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Monitoring & tracking Project Cost through Earned Value Management System

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Abstract: *Earned value management system is unique way of tracking project cost and schedule. We can also say that after a set of project activity completion if we apply this system then to know how much we have earned in terms of Cost, Schedule and performance, through thesis information we can manage our finance and complete the allotted targets of activity as per the plan. So project can be complete on pre-define frame. In this paper Author had applied this technique on a project and calculated the Actual expenditures with respect to planned and calculated the variances of the project. Project performance as well as current situation of the project can easily forecast with the help of this Management technique.*

Keywords: *Construction Project, Earned value, planned value, Project performance.*

I. INTRODUCTION

In developing countries like India, the construction industry faces a lot of project over runs due to the large amount of uncertainties. These project overruns are primarily attributed to time and cost overrun. The traditional method of project cost monitoring is based on simple parameters using two data sources that is the budget (or planned) expenditure and the actual expenditure. Besides, it does not relate any current performance trend to forecast future performance. Currently available methods are mostly deterministic, overly simplified, or inconsistent in application and assumption, which make them unreliable or impractical. Ultimately problems like time and cost overruns, lack of management and timely execution of the activities is not takes place and ultimately project cannot complete with predefine frame. Earned Value Management introduces a third variable called Earned Value which would give a clearer understanding of the budgeted cost and the schedule. It acts as an early warning to the project manager to spot and control potential problems that may arise so as to maximize profits and minimize delays.

II. CONCEPT OF EARNED VALUE MANAGEMENT

The basic concept of EVM is developed to track the performance of the project. Earned value management is system for planning and controlling the project cost performances. EVM establish work packages earned value baseline by integrating project scope, time schedule and cost objectives. In this method performance evaluation of project is done by using cost control. Variance is analyzed using cost related information's which to identify the problems, trend analysis and actions to be done for correction which leads to re-planning and revising the whole budget. Main purposes served by Earned Value Analysis, it analyses changes in cost i.e. cost over-run or under-run. It helps to implement corrective actions in time. Corrective actions may involve cash flow, future financial requirement and profitability of the project. Secondly, analysis of variance gives current status of project which set off corrective actions and to forecast about future trends can be obtained.

III. OBJECTIVES OF THE EVM

The objectives of Earned Value Management are: Relation between times phased budgets with tasks, to capture progress assessment of work related with plan. Elaborates the relation between performance indices like technical, schedule, and cost Data obtained is valid and informative for management to take necessary action. Helps to take effective decision at practical level Contractor as well as customer can get significant benefits by implementing designed EVM system. Contractor can quickly respond and control the issues to meet easily the schedule of project, cost and other technical objectives. This improves contractor's ability to identify the problems in time, manage the project, and control the cost and schedule of the project which benefits the customer directly.

IV. Need of Earned Value Management System

The Earned Value Management System is needed for following reasons,
1. To check whether we are ahead or behind the schedule of the project.
2. To check whether we are currently under or over budget of the project.
3. To check how efficiently we are working with the project.
4. To know when the project is likely to be complete.
5. To know what is the remaining or entire project is likely to cost.

V. Terms of EVM

The basic terms associated with Earned Value Management are,

- **Planned Value (PV):** It is the amount of money budgeted to be spent at a particular point of time.
- **Earned Value (EV):** It is the amount of work in terms of cost that is actually accomplished at a particular point of time with respect to the planned value.
- **Actual Cost (AC):** It is the actual amount of money spent for the corresponding planned and earned value.
- **Cost Variance (CV):** It is the difference between Earned Value and Actual Cost. (EV-AC)
- **Schedule Variance (SV):** It is the difference between Earned Value and Planned Value. (EV- PV)
- **Cost Performance Index (CPI):** It is the ratio between Earned Value and Actual cost. If CPI greater than 1 then the project is under budget and CPI less than 1, then the project is under budget.
- **Schedule Performance Index (SPI):** It is the ratio between Earned Value and Planned Value. It indicated how much ahead or behind schedule the project is at a particular point of time.
- **Critical Ratio (CR):** It is the product of Cost Performance Index and Schedule Performance Index. It indicates the overall performance of the Project with respect to both cost and time.
- **Estimate at Completion (EAC):** It's a prediction of the total project cost based upon the current trends in project performance.
- **Variance at Completion (VAC):** It is the difference between the planned budgets at the beginning of the project to the Estimate at Completion. This value denotes how much more profit or loss the contractor will make on that Project.
- **Time Estimate at Completion (EACt):** It predicts the completion time of a Project based on its current performance. EACt = (BAC / SPI) / (BAC / months)

