

# Project Planning, Scheduling and Preparation of Quality Assurance Control Documents

J.SHARANYASREENIVAS<sup>1</sup>, G.GAJALAKSHMI<sup>2</sup>, K.RAVI THEJA<sup>3</sup>

<sup>1</sup>P.G Student M.Tech (Structural Engg. and construction managment) , GVIC , Madanapalle, A.P, INDIA

<sup>2</sup>Head of the Dept, Dept. of Civil Engineering GVIC, Madanapalle, A.P, INDIA

<sup>3</sup>P.G Student M.Tech (Structural Engg.)SVTM, Madanapalle, A.P, INDIA

\*\*\*

**Abstract** - The project management techniques of planning, scheduling and controlling are used to Complete the project within the stipulated time, scope, quality and cost. These techniques Can be applied to all types of projects. The study covers the process of planning and Scheduling of a Multi Storied Building. In this project Microsoft project planner, a powerful software tool, is used for planning and scheduling of the various construction activities of the project. Learning and using such a powerful tool for the project management of an on-going live project is considered as a major outcome of this project. Quality assurance is the process of auditing the quality requirements and the results from quality control measurements to ensure appropriate quality standards are incorporated. Quality assurance is an execution process that uses data created during Perform Quality control. Quality assurance provides direction towards control, measure and protection against quality problems through early warnings of trouble ahead. Such early warnings play an important role in the prevention of both internal and external problems.

**Key Words:** Project planning, scheduling, Quality assurance, quality control, Microsoft project software

## 1. INTRODUCTION

Construction projects are time bound and all project activities are directed towards the achievement of project objectives with respect to time, scope and quality. In a complex project where large number of activities are performed at different places by different agencies and sub organizations, with each having its own scheduled targets, a small delay in the critical activity can affect successor activities in schedule.

Project planning and scheduling aims at timely execution of work according to the project planned schedule and can apply corrective measures in case of any time deviations. In a broader sense, time control implies the control of the entire planning system, as time is directly or in-directly related with all project activities and project functions.

Quality assurance provides protection against quality problems through early warnings of trouble ahead. Such

early warnings play an important role in the prevention of both internal and external problems.

## 1.1 Objectives

- To study an on-going construction project with focus on project Planning, Scheduling and preparing Quality assurance documents.
- To identify the specific methodologies that can be adopted in the project for Planning, Scheduling and Quality assurance.
- To identify scheduling technique used in developing Planning and Scheduling.
- To discuss the effectiveness of the methods and their usefulness for construction project process.
- Use of computer software like Microsoft project software, which is most widely and globally used.
- To identify and prepare quality assurance control documents for the selected case study.

## 2.0 CONSTRUCTION PROJECT MANAGEMENT

A project is a temporary endeavour undertaken to create a unique product, service, or result. The temporary nature of projects indicates a definite beginning and end. The end is reached when the project's objectives have been achieved or when the project is terminated because its objectives will not or cannot be met, or when the need for the project no longer exists. Temporary does not necessarily mean short in duration. Temporary does not generally apply to the product, service, or result created by the project; most projects are undertaken to create a lasting outcome. Major construction works are time bound and employ huge resources of men, material and machines. They involve heavy investments running to crores of rupees. They require a high level of technology and need an effective management of resources.

Project management processes comprising the 5 Process Groups.

These 5 Process Groups are:

- Initiating
- Planning
- Executing
- Monitoring and Controlling, and
- Closing

### 2.1 Components of a project

A project is an endeavor that is undertaken to produce the results that are expected from the requesting party.

