:** Projects are arranged in a hierarchy. Enterprise project structure is created by spliting the project into three stretches such as Kavanad to Kallumthazham , Kallumthazham to Ayathil and Ayathil to Mevaram.

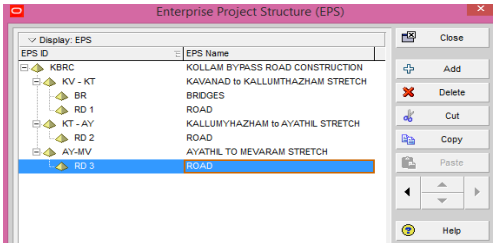

Fig. 2 Enterprise Project Structure

c. Define the selected area for study: Kavanad to Kallumthazham stretch is taken. In that stretch, performance evaluation of three bridges and road is done . Therefore these three bridges and road are created as different projects in primavera.

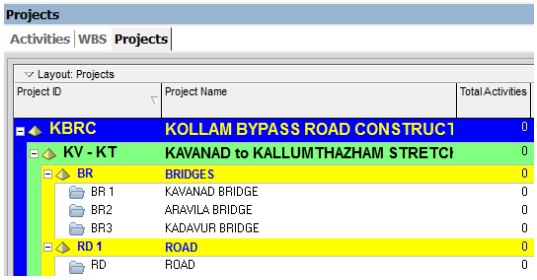

Fig. 3 Project selected for study

d. Creating WBS for each project

This is systematic means of defining the activities so that each activity can be readily identify by its WBS number. The WBS numbers build intelligence into the activity ID number. The numbering system is typically unique for a company or project. First three bridge projects are broken down into substructure and superstructure.

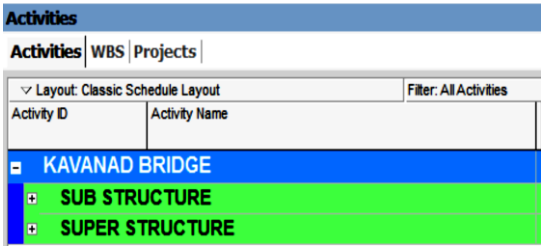

Fig. 4 WBS for Kavanad bridge (project 1)

e. Scheduling and Cost estimation: Scheduling is done with the practical durations and quantities for each activity. Cost estimation is done with the CPWD schedule of rates and the quantities calculated for each activity.

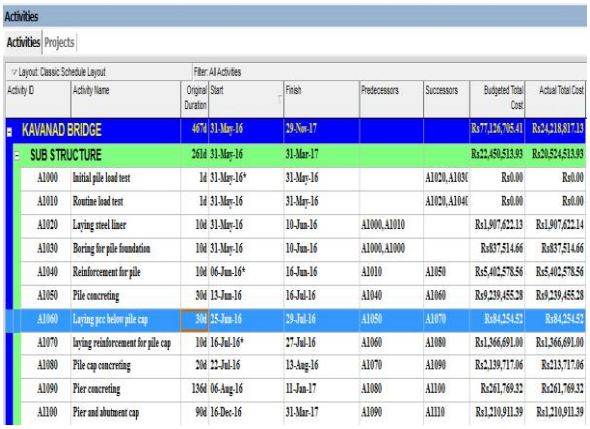

Fig. 5 Scheduling details screen shot for substructure for project 1

SUPER STRUCTURE	256d	02-Feb-17	29-Nov-17			Rs54,676,191.48	Rs5,694,303.20
A1110	Precast girder	90d	02-Feb-17	18-May-17	A1100	A1150, A1120	Rs5,084,520.00	Rs0.00
A1130	Casting and laying of deck slab	217d	21-Feb-17	02-Nov-17	A1110, A1120	A1150, A1160	Rs5,126,207.48	Rs0.00
A1120	Precast girder for navigation span	70d	01-Mar-17	22-May-17	A1110	A1150	Rs1,938,800.00	Rs0.00
A1140	RCC crash barrier	80d	16-Aug-17*	16-Nov-17	A1110		Rs25,196,248.80	Rs0.00
A1150	Expansion joint	40d	20-Sep-17*	04-Nov-17	A1130		Rs108,000.00	Rs0.00
A1160	Bituminous wearing coat	14d	18-Oct-17*	02-Nov-17	A1150		Rs13,089,408.00	Rs0.00
A1170	Excavation for approach slab	5d	02-Nov-17	04-Nov-17	A1130	A1180	Rs254,184.00	Rs0.00
A1180	PCC for approach slab	10d	06-Nov-17	16-Nov-17	A1170	A1190	Rs58,320.00	Rs0.00
A1190	RCC for approach slab	10d	13-Nov-17	23-Nov-17	A1180	A1200	Rs145,800.00	Rs0.00
A1200	Protective coating	5d	24-Nov-17	29-Nov-17	A1190		Rs5,694,303.20	Rs5,694,303.20

Fig. 6 Scheduling details screen shot for superstructure for project 1

f. Plot the Gantt chart for all projects: Graphically show the progress of a project. Gantt charts are plotted for each project from their schedule using primavera. Activities shown in red colour indicate the critical activity of the project.