VI. CASE STUDY: EARNED VALUE ANALYSIS OF A RESIDENTIAL HOUSE PROJECT, IN SURAT DISTRICT.

Earned Value Analysis is done on a Residential housing Project in Surat. The project duration is 82 days. Earned Value analysis is done on this ongoing project after the 45th day of project, Up till that time period the foundation work was completed and in superstructure part the construction of 1st and 2nd floor slab was completed. By gathering all the relevant information's, Schedule of the project, actual spend of the project. It was 1st phase of the project Anandvatika. Out of 12 Phases.

Step:1 WBS of the project

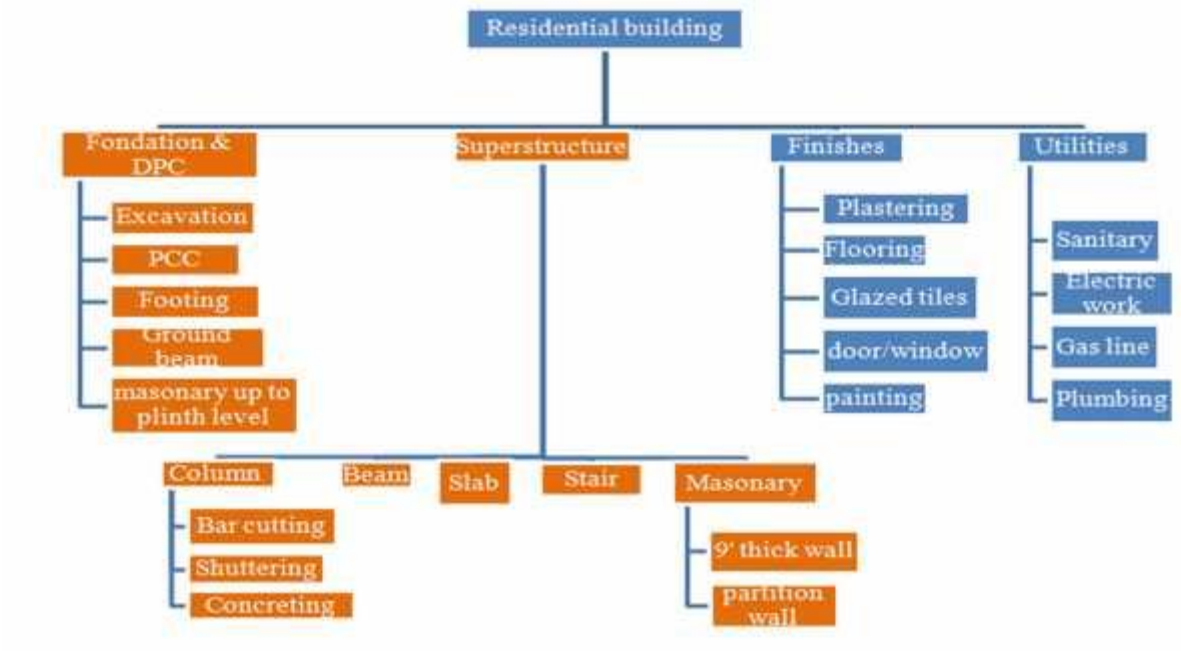


Figure:1 Work break down structure for a residential building

Work is finish (superstructure work complete upto 1st floor slab level)

Work is incomplete

Step:2 EVM calculations

Table:1 Data analysis table for the project through EVM

Up to Foundation	PV(Rs)	AC(Rs)
Excavation	40716	40716
PCC	156600	168520
Footing	692430	725845
Ground beam	414270	452845
Masonry up to plinth	644538	715656