A project consist of three components namely

- Scope
- Budget
- Schedule

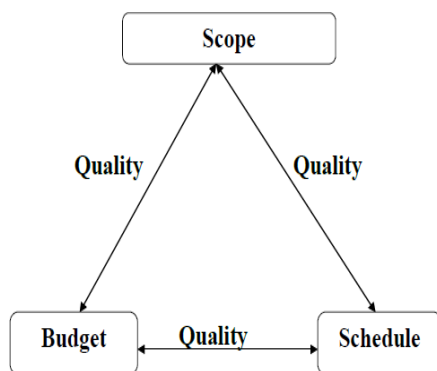


Figure 2.1 Components of a Project

**SCOPE:** Work to be accomplished in both qualitative and quantitative.

**BUDGET:** Refers to the costs measured in currency.

**SCHEDULE:** Logical sequencing and timing of the work to be performed.

### 2.2 Project Life Cycle

A project life cycle is a collection of generally sequential and sometimes overlapping project phases whose name and number are determined by the management and control needs of the organization or organizations involved in the project, the nature of the project itself, and its area of application. The life cycle provides the basic framework for managing the project, regardless of the specific work involved. No matter how large or small, simple or complex,

all projects can be mapped to the following life cycle structure.

- Starting the project
- Organizing and preparing
- Carrying out the project work, and
- Documenting and handover of project

This generic life cycle structure is often referred to when communicating with upper management or other entities less familiar with the details of the project. This high-level view can provide a common frame of reference for comparing projects—even if they are dissimilar in nature.

### 2.3 Functions of project management

Management is summarized into five basic functions:

- Planning
- Organizing
- Staffing and provisioning resources
- Directing or leading
- Controlling

#### Planning:

It involves deciding in advance what is to be done, how and in what order it is to be done in order to achieve the objectives. Planning aims at deciding upon the future course of action. In brief, Planning and scheduling involves the following:

- Collecting and synthesising information.
- Developing alternative courses of action within specified constraints.
- Comparing alternatives in terms of objectives feasibility and consequences.
- Selecting and scheduling the optimum course of action.
- Establishing policies, procedures, methods, schedules, programs, systems, standards and budgets for accomplishing project objectives.

#### Organising:

It is the process of establishing a structural relationship among functions of people, so as to streamline the achievement of assigned objectives. Organising involves the following main tasks:

- Dividing the work into component activities.
- Designing job structures.
- Defining performance targets and responsibilities.
- Allocating resources.
- Delegating authority commensurate with responsibility.
- Establishing structural relationship to secure coordination.

### **Staffing and provisioning resources:**

It implies managing and keeping manned, the positions created by the organization structure and providing them the right quality resources at the right time. These resources include people, materials, machinery and money. The connected management tasks include the following:

- Preparing resource procurement schedules.
- Developing specifications for required resources.
- Deciding appropriate sources of procurement.
- Budgeting resources and arranging approvals and purchases.
- Preventing wastage during resource holding at site.
- Supplying on time required quality and quantity of resources.

### **Directing or leading:**

It involves influencing people so as to enable them to contribute to organizational goals efficiently and effectively. Direction implies the following tasks:

- Providing effective leadership.
- Motivating participant's behaviour.
- Communicating instructions and orders.
- Providing a suitable climate for subordinates' development.

### **Controlling:**

It involves monitoring of the performance and applying corrective measures in case of deviations from the plan. The process of control can be sub-divided into the following stages:

- Specifying the factors to be controlled.
- Stating the methods of measuring control factors.
- Evolving systems for generating performance data.
- Monitoring data received and formulating corrective options.

- Applying corrective measures to put a plan on the scheduling path.
- Re-planning, when necessary.

## **3.0 PROJECT PLANNING AND SCHEDULING**

Project planning is the process of identifying all the activities necessary to successfully complete a project. Proper management and analysis of a construction project can be achieved by proper planning, scheduling and control. The objective of a project planning is to produce a time table of work with each job or task allocated a start date and a finish date, and with the assurance that the things necessary to do each job or task will be available when required. Although the common desired results of planning and scheduling is to finish the project on time.

A scheduling is a work programmer, set date-wise in a logical sequence; it is a time table for action. Time scheduling is the process of developing a work programme. It implies programming of the chosen work plan on a calendar basis and provides the base against which time progress is measured. A work schedule is an action plan with calendar date targets, whereas network is a planning technique.

