

## Realization on Construction management of residential apartments

Ashfaq Ahmed

(M.tech), School of Civil Engineering, HINDUSTAN university, chennai - 603103, Tamil Nadu, India;

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**Abstract:** Proper planning and scheduling is very important in construction projects for reducing and controlling delays of the project. Substantial amounts of time, money, resources are wasted each year in a construction industry due to improper planning and scheduling. With globalization the construction projects have become vast and complex. Planning of such projects requires huge amount of paperwork, which can be reduced with the help of project planning software. Providing good planning, proper organization, sufficient flow of resources to a project cannot automatically achieve desired result. A warning mechanism must be present which can alert the organization about its possible success and failures throughout the project. The main objectives of this study are to plan, schedule a Residential project with help of primavera software, study the results generated, it is possible to suggest which method is suitable for the selected residential Building project. Also to recommend measures to the organization for enhancing their project planning skills for similar projects in future and provide them with technical problems encountered in their process. This study is mainly done using Primavera P6, project management software. All activities and their sequence of occurrence, duration, resources required and costs involved are studied. The organizational breakdown structure of company and work breakdown structure of the project are noted. This gives an idea about the resources involved and financial aspect of the completed work. "Project management is the application of knowledge, skills, tools and techniques to project activities to meet the project Requirements

**Keywords:** Planning, Scheduling, budgeting, Project Planning Software, Primavera

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### I. Introduction

Construction industry is an integral component of a nation's infrastructure and industrial growth. Even though construction industry is the second largest industry in India, the growth of this industry has been differential across the nation. The rural regions need tools for economic development, land use and environment planning to cope with the status of development in urban areas. The time available to achieve this goal is shrinking. Here arises the need for effective project management. Many issues are being faced by construction industry that must be taken care of. They include time and cost overruns due to inadequate project formulation, poor planning for implementation, lack of proper contract planning and management and lack of proper management during execution. It has been estimated by analysts that average cost of a project goes up by 30 percentage compared to the budgeted cost. Observations show that proper skilful management is imperative for the timely completion of the project within estimated budget and with allocated resources. Projects with good planning, adequate organizational machinery and sufficient flow of resources cannot automatically achieve the desired result.

There must be some warning mechanism, which can alert the organization about its possible success and failures, off and on. Project monitoring is the process of collecting, recording, and reporting information concerning project performance that project manager and others wish to know. Monitoring involves watching the progress of the project against time, resources and performance schedule during execution of the project and identifying lagging areas requiring timely attention and action whereas project controlling uses data from monitor activity to bring actual performance to planned performance.

#### The main objectives of this study are:

1. To suggest the importance and purpose of Planning the construction work.
2. To suggest guidelines to contractors for Scheduling the project.
3. To reduce ideal in construction process of residential building.
4. To suggest a layout for updating the schedule.
5. To suggest effective budgeting method.

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**Plan.**-During the planning stage of a project schedule, the contractor lays out all project elements to create a time-based graphical representation of the project scope. The planning stage includes:

- Defining objectives and scope of work.
- Identifying milestones (contractual dates, benchmarks).
- Developing work breakdown structures (what and where).
- Developing an organization breakdown structure (who).
- Creating activities (when and where).
- Creating relationships (interfaces, dependencies, network).
- Identifying a critical path.
- Assigning resources (personnel, equipment, or material).
- Performing risk analysis.
- Refining schedule as needed.
- Establishing the baseline schedule.

**Perform.** This state occurs after the schedule has been planned, adopted, and executed. The perform stage includes:

- Updating the schedule on a regular basis.
- Updating progress.
- Incorporating updates or revisions, including project delays.
- Communicating status to team and management.