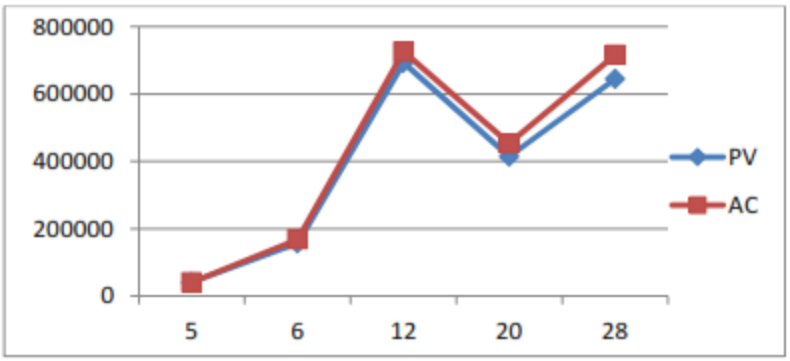
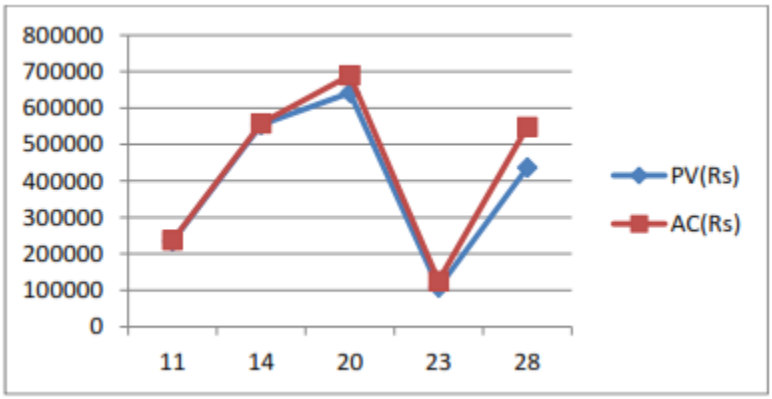


Table-2: Data analysis table for the project through EVM

Superstructure (1st Floor)	PV(Rs)	AC(Rs)
Column	234270	237564
Beam	554040	558136
Slab	641250	643254
Stair	107100	107609
Masonry	436620	441120



VII. Results & Discussion

Table-3: Earned value parameters calculation table

CV= EV-AC	-215625
CV%=(CV/EV) X 100	-5.48302
SV= EV-PV	-43074.7
SV%= (SV/PV) X 100	-1.08346
CPI= EV/AC	0.94802
SPI= EV/PV	0.989165
EAC= BAC/CPI	10129353
VAC= BAC-EAC	-526525
EACt= (BAC / SPI) / (BAC / months)	2.830669

- This Project has a favourable CV%=-5.48%. This means that the project is 5.48% under budget for the work performed.
- The project has an unfavourable SV%=-1.083%. This means that the Project is 1.083% behind schedule.
- This Project has a favourable CPI of 0.94. This means that for every rupee spent, 0.94 rupee in earned value is accomplished.
- This Project has a favourable SPI of 0.99. This means that for every rupee worth of work the Project planned to accomplish, 0.99 rupees worth of work was accomplished.
- This project is estimated to be completed is 2.83 months and not 82 days. 3 days more than what was planned.
- The Estimate at Completion of this Project is forecasted to be Rs.10129353/- and not Rs.9602828/-.
- When VAC= Rs 526525/-, the project is more budget required 526525/- for completion of project

VIII. CONCLUSION

With the introduction of Earned Value Analysis monitoring of the project is easy. It is good tool for the measuring the performance with the parameters of EVM like cost performance indices, schedule performance indices. It shows how much ahead of schedule or behind schedule the project is at a particular point of time. It also helps in the monitor if the corrective actions done to improve the performance of work are actually working. On a whole Earned Value Analysis enables the contractor to monitor the progress of work in terms of Cost and Time in a much more effective.

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