ESTIMATION OF RESIDENTIAL BUILDING USING MICROSOFT PROJECT

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***Abstract* :** The rapid advancement of science and technology makes the use of machinery equipment's and deals with human capital as major aspects any construction project i.e., involves various activities of the project connecting by CPM. It is effective tool for scheduling the activities of complex project. It is a step by step methodology technique or algorithm for planning projects with numerous activities that involve complex, interdependent interactions. It is often applied to the analysis of project network.

The project aims at planning, scheduling and optimizing the resource usage by using a software tool Microsoft project (MSP). Thus, the design provides complete resource smoothing, allocation and cost optimization of the project.

Keywords – **Microsoft Project, Scheduling, Planning, Cost optimization.**

1. INTRODUCTION

Project is a temporary endeavour with a beginning and an end. It creates a unique product, service or result. It is a non-repetitive one-time venture to build something of lasting value, amidst formidable uncertainties to be overcome. It is a unique set of inter-related activities that must be completed to achieve a specific objective with in minimum duration by utilizing minimum amount of resources. It is a job that has beginning and end (time), a specified (performance) and a budget (cost).

Project management is a profession that is growing rapidly. It is both a science and an art, and follows a systematic process. It is an art and science of mobilizing and managing people, material, equipment and money to complete the assign project work on time within the budgeted cost and by specified technical performance standards. Project gets starts at the right way but as it proceeds further, gets off the track. The project leads to some delays in the construction site which can be managed by additional resource allocations and appropriation of overtimes for the labours there by resulting in the uncertainty of the cost.

1.1. Project management processes:

There is a process for managing projects. It includes:
- ➢ Initiating the project (Start)
- ➢ Planning the project (Plan)
- ➢ Executing the project (Do)
- ➢ Monitoring and controlling the project (Check and act)
- ➢ Closing the project (End)

1.1.1. Initiating process group: The initiating processes formally start a new project or project phase by officially authorizing the project and providing the project manager with the information necessary to begin the project. In well-run organizations, there is a formal project selection process or established selection criteria. Once the project is selected, it is chartered and, therefore, authorized. Initiating a project also involves the identification of stake holders so their needs can be incorporated into the project.

1.1.2. Planning process group: Project Planning determines whether the objectives as stated in the project charter can be achieved, as well as how the project will be accomplished and addresses all appropriate project management processes and knowledge areas. Planning process group includes

- ➢ The initiating process group is completed.
- ➢ Approved changes, including corrective and preventive actions that require replanning.

1.1.3. Executing process group: The purpose of executing processes is to complete work defined in the project management plan and to meet the project objectives. This is the "do" step of the process. The focus is on managing people, following processes, and distributing information. It is essentially a guiding, proactive role accomplished by constant referral back to the project management plan and project documents.

Executing process group includes

- ➢ Project planning is completed. Integrated change control results in a changed project management plan.
- ➢ The processes of project management are not always performed in the same sequence.

Executing process means executing the project management plan or the latest revision of the project management plan. There is always executing to the project management plan, but the plan might change over the time.

1.1.4.   Monitoring and controlling process group: Monitoring and controlling means measuring the performance of the project to the project management plan and approving change requests, including recommended corrective and preventive actions and defect repair. For the better understanding of project monitoring and controlling group, control processes are given as control scope, control schedule, control costs, perform quality control, report performance, monitor and control risks, administer procurements. The process of project management does not always go from initiating to planning to executing to monitoring and controlling to close. It might also shows that you might go from monitoring and controlling to any of the other process groups (i.e., initiating, planning, executing, or closing), depending on the needs of the project.

1.1.5.   Closing process group: The closing process group is where the project is finished. This is one of the most ignored parts of the project management process. One must remember that project is not complete when the final product scope is done. This effort will include administrative activities such as collecting and finalizing all the paper work needed to complete the project, and technical work to verify that the product of the project is acceptable. It will also include any work needed to transfer the completed project to those who will use it and to return all resources back to the performing organization and or the customer.

Closing process group includes

- Project phase is complete.
- Project is complete.
- Project is terminate.

1.2.   About Microsoft project: Microsoft Project is a project management software program developed and sold by Microsoft, which is designed to assist a project manager in developing a plan, assigning resources to talks, tracking progress, managing the budget, and analyzing workloads.

Project creates budgets based on assignment work and resource cost. As resources are assigned to the task and the program calculates the cost equal to the work times the rate, which rolls up to the task level and then to any summary tasks level and finally to the project level. Resource definitions (Labour, equipment and materials) can be shared between projects using a shared resource pond. Each resource can have its individual calendar, which defines what days and time is resource present.