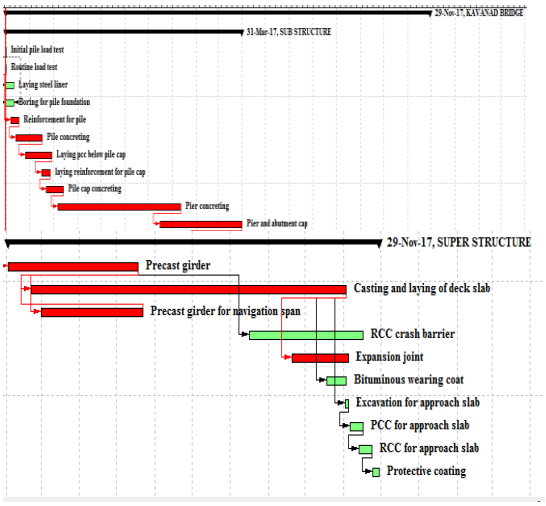

Fig. 7 Gantt chart screen shot for project 1

V. PERFORMANCE EVALUATION

Performance evaluation of the project can be done by updating the project. Updating shows that whether an activity is completed or in progress or not started. By direct interview method, interview is conducted with the project manager and site engineer and the activity status is obtained. Thus the schedule gets updated and Gantt charts are plotted.

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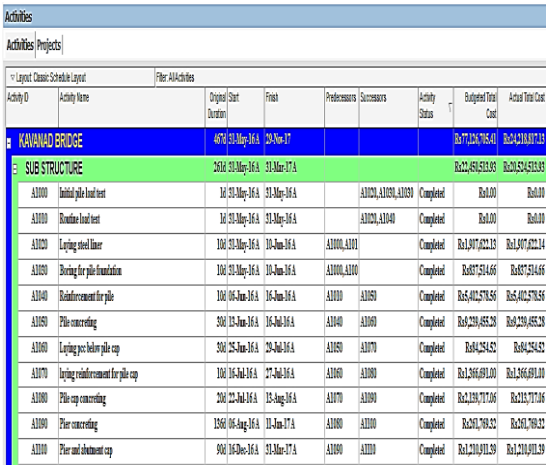

Activity ID	Activity Name	Original Duration	Start	Finish	Predecessors	Successors	Activity Status	Budgeted Total Cost	Actual Total Cost
KAVANAD BRIDGE		467d	01-May-16 A	29-Nov-17				Rs77,126,705.41	Rs50,218,807.13
SUB STRUCTURE		265d	01-May-16 A	31-Mar-17 A				Rs22,454,513.93	Rs20,524,513.93
A1000	Initial pile load test	1d	01-May-16 A	31-May-16 A		A1020, A1030, A1050	Completed	Rs0.00	Rs0.00
A1010	Routine load test	1d	01-May-16 A	31-May-16 A		A1020, A1040	Completed	Rs0.00	Rs0.00
A1020	Laying steel liner	10d	01-May-16 A	10-Jun-16 A	A1000, A1010		Completed	Rs1,907,022.13	Rs1,907,022.14
A1030	Boring for pile foundation	10d	01-May-16 A	10-Jun-16 A	A1000, A1010		Completed	Rs837,534.66	Rs837,534.66
A1040	Reinforcement for pile	10d	06-Jun-16 A	16-Jun-16 A	A1010	A1050	Completed	Rs5,402,578.56	Rs5,402,578.56
A1050	Pile concreting	50d	13-Jun-16 A	16-Jul-16 A	A1040	A1060	Completed	Rs9,259,455.28	Rs9,259,455.28
A1060	Laying pcc below pile cap	50d	25-Jun-16 A	29-Jul-16 A	A1050	A1070	Completed	Rs842,542.52	Rs842,542.52
A1070	laying reinforcement for pile cap	10d	16-Jul-16 A	27-Jul-16 A	A1060	A1080	Completed	Rs1,566,693.00	Rs1,566,693.00
A1080	Pile cap concreting	20d	22-Jul-16 A	13-Aug-16 A	A1070	A1090	Completed	Rs2,230,717.06	Rs2,213,717.06
A1090	Pier concreting	156d	08-Aug-16 A	13-Jun-17 A	A1080	A1100	Completed	Rs263,769.52	Rs263,769.52
A1100	Pier and abutment cap	90d	16-Dec-16 A	31-Mar-17 A	A1090	A1110	Completed	Rs1,210,931.29	Rs1,210,931.29

