

Planning & Scheduling Guideline

By: Mohammad Wahba

Mo Wahba

Table of Contents

Planning & Scheduling Guideline	1
1. Introduction	3
2. Limitations	3
3. Understanding Basic Scheduling Concepts.....	3
2.1 What is a Schedule?	3
2.2 Types of Schedules.....	4
2.3 Scheduling is crucial for	5
4. Basic Primavera P6 Concepts.....	5
3.1 Introduction to Oracle Primavera P6.....	5
3.2 Key Terminologies in P6	5
5. Best Practices in Developing & Reviewing a Baseline Schedule	8
6. Best Practices in Reviewing a Schedule Monthly Update and Reports.....	10
6.1. Regular Updates:	10
6.2. Major changes “Working schedule Update”:	11
6.3. Reporting.....	12
7. General Recommendations for Project Managers Overlooking Critical Path Analysis	13
7.1 Check the Critical Path.	13
7.2 Review Resource Constraints.....	13
7.3 Clearly Define Activities.....	13
7.4 Ensure Regular Updates	13
7.5 Conduct Regular Communication.....	13
7.6 Detect and address deviations from the plan promptly.	13

Attachments:

- 1- Schedule review checklist
- 2- Schedule approval flow chart

3- Schedule logic representation

1. Introduction

This guideline is designed to help professionals responsible for reviewing schedules and construction planning easily understand the scheduling and Primavera P6 fundamentals. In addition, understand the best practices for developing, reviewing, and updating a baseline schedule. It also helps to highlight the common pitfalls and offers practical recommendations for project managers to ensure successful project delivery.

2. Limitations

This guideline is NOT designed to help senior or expert planning and scheduling professionals develop a detailed schedule; rather, it serves as fundamental knowledge and practice for construction professionals.

However, this guideline can be used by planning and scheduling professionals as a checklist, reminders and summary for best practices as it is based on AACE best practices.

3. Understanding Basic Scheduling Concepts

2.1 What is a Schedule?

A schedule is not just a timeline; it is a timeline that helps in delivering the project effectively. For the schedule to be effective, it should include and cover the following basic elements, among others:

- A detailed plan that outlines the sequence and duration of all tasks and activities required to complete a project.
- A complete project scope as per the contract
- Outlines the important contract deliverables, milestones and constraints.
- Outlines the milestones which have payment or liquidated damages attached to them.
- Outlines the long lead procurement items and delivery dates.
- Outlines the authorities' approval and long submittal processes
- As per contract requirements, a schedule should be loaded with appropriate resources, especially if the resources are insufficient for progress.
- If the schedule will be used as a progress payment tool, the schedule must be loaded with contract quantities and prices for the relevant activities.

2.2 Types of Schedules

- **Master Schedule (Level 1 pre-award schedule)**

High-level overview of the project timeline.

- **Detailed Schedule (Detailed post-award schedule)**

Sometimes called Level 3, Break down the master schedule into specific tasks and durations.

- **Short-term Schedule (Lookahead schedule)**

Also known as a lookahead schedule, this schedule focuses on the immediate future, typically covering a few weeks or months.

- **Updated Schedule (Monthly Progression schedule)**

The Updated Schedule reflects the project's current status, including any changes to activity start and finish dates, durations, and progress. It is regularly updated to reflect the project's progress and forecast accurately.

- **Baseline Schedule**

The Baseline Schedule is a snapshot of the original project schedule (Detailed schedule), including all planned activities, durations, and relationships. It serves as a reference point for comparing actual progress against the initial plan.

- **Recovery Schedule**

A Recovery Schedule is developed to bring a project back on track after it has deviated from the baseline schedule. It includes revised activities, durations, and resources to overcome delays and achieve project objectives within the original timeframe.

- **Revised Schedule**

A Revised Schedule is a modified version of the original or baseline schedule, incorporating significant changes such as scope adjustments, resource reallocation, or revised timelines. It reflects an agreed Extension of Time and an updated plan for project completion based on new information or circumstances.

- **Working Schedule**

A Working Schedule is a modified version of the original or baseline schedule, incorporating significant changes such as scope adjustments, resource reallocation, or major changes to the construction projects during the periodic updates. The increase in working schedule time does not reflect an agreed-upon Extension of Time but rather is used to monitor the project from an operational perspective in a realistic manner.