**Monitor.** During this stage, the schedule is most beneficial to predict the outcome of the project. Monitor (also referred to as controlling) includes:

- Regularly analyzing the schedule based on special provisions and *Standard Specifications* requirements.
- Analyzing resource productivity.
- Analyzing cost usage.
- Analyze time extensions.
- Comparing different schedules to find changes to key elements such as:
  - Planned duration versus actual duration
  - Remaining duration
  - As-built dates (start and finish)
  - Descriptions
  - Changes to logical relationships
- Evaluating performance (earned value techniques).
- Identifying trends.
- Developing forecasts.

**Modify.** This stage includes:

- Incorporating approved change orders.
- Performing time impact analysis for delays.
- Identifying recovery plan (fast-tracking, modifying logic).
- Communicating new direction to team and management.

## **II. Methodology**

The scope of work was divided into the following steps:

- Study area characteristics.
- Preparing actual schedule for the project in primavera.
- Identifying the constraints in that project.
- Reducing the constraints which causes delay and prepare new schedule.
- Optimize the labour resources to reduce the cost of the project.

### **Preparing Actual Schedule for the Project in Primavera**

Actual schedule preparation process starts with the collection of data like project start date, activities involved in the construction of a G+7 apartment with stilt, activities sequences, duration taken for each and every activities, resources needed for each and every activities and its amount, cost spent for each and every activities. The collected data are entered in the software and the relations between the activities are given as per its sequence of activities collected. The process of scheduling in primavera for the actual progress of work

is shown in Figure 1, 2, 3, 4 .This actual schedule and report is considered as a base schedule for this project.

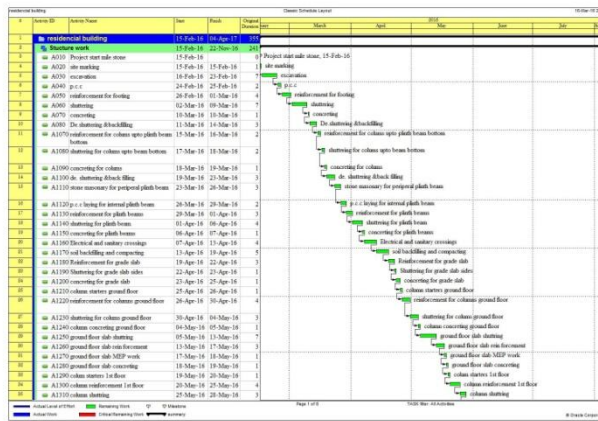


Figure 1. Actual Schedule Part (i).

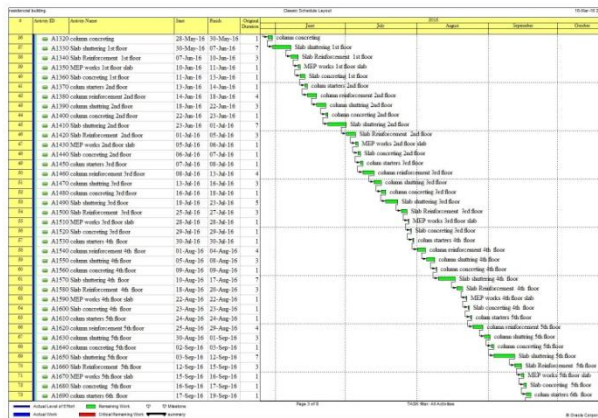


Figure 2. Actual Schedule Part (ii).



Figure 3. Actual Schedule Part (iii).

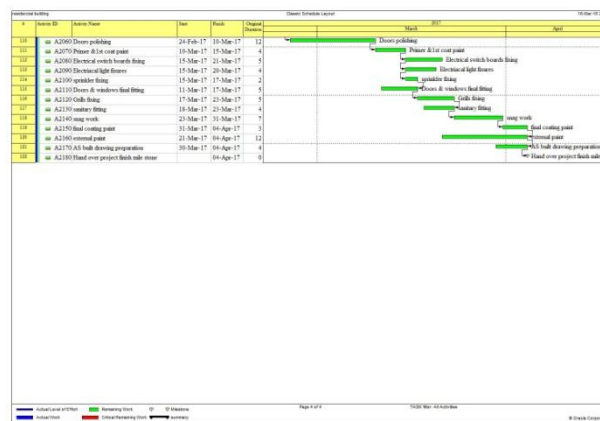


Figure 4. Actual Schedule Part (iv).