Microsoft project software is used for planning, scheduling, monitoring, controlling and resource optimization of the project.Project is a powerful application that helps to plan and manage a wide range of projects. From meeting crucial deadlines and budgets to selecting the right resources, that can be more productive and realize better results using the set of features Project offers.

This can use Project to do the following.

- Create plans at the level of detail that's right for your project. Work with summary data initially, or shift to a more detailed approach when it's convenient.
- Control what tasks Project can schedule automatically or that you'll schedule manually.
- Manage tasks, costs, work and resources at whatever level of detail is appropriate for your project's needs.
- Work with your plan's data in a variety of views and reports.
- Track and manage your plan throughout the life of the project.
- Collaborate and share data with others in your organization using rich view and report formatting options.
- Use resource tools, consolidated projects, and cross-project links to extend your project-management focus across multiple projects.

1.3.   Objectives:

- The main objective of using MS Project to execute the project most economically.
- To determine how MSP is effective in controlling cost and time.
- To prepare construction sequence of work for construction.
- Identify risks in construction activities which causes delay.

2. LITERATURE REVIEW

- **ABHISHEK SHARMA (2015)**

Many projects suffer time and cost overruns due to improper planning, scheduling and completing works that results in numerous issues like delay in providing facilities, development, cutback in quality of construction and making the project more expensive. A little consideration shows that the time required to complete the project is inversely comparative to the supply of manpower. As the manpower is increased, the completion time of the project is decreased and on the other hand if the manpower is decreased, the completion time of the project is increased.

A comparison between the baseline duration and cost to actual duration and cost of manpower of project is also determined using project management software tool Microsoft Project. The schedule report is examined and causes for delay are analyzed. This delay is due to inadequate manpower, contractor not starting the multitasking activities at site, shortage of shuttering material and the work executed by the activity in haphazard manner at site.

> **E. SURESH KUMAR (2015)**

Scheduling using MSP Software is a development which involves estimation, sequencing the activities, resources allocation and timing. The construction scheduling is to complete the project in time and equal the resources with the allocated time. EV Analysis is a standard method of measuring a project's progress at any given point of time, forecasting its completion date, final cost and analysis difference in the schedule and budget of the project. Scheduling using MSP Software gives good controlling.

> **Prof R. G. RATHOD and Prof A. R. PATIL (2016)**

They made an effort in comparison study using MS Excel and MS Project for planning, scheduling and delay analysis updating of the various task. In this paper the project was under residential apartment with two blocks with B+G+4 ever floor with 60 flats in total, every block in floor has 12 flats. Every floor with a floor area of 12,596 S/ft. The actual cost of the project was Rs. 4,93,12,027/- but due to delay the cost increased to Rs. 3,71,100/- therefore the delay of cost can be minimized with proper planning, scheduling and execution work taken in a project.

> **SUBHAM LADDHA, PRWEMA CHANDRA and SNEHA KHEDEKAR (2017)**

They carried on an online study concentrating on every one of the partners identified with the project with a view to acquiring a thought of different task administration hones in the development business. In conclusion, they presumed that Construction of building utilizing Traditional route turns out to be uneconomical and expends additional time with numerous complexities and huge mistake which real execution of the Project. MSP is the cutting-edge instrument of Project Management that guide beat the hindrances confronted inferable from the conventional method for Planning and Management.

3. METHODOLOGY

The flow chart of the work process is presented below
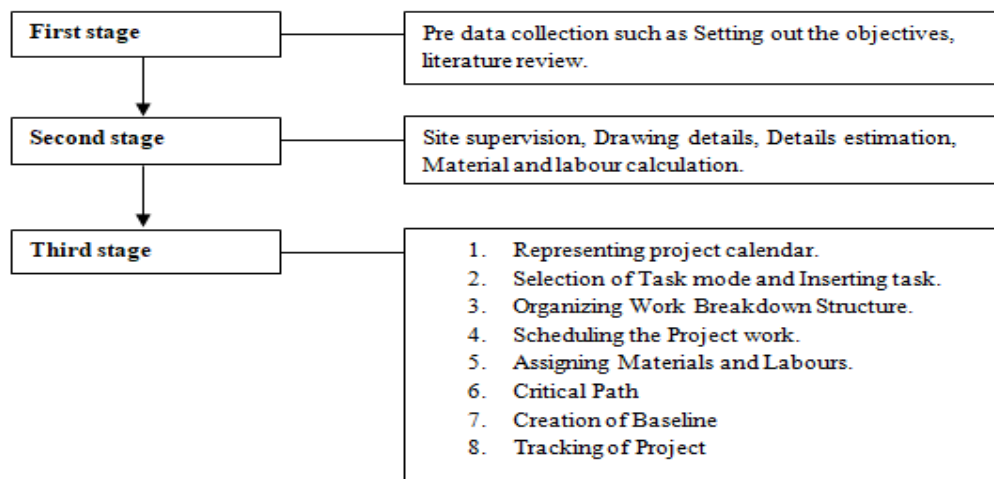
3.1 First stage:

This stage is known as pre-data collection where it consists of setting out the objectives, literature review, and based on the area of research, the Residential building is taken as a case study.

3.2 Second stage:

3.2.1 Site Supervision: working status and understanding the working on the site is considered here. The work which is carried here should be understood by every individual like organization of structure, degree of quality used in work, safety aspects, rules etc. Dimension, equal, alignment, cross section should be with accordance to all work.

3.2.2 Drawing Details: In every planning task drawing is an important role. There are various drawings which are observed during the construction work like architectural drawings and structural drawings. According to the drawings all the tasks are identified to reduce the sequential order.
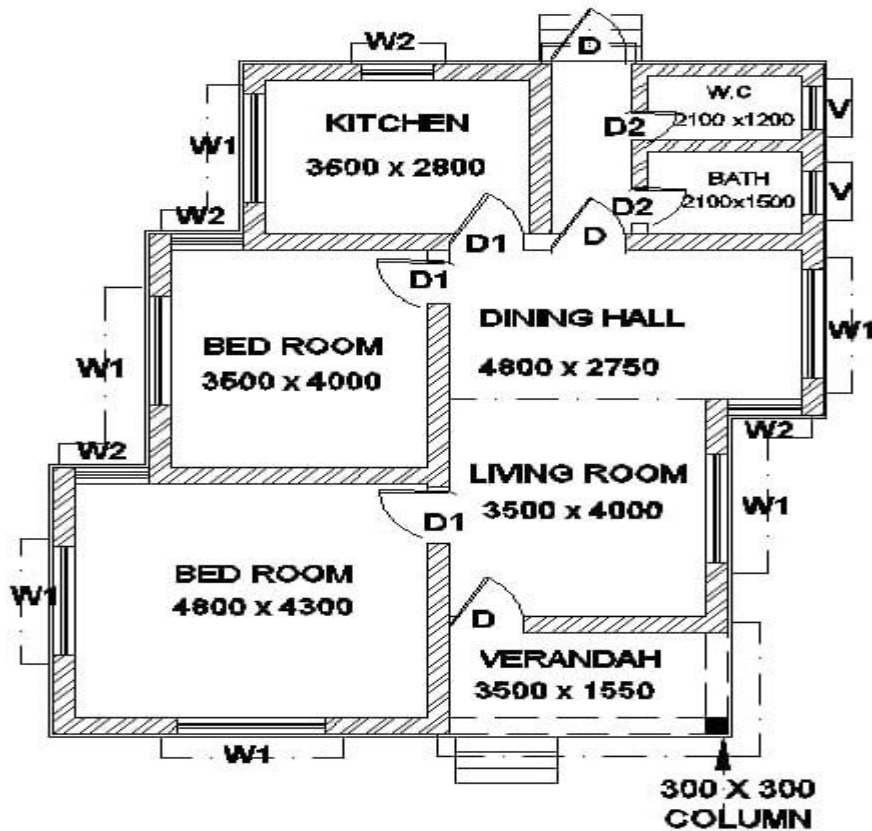
Fig.3.2.2 Plan of residential building

3.2.3 Details Estimation: For all engineering work it is necessary to know beforehand the cost of construction known as the estimated cost. The subject of estimating is easy, nothing much to understand, but the knowledge of drawings is very important.

3.2.4 Material and Labour Calculation: The cost of quantities of materials, the cost of labours, and other miscellaneous is determined by rate per unit of a particular item work is known as analysis of rate.

3.3 Third stage:

This stage is also known as post data collection, whatever data is collected is analyzed in Microsoft project 2016, where planning, scheduling, and tracking of the project is done.