4. Why a Valid Schedule is Pivotal for a Project

A valid and healthy schedule is a versatile tool that can be used for different purposes as follows:

- Ensure and monitor the project completion
- Manage resources effectively and monitor their effect on the project
- Track progress and performance
- Identify potential delays and issues early
- Identify the risks and mitigate their effects
- Identify the critical external factors and their effect on the project
- Identify the effect of long-lead procurement on the project
- Analyze, quantify, and validate the time claims

5. Basic Primavera P6 Concepts

3.1 Introduction to Oracle Primavera P6

- Oracle Primavera P6 is a powerful project management software widely used for planning, scheduling, and controlling large-scale projects. It provides tools for managing schedules, resources, and project portfolios.

3.2 Key Terminologies in P6

- **Project**

A project in Oracle Primavera P6 is a collection of related activities and tasks to achieve a specific goal or set of objectives within a defined timeframe and budget. It includes all planning, scheduling, and management elements necessary for successful project execution.

The project can include linked subprojects. The decision to have subprojects depends on the Project's complexity and contract type.

- **WBS (Work Breakdown Structure)**

The Work Breakdown Structure (WBS) is a hierarchical decomposition of the project scope of work. It breaks the project into smaller, manageable sections or work packages, facilitating detailed planning, assignment, and monitoring of project activities.

- **Enterprise Breakdown Structure (EBS)**

The Enterprise Breakdown Structure (EBS) is a high-level framework within P6 that organizes and categorizes all projects and resources across the entire enterprise. It enables consistent project and resource management across different departments and business units.

- **Critical path:** The longest sequence of activities that determines the project completion date. Every delay in the critical path is a day delay to the project completion date.
 - **Total float (Slack):** the number of days the project critical path can be delayed by delaying the project completion date.
-
- **Free float:** is the number of days an activity can be delayed without delaying its successors.
-
- **Activity**
An activity in P6 represents a specific task or work item within a project. Each activity has a defined duration, resources, and relationships with other activities. It is the fundamental building block of a project schedule.
 - **Original Duration**
The original duration is the total time initially planned for an activity to be completed from start to finish. It is defined when the activity is first created and remains constant unless the schedule is updated or revised.
 - **Remaining Duration**
The remaining duration is the amount of time still needed to complete an activity. It is regularly updated to reflect the actual progress and work left to be done.
 - **Activities:** Specific tasks or work items to be completed at a specific time.
 - **Activity ID**
The Activity ID is a unique identifier assigned to each activity within a project. It is used to track, reference, and manage activities in the schedule.
 - **Duration:** The time allocated to each activity. It is calculated based on productivity, experience, or best practices.
 - **Physical Percentage Completion**
Physical Percentage Completion is a measure of the actual physical progress of an activity, expressed as a percentage. It is based on the amount of work completed relative to the total work required for the activity.
 - **Duration Percentage Completion**
Duration Percentage Completion is a measure of progress based on the amount of time elapsed relative to the total planned duration of an activity. It indicates how much of the activity's duration has been used up.
 - **Retained Logic**

Retained Logic is a scheduling technique that maintains the logical relationships between activities when an activity is delayed. It ensures that successor activities are scheduled to start only after their predecessors are completed.

- **Relationships:** The dependencies between activities. It can be Start-to-start (SS), Finish-to-Start (FS) and Finish-to-Finish (FF). The Start-to-Finish (SF) is rarely used in the construction.
- **Early Start (ES):** The earliest date an activity can begin based on the project schedule and its predecessor activities.
- **Early Finish (EF):** The earliest date an activity can finish, calculated based on its Early Start date and duration.
- **Late Start (LS):** The latest date an activity can begin without delaying the project completion date.
- **Late Finish (LF):** The latest date an activity can finish without delaying the project completion date.
- **Critical Path Method (CPM)**
The Critical Path Method is a scheduling technique used to determine the sequence of activities that defines the project duration. The critical path is the longest path through the project, with the shortest possible completion time and no float.
- **Resources:** Labor, equipment, and materials needed for each activity.
- **Resource Leveling**
Resource Leveling is a technique used to resolve resource over-allocations by adjusting activity start and finish dates, often resulting in an extended project duration.
- **Milestones**
Milestones are significant points or events in the project, typically with zero duration, used to mark the start or completion of major phases or deliverables.
- **Constraints**
Constraints are restrictions or limitations imposed on activities, such as specific start or finish dates. Examples include "Must Start On" (MSO) and "Must Finish On" (MFO).
- **Calendars**

Calendars define