The root causes for the long duration are,

- No parallel activities were done.
- Longest critical path.
- Lack of resources.

These three are the reasons for the delay of the project and due to the interdependencies of time and cost; these causes are also responsible for the cost overrun of the project.

#### Measures Taken to Reduce the Time Constraints

Constraints causing the time delay have to be reduced. The techniques used to reduce these constraints are,

- Interconnecting activities properly.
- Increasing the resources.

#### Budgeting the project

A budget is a quantitative expression of a plan for defined period of time. It may include planned sales volumes and revenues, resource quantities, costs and expenses, assets, liabilities and cash flows. It expresses strategic plans of business units, organizations, activities or events in measurable terms.

Budget helps to aid the planning of actual operations by forcing managers to consider how the conditions might change and what steps should be taken now and by encouraging managers to consider problems before they arise. It also helps co-ordinate the activities of the organization by compelling managers to examine relationships between their own operation and those of other departments

### III. Results and Discussions

#### Modified Schedule 1 - Interconnecting Activities Properly

The connection of the activities plays a major role in the time controlling of the project. Connecting activities should be carefully done which is considerably resulting in the project success. The constraints of having longest critical path can be reduced by means of doing activities parallel. These parallel activities can be done in the prima- vera software by differentiating relationship between the activities.

Report obtained from the modified schedule 1 gives the result of interconnecting activities properly. This interconnecting activity shows a considerable result in the time taken for completion of the project. The time difference taken for the completion of the project between the original schedule and modified schedule 1 is five months.

#### Modified Schedule 2 Increasing Resources

For doing every activity in the construction process, sufficient amount of resources is required. Resources play a vital role in the project for the successful completion of all the activities on time. Time delay caused in a single activity will be carried over to the subsequent activities. This delay of each activity is due to the insufficient resources. Therefore, it is necessary to provide sufficient amount of resources like men, material and equipment to reduce the time taken for the construction of the project.

In this residential apartment, the shuttering material and workmen are insufficient. Therefore the activities of constructing structural elements of columns in each floor take four sets of activities. Single set of activities consists of reinforcing, shuttering, concreting and de-shuttering. Therefore increasing the resources will result in reducing the

repetition of that sets of activities, which results in reducing the delay in the project. In this, the resources have been increased twice and the schedule was prepared in the primavera.

These two measures can be done by means of proper planning and scheduling of the project. The corrective measures of proper interconnecting activities and increasing the resources is incorporated in the new schedule of that residential project.

The schedule made by increasing the resources twice with the interconnection of activities properly completes two months before from the project completion time of the modified schedule 1 and it completes seven months before from the original schedule of the residential apartment project.

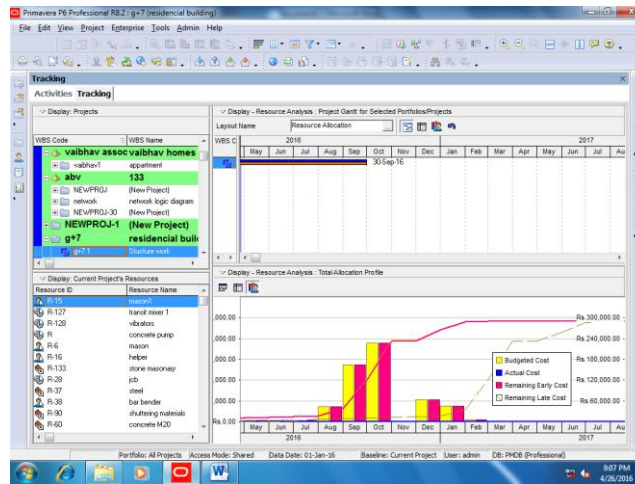


Figure 5. S-curve analysis.