3.3.1 Start a new project: Project focuses primarily on time. Sometimes one might know the expected start date of a project, the expected finish date, or both. However, when working with Project, specify only one date, not both: the plan's start date or finish date. Because after entering the plan's start or finish date and other details, Project calculates the other date. Remember that Project is not merely a static repository of one's schedule information or a Gantt chart drawing tool it is an active scheduling engine.

3.3.2 Representing project calendar:

 Calendars are the primary means by which one control when each task and resource can be scheduled for work in Project. The project calendar defines the general working and nonworking days and times for tasks. Project includes multiple calendars, called base calendars, any one of which conserve as the project calendar for a plan. You select the base calendar that will be used as the project calendar in the Project Information dialog box.

The Calendar list contains the three base calendars that are included with Project:
  > **24 Hours** Has no nonworking time.
  > **Night Shift** Covers a late-night "graveyard" shift schedule of Monday night through Saturday morning, 11:00 P.M. to 8:00 A.M., with a one-hour break each day.
  > **Standard** The traditional working day and week, Monday through Friday from 8:00A.M. to 5:00 P.M., with a one-hour break each day.
Only one of the base calendars serves as the project calendar; the Standard calendar is the default.

3.3.3 Selection of task mode and entering tasks:

Project handles task scheduling in two ways
1.   Auto-scheduled
2.   Manually scheduled

Automatically scheduled tasks always have a duration (one day by default). Manually scheduled tasks, however, do not initially have any duration. A task's duration is essential for Project to schedule a task, so it makes sense that a manually scheduled task, which is not scheduled by Project, does not require a duration.

With manually scheduled tasks, one can enter regular duration values by using the abbreviations shown in the preceding table—for example, 3d for three days. Can also enter text values, such as Check with Bob or Sometime next quarter. Such text values are replaced with the default one-day duration value when one convert a task from manual to automatic scheduling.

3.3.4 Link tasks to create dependencies:

When one link tasks, it can create scheduling relationships between the tasks. These task relationships are called dependencies.

➢ Finish-to-start (FS): The finish date of the predecessor task determines the start date of the successor task. This is the default task relationship.
➢ Start-to-start (SS): The start date of the predecessor task determines the start date of the successor task.
➢ Finish-to-finish (FS): The finish date of the predecessor task determines the finish date of the successor task.
➢ Start-to-finish (SF): The start date of the predecessor task determines the finish date of the successor task.

3.3.5 Assign resources to tasks:

Resources include the people, equipment, and material needed to complete the work of a project. One can manage three types of resources in Project—work resources and two special-purpose resources: cost and material.

➢ Work resources include the people and equipment needed to complete the tasks in a project's plan.
➢ Cost resources represent categories of financial costs, derived from specific tasks that one need to account for in the plan. Examples include categories of expenses like travel and entertainment.
➢ Material resources are consumables that get used up as the project proceeds. For example, a construction project might need to track steel or concrete as it is used throughout the project. "Setting up resource information in Project takes a little effort, but the time is well spent if your project is primarily driven by time or cost constraints (as nearly all projects are).