### **3.1 Principles of planning and scheduling**

There must be an explicit operational plan to guide the entire project. The plan must include and link the three components of the project: scope, budget and schedule. Too often, planning is focused only on schedule without regard to the important components of budget and scope. This process starts with WBS. Planning, scheduling and controlling begin at the inception of the project and continue till the life of the project until completion. The other key principles of planning and scheduling are listed below:

- To build flexibility into the plan, include allowance for changes and time for reviews and approvals.
- To always remember that the schedule is the plan for doing work and it will never be precisely correct.
- To keep the plan simple, eliminate irrelevant details that prevent the plan from being readable.

### **3.2 Steps involved in Project Planning**

The following are the step by step procedure for project planning. They are:

- Make a detailed list of activities
- Prepare a network diagram
- Identify the critical path
- Allocate the resources or juggle the schedule

- Consider the trade-off of time and money
- Organize the project information
- Record the status of every activity
- Compare reported original plan

### 3.3 Project management process groups

Project management processes are grouped into four categories known as Project Management

Process Groups (or Process Groups) mentioned below:

#### 3.3.1 Planning process group

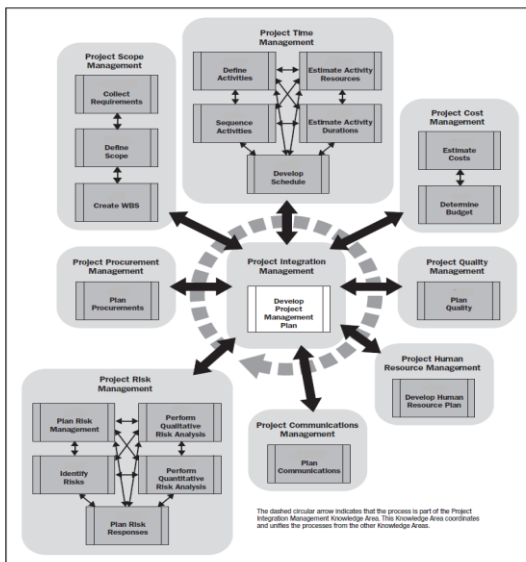


Figure 3.1 Planning process group

The Planning Process Group consists of those processes performed to establish the total scope of the effort, define and refine the objectives, and develop the course of action required to attain those objectives.

The project management plan and project documents developed as outputs from the Planning Process Group will explore all aspects of the scope, time, costs, quality, communication, risk, and procurements.. The Planning Process Group (Figure 3.1.) includes the project management processes identified below.

#### 3.3.2 Executing Process Group

The Executing Process Group consists of those processes performed to complete the work defined in the project management plan to satisfy the project specifications. This Process Group involves coordinating people and resources,

as well as integrating and performing the activities of the project in accordance with the project management

The Executing Process Group includes the following project management processes.

#### • Direct and Manage Project Execution:

Direct and Manage Project Execution is the process of performing the work defined in the project management plan to achieve the project’s objectives.

#### • Perform Quality Assurance:

Perform Quality Assurance is the process of auditing the quality requirements and the results from quality control measurements to ensure appropriate quality standards and operational definitions are used.

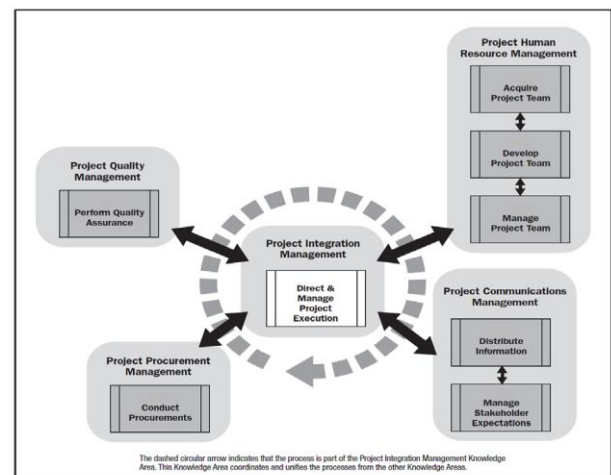


Figure 3.2 Executing process group

#### • Acquire Project Team:

Acquire Project Team is the process of confirming human resource availability and obtaining the team necessary to complete project assignments.

#### • Develop Project Team:

Develop Project Team is the process of distributing the competencies, team interaction, and the overall team environment to enhance project performance.