**Lower productivity of machinery**

Productivity is an average measure of the efficiency of production. It can be expressed as the ratio of output to inputs used in the production process, i.e. output per unit of input. When all outputs and inputs are included in the productivity measure it is called total productivity. Outputs and inputs are defined in the total productivity measure as their economic values. The value of outputs minus the value of inputs is a measure of the income generated in a production process. It is a measure of total efficiency of a production process and as such the objective to be maximized in production process

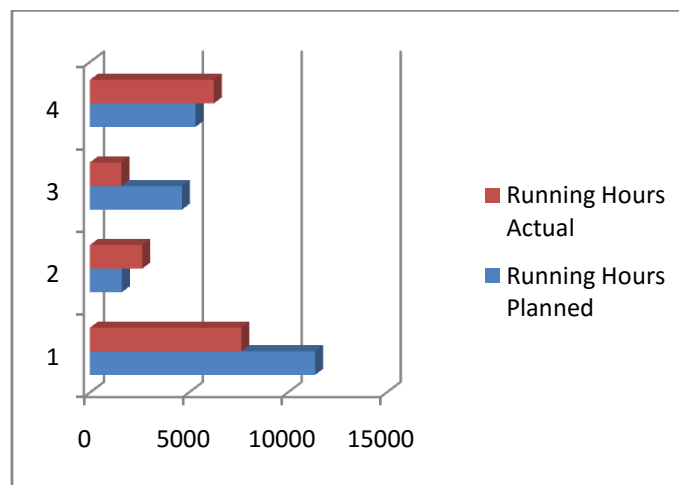


Figure 6. running hours for equipments

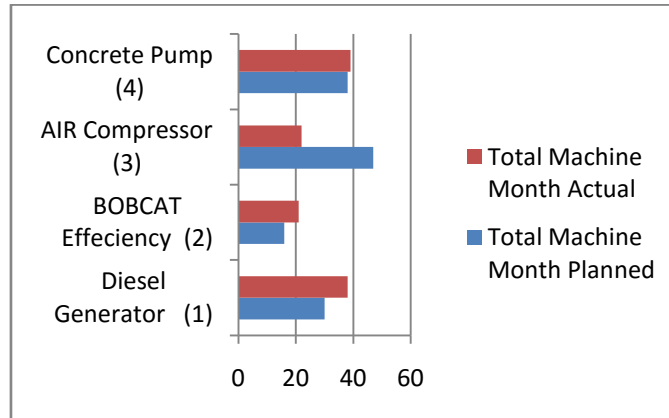


Figure 7. total machine months variation.