3.3.6 Gantt chart view:

The Gantt chart became a standard way of visualizing schedules when, in the early twentieth century, American engineer Henry Gantt developed a bar chart showing the use of resources over time. For many people, the Gantt chart is the most common visualization of a project's schedule or plan. In fact, the Gantt chart is a popular and widely understood representation of schedule information throughout the project management world. In project, the default view is dominated by a Gantt chart.
The bar chart includes an adjustable timescale band across the top that denotes units of time. The bars on the chart graphically represent the tasks in the table in terms of start and finish dates, duration, and status (for example, whether work on the task has started or not).On a Gantt chart, tasks, summary tasks, and milestones all appear as Gantt bars or symbols, and each type of bar has its own format.
Other elements on the chart, such as link lines, represent relationships between tasks .The default formatting applied to a Gantt chart view works well for on-screen viewing, sharing with other programs, and printing.
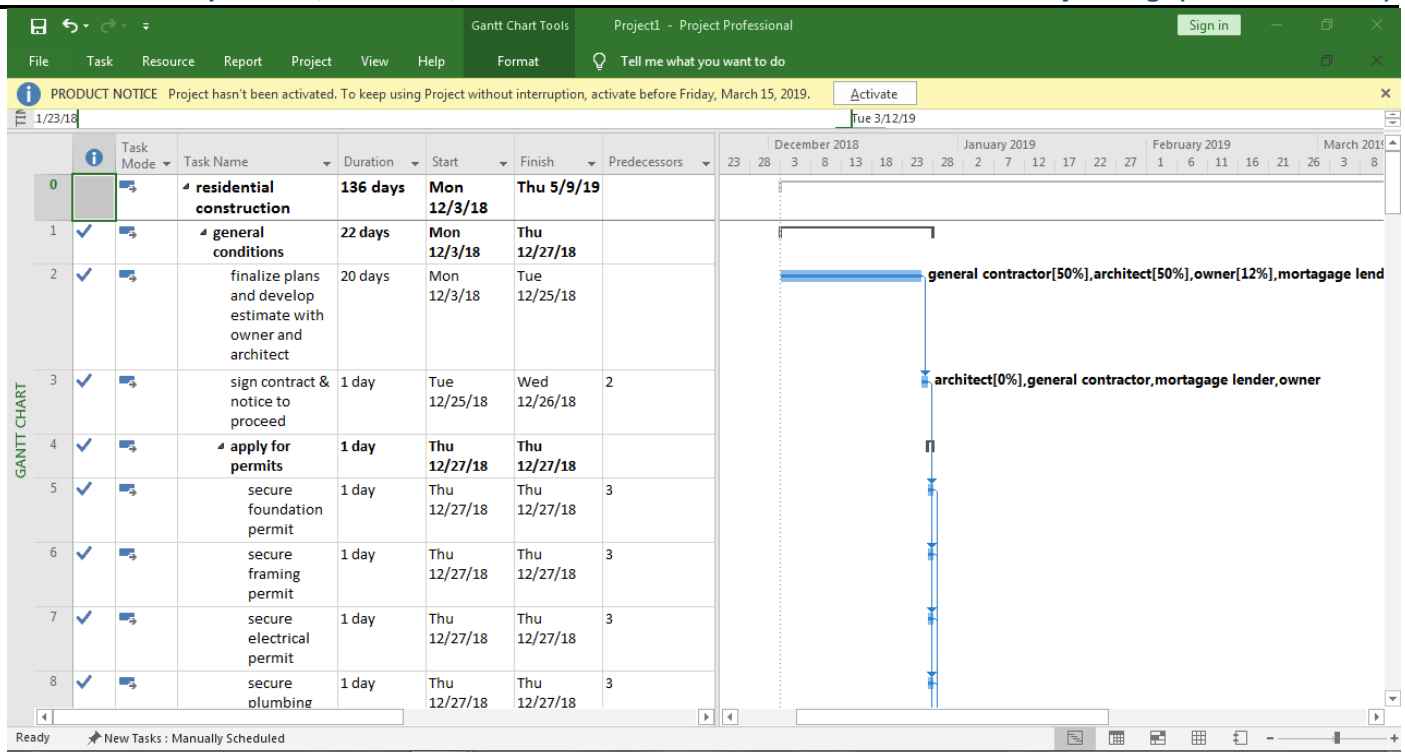
Fig.3.3.6 Gantt chart view

3.3.7 Critical path:

A critical path is the series of tasks that will push out the plan's end date if any of those tasks are delayed. The word critical in this context has nothing to do with how important these tasks are to the overall plan. It refers only to how their scheduling will affect the plan's finish date. However, the plan's finish date is of great importance to most projects. If one want to shorten the duration of a plan to bring in the finish date, they must begin by shortening (also referred to as crashing) the critical path. Over the life of a project, the plan's critical path is likely to change from time to time as tasks are completed ahead of or behind schedule. Schedule changes, such as changing task relationships or durations, can also alter the critical path.

3.3.8 Creation of Baseline:

A baseline is a group of nearly 20 primary reference points (in five categories: start dates, finish dates, durations, work, and cost estimates) that one can set to record the original project plan when that plan is completed and refined. As the project progresses, they can set additional baselines (to a total of 11 for each project) to help measure changes in the plan. For example, if the project has several phases, one can save a separate baseline at the end of each phase, to compare planned values Because the baseline provides the reference points against which they compare actual project progress, the baseline should include ones best estimates for task duration, start and finish dates, costs, and other project variables that they want to monitor.

The baseline may also represent a contractual obligation for the project. Baseline information that consistently differs from current data may indicate that original plan is no longer accurate, possibly because the scope needs review or because the nature of the project has changed. If project stakeholders agree that the difference warrants it, they can modify or rework the baseline at any time during the project. One may find that setting multiple baselines is especially useful for long projects or for projects in which the baseline is rendered irrelevant by significant changes to scheduled tasks or costs.

Use the baseline for later comparison of what one thought was going to happen to what actually has happened.