#### • Manage Project Team:

Manage Project Team is the process of tracking team member performance, providing feedback, resolving issues, and managing changes to optimize project performance.

### 3.3.3 Monitoring and Controlling Process Group

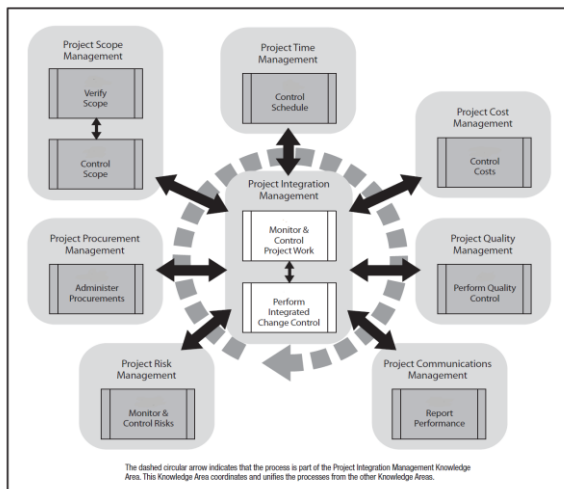


Figure 3.3 Monitoring and Controlling Process Group

The Monitoring and Controlling Process Group consists of those processes required to track, review, and regulate the progress and performance of the project; identify any areas in which changes to the plan are required; and initiate the corresponding changes.

The Monitoring and Controlling Process Group also includes:

- Controlling changes and recommending preventive action in anticipation of possible problems.
- Monitoring the on-going project activities against the project management plan and the project performance baseline, and
- Influencing the factors that could circumvent integrated change control so only approved changes are implemented

### 3.3.4 Closing process group

The Closing Process Group consists of those processes performed to finalize all activities across all Project Management Process Groups to formally complete the project, phase, or contractual obligations. At project or phase closure, the following may occur:

- Obtain acceptance by the customer or sponsor
- Conduct post-project or phase-end review
- Record impacts of tailoring to any process
- Document lessons learned
- Apply appropriate updates to organizational process assets

- Archive all relevant project documents in the Project Management Information System (PMIS) to be used as historical data, and
- Close out procurements

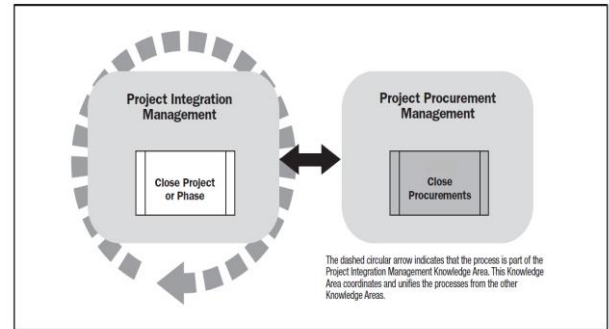


Figure 3.4 closing process groups

## 4.0 PROJECT SCHEDULING

Scheduling is the determination of the timing of activities and follows logically from the planning process.

### 4.1 Scheduling Methods

There are four basic scheduling methods that can be used:

- Bar chart
- Line of balance chart
- Network-based diagrams

#### Bar chart:

Bar charts were first used by Henry Gantt in the early part of the 20<sup>th</sup> century and accordingly are also referred to as Gantt charts. Bar charts are perhaps the most familiar method of scheduling

#### Line of balance:

The LOB is used when the activities or the work within a project consists of a number of units that are the same. LOB can be used for subset routines which may be a repetitious part of a network schedule. It is often used where the same activities are to be performed by the same team.