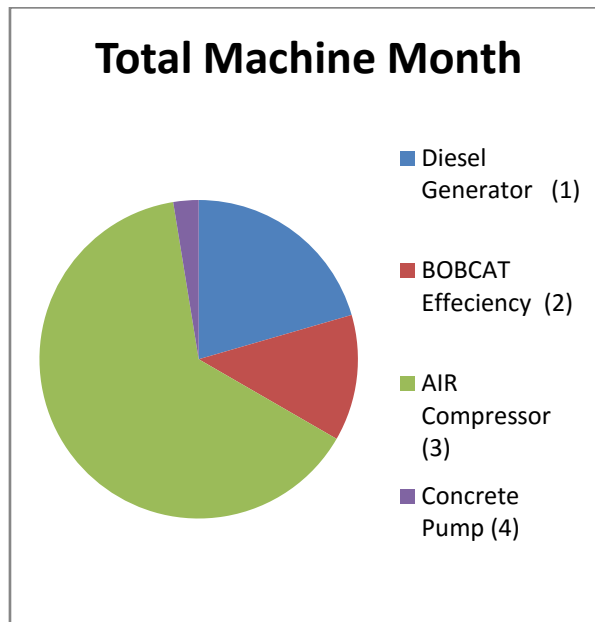


Figure 8. variation for equipment



Figure 9.. comparison of equipments running hours

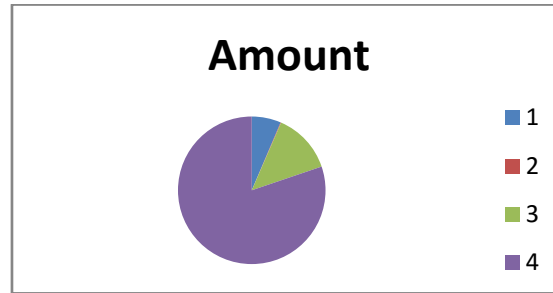


Figure 10. amount for each equipment

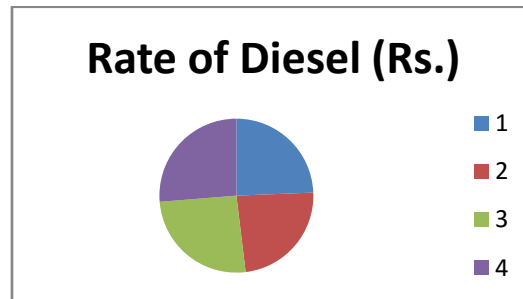


Figure 11. comparison of rate of diesel

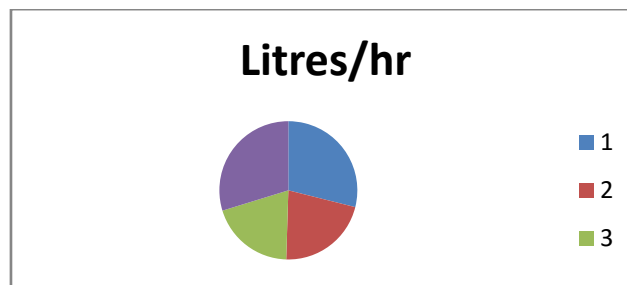


Figure 12. milage for each equipment

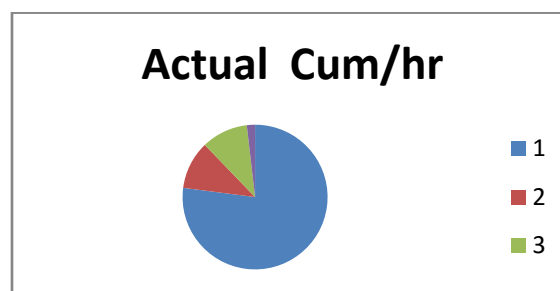


Figure 13. cumulative hours comparison for equipments

#### IV. Conclusion

Schedule made by using techniques that reduce the constraints helps for the project to complete earlier of five to seven months from the actual base schedule of the project and thereby increase the profit outcome from the project. Further, with the management on the labour resource of skilled, unskilled male worker and unskilled female worker in the construction activities, the cost spent on the labour resources reduces by 5% of the actual cost spent on the labour resources. Using a soft- ware helps to manage the work easily and it reduces the information constraints between the management and the site members which greatly contribute to the project success.

This study concludes that by using the Primavera a time period of 4 months from the actual base schedule of the project was saved and also helps to prevent the cost overrun, thereby ensuring the successful completion of the project. It helps to manage the work easily and also helps to avoid constraints or risks that will delay the project by interconnecting and parallelizing the activities and mobilization of the resources from time to time for successful completion of the project within the estimated time

Budget is prepared for each and every activity by allocating the resources to the activities. Budgeted project labor, Non labor, Expense, Material and total cost of all the activities are calculated. The total budgeted cost of the project was Rs16, 556,504.80.

Activities are to be tracked as per the project duration from January 1st to April 4nd and actual costs for all the activities in that duration are updated. Total actual cost within this duration was Rs.21,02,789.39.

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