3.3.9 Tracking of project:

The simplest approach to tracking progress is to report that the actual work is proceeding exactly as planned. For example, if the first week of a five-week project has elapsed and all of its tasks have started and finished as scheduled, one can quickly record this in the update project dialog box. When one record progress on tasks, Project displays that progress by drawing progress bars within the Gantt bars for those tasks. In the chart portion of the Gantt chart view, the progress bar shows how much of each task has been completed. When one record progress through a specific date, Project calculates the actual duration, the remaining duration, actual costs, and other values up to the date they entered. This approach might be fine even if the actual work and cost values generated by Project won't exactly match what happened in the real world, but are close enough for their schedule tracking purposes.

4. RESULTS AND DISCUSSION

4.1 Project overview includes
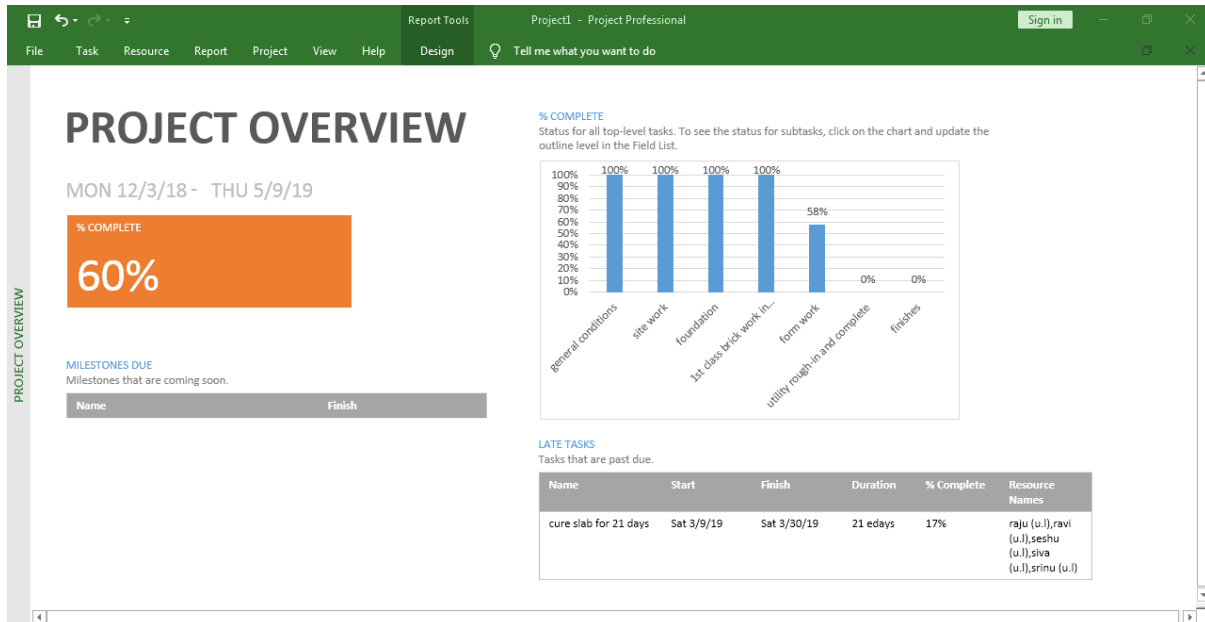

Fig 4.1 Project overview

➢   The above figure of project overview shows that

➢   The completion of project is 60% till the date of 10th march 2019.

➢   The bar graph in the figure shows that the completion of activity up to 1st class brick work is 100% and the form work is completed up to 58%.

➢   The next task to be performed is shown under the late tasks.

5. CONCLUSIONS:

➢   Construction of a residential building was planned on date 3rd December 2018 and scheduled completion date was 9th may 2019.

➢   On 10th march 2019 the project was tracked where running and not running task were tracked and this present completion of work was known. On the basis of this tracking, it was found that the project completion on 10th march 2019 was 60%.

➢   Using MSP as a construction project management tool, project planning is done accurately. This enables the management to organize the resource required for the project effectively.

➢   Labour management becomes easier as the over allocated activities are levelled using the levelling option available in MSP this helps to optimize the duration of the project without effecting the original duration of the project.

➢   Total cost of the project   :   Rs. 12,16,538.62/-

➢   Total duration of project   :   136 days

➢   Total material cost   :   Rs. 8,01,032.9485/-

➢   Total labour cost   :   Rs. 4,15,505.6715/-

➢   Percentage completion of work: 60%

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