#### Network-based diagrams:

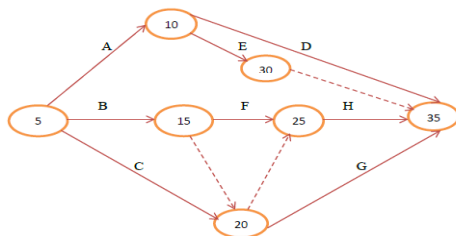
Modern planning and scheduling techniques have their origins through two developments known as CPM (critical path method) and PERT (program evaluation and review technique). There are two types of basic diagrams used in network scheduling:



- Activity-on-Arrow (AOA) and
- Activity-on-Node (AON)

**Activity-on-Arrow:**

AOA is the scheduling method applied when using PERT. AOA diagrams, like logic diagrams should always move from left to right, and as shown by Figure 4.1 the lines or arrows should always consist of a sloping section and a horizontal section. The AOA is also known as the "i-j" method; it was referred to as the "circle and connecting line". In this type of diagram the nodes show events; these are activities which have no duration — that is they take no time, such as the start or finish of an activity. The arrows connecting the nodes represent the activities. The nodes are usually numbered as a means of identifying the activities in the network. In activity on arrow (AOA) diagrams, "i" is the designation given to the start node of an activity and "j" is the designation given to the finish node of the same activity. Each node should have its own unique number. The same number should not be used more than once. The best procedure is to work out the sequence of activities first without nodes and then number the nodes after a satisfactory network has been drawn. Usually "j" number node is greater than "i" number node, but this is not mandatory. Forward numbering helps prevent loops.



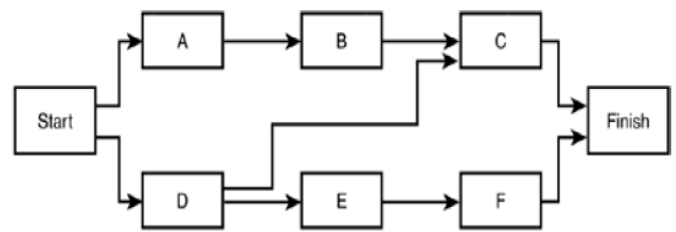
**Figure 4.1 Activity-on-Arrow diagrams**

The numbering of nodes is very important because the activities are normally referred to by their "i" and "j" designators. For example, if "H" is activity 25-35 then i=25, j=35. Both i and j represent events and points in time. Unlike activities, events do not need time for their execution. In AOA the nodes are represented by circles big enough to contain an event number, it is advisable not to use consecutive numbers.

**Activity-on-Node:**

The AON diagram is constructed using boxes containing activities, these boxes are called nodes. Arrowed lines, representing relationships with other activities, flow into the left of the node and leave on the right of the node. The arrowed lines, as in logic diagrams, show the "flow" or sequence of the activities. Lines in AON diagrams represent

the logical relationships among the activities. It is normal to draw these lines in what is referred to as staff format, which means the lines are either vertical or horizontal and all connections being orthogonal. In AON scheduling, the convention is that only one kind of dependency or logical relationship between activities is allowed — that is, "finish-to-start" (FS). In other words, the preceding activity must be complete before the succeeding activity can commence. As FS dependencies are the most common relationship found in practice between activities, then the AON network can be accepted as a valuable method of analyzing plans.

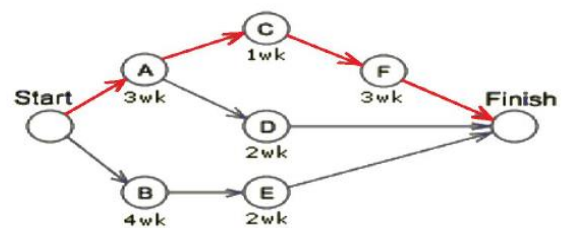


**Figure 4.2 Activity-on-Node diagrams**

**4.3.1 Critical Path Method (CPM)**

The most widely used scheduling technique is the critical path method (CPM) for scheduling. This method calculates the minimum completion time for a project along with the possible start and finish times for the project activities.

Critical path method models the activities and events of a project as a network. Activities are shown as nodes on the network and events that signify the beginning or ending of activities are shown as arcs or lines between the nodes. The figure below shows an example of a CPM network diagram:



**Figure 4.3 Critical path method diagrams**

**4.3.2 PERT (Programme Evaluation Review Technique)**

The Programme Evaluation and Review Technique (PERT) are employed for planning and controlling the projects involving uncertainties.