Fig. 8 Updated schedule screen shot for substructure for project 1

SUPER STRUCTURE		568d	02-Feb-17 A	28-Nov-17				Rs54,671,101.48	Rs5,094,305.20
A1110	Precast girder	90d	02-Feb-17 A	18-May-17	A1100	A1120, A1130, A1140	In Progress	Rs5,094,820.00	Rs0.00
A1120	Precast girder for navigation span	70d	01-Mar-17 A	22-May-17	A1110	A1130	In Progress	Rs1,918,800.00	Rs0.00
A1130	Casting and laying of deck slab	217d	21-Feb-17 A	02-Nov-17	A1110, A1120	A1150, A1160, A1170	In Progress	Rs5,126,307.48	Rs0.00
A1140	RCC crash barrier	80d	16-Aug-17*	16-Nov-17	A1110		Not Started	Rs52,186,240.00	Rs0.00
A1150	Expansion joint	40d	20-Sep-17*	14-Nov-17	A1130		Not Started	Rs198,000.00	Rs0.00
A1160	Bituminous wearing coat	14d	18-Oct-17*	02-Nov-17	A1130		Not Started	Rs13,088,400.00	Rs0.00
A1170	Excavation for approach slab	5d	02-Nov-17	06-Nov-17	A1130	A1180	Not Started	Rs254,304.00	Rs0.00
A1180	PCC for approach slab	10d	06-Nov-17	16-Nov-17	A1170	A1190	Not Started	Rs98,820.00	Rs0.00
A1190	RCC for approach slab	10d	15-Nov-17	25-Nov-17	A1180	A1200	Not Started	Rs145,800.00	Rs0.00
A1200	Protective coating	5d	24-Nov-17	28-Nov-17	A1190		Not Started	Rs5,094,305.20	Rs5,094,305.20

Fig. 9 Updated schedule screen shot for superstructure for project 1

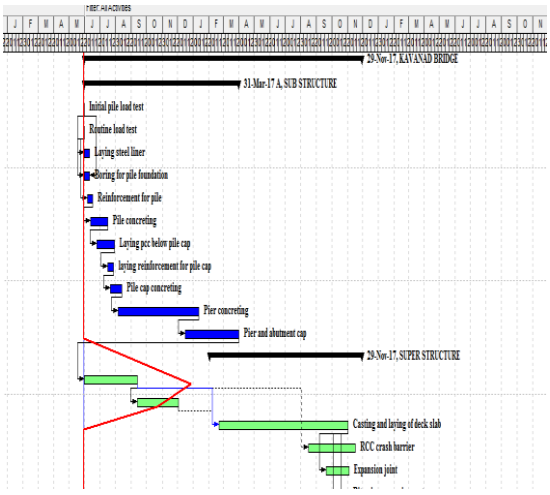

Fig. 10 Gantt chart screen shot for project 1

VI. RESULTS AND DISCUSSION

The schedule starts at 2016 May and ends on 2017 November. By direct interview method, project is behind schedule with reference to certain activities such as precast girder casting and laying, Casting and laying of deck slab, Construction of granular sub base courses on RE wall portion etc. and in the case of cost, there is no difference between the budgeted cost and the actual cost for the work completed. Delay in construction projects is considered as a typical issue bringing in numerous negative consequences for the projects and taking on an interest parties. Along these lines, it is crucial to distinguish the genuine causes for delay, keeping in mind the end goal so as to minimize and dodge the delays and their related costs.

Causes of delay in the project schedule are:

- Delay I design and approval of drawings
- Inadequate early planning
- Non-availability of red earth for filling the cutting in the RE wall portion
- Under budget due to stage payment may led to financial crises and thus it affects the construction activities
- Unsuitable weather condition
- Activities on the critical path was delayed

Proper corrective measures must be taken to finish the project as planned. The corrective measures may include

- crashing of duration
- over time work
- reduce the percentage of work to be completed for obtaining the stage payment
- Provide easy availability of red earth by proper preplanning

VII. CONCLUSION

Primavera is an amazing project management software tool which is not just used by project managers, also used to managing complex construction projects. Cost and time are considered to be most important and critical because of their direct economic implications if they are unnecessarily exceeded. .In Kollam bypass road construction project, project is behind schedule with reference to certain planned schedule activities and in the case of cost, there is no difference between the budgeted cost and the actual cost for the work completed. Causes of delay in my project are identified by direct interview method and suggest suitable measures to overcome the construction delay.

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