PERT is an event-oriented technique. Its basis is a network of events in which the activities are derived by connecting the

events. It lays stress on measuring the uncertainty in activity times by using the three-time duration estimation method. The figure below shows a simple example of a PERT diagram.

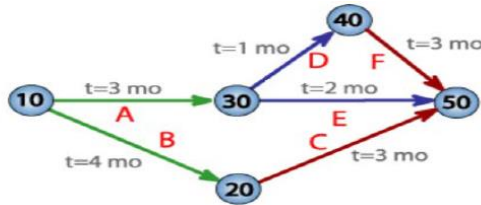


Figure 4.4 Programme Evaluations and Review Technique

### 5.0 QUALITY ASSURANCE

Quality assurance refers to the managerial processes which determine the organizations design, objectives and resources, the project team, funding agencies, performance standards and feedback on the project’s performance, appropriate actions to deal with deviation and all steps necessary for promoting quality awareness at all levels and in all parts of the project organisation.

A typical quality assurance programme addresses itself to the following:

- Organization structure of the project team and quality assurance department
- Responsibilities and powers of the various personnel involved
- Identification of the coordinating personnel
- Quality and its programmes
- Quality education and awareness
- Quality circles
- Training
- Setting up of management information systems for quality
- Resolution of technical differences and disputes
- Preparation of quality assurance manuals and their checklists
- Vendor survey procedure
- Vendor surveillance procedure

#### Perform quality assurance

Perform Quality Assurance is the process of auditing the quality requirements and the results from quality control measurements to ensure appropriate quality standards and

operational definitions are used. Perform Quality Assurance is an execution process that uses data created during Perform Quality Control. Continuous process improvement reduces waste and eliminates activities that do not add value.

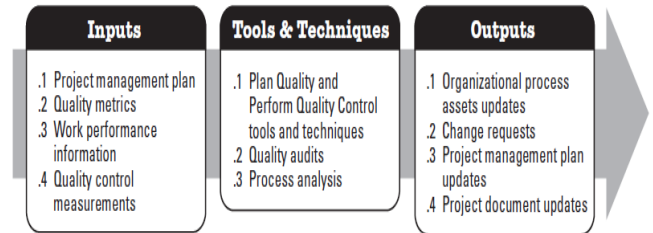


Figure 5.1 Perform quality assurance: Inputs, Tools and Techniques, and Outputs

List of some of the important BIS codes used to prepare quality assurance manual are:

- Foundation-As per IS 2950 (part I) – 1981
- Cement-As Per IS 8112-1989 & IS 12269 – 1987
- Hollow and Solid concrete block- As per IS 2185(part I) – 2005
- Concrete Works-As Per IS 456 - 2000
- Sand-As Per IS 2116 – 1980
- Aggregates for concrete-As per IS 2386 - 1963(Part-I to Part-V)
- Steel- As Per IS 432 (Part-I) – 1982

### 6.0 CONCLUSION

The construction planning and scheduling was done using the project management software known as Microsoft Project and was found effective in scheduling, allocation of resources and tracking of project.

- The schedule which was prepared here involves periodical as well as day to day observation in scheduling and tracking of the project.
- Scheduling using computer software as a tool was found to be easy and accurate. The project schedule and project track generation was its main highlight. The schedule report helps in identifying start date, finish date, also the duration of the project as a whole.
- Quality construction assurance documents were prepared to maintain the quality aspects in such a manner that the standards set by BIS are maintained.

## REFERENCES

1. Diego Echeverry, C. Williams Ibbs, Simon Kim (1991), 'Sequencing Knowledge for Construction Scheduling', Journal of construction engineering and management, Vol.117, No.1, March.
2. James L. Burati Jr, Michael F. Matthews, Satyanarayana N. Kalidindi (1991), 'Quality Management In Construction Industry', Journal of construction engineering and management, Vol.117, No.2, June.
3. Alexander laufer, Aviadshapira, Dora cohenca-Zall, Gregory A. Howell (1993), 'Prebid and Preconstruction Planning Process', Journal of construction engineering and management, Vol.119, No.3, September.

## BIOGRAPHIES



J.SHARNYASREENIVAS M.tech  
(civil) specialization in structural  
and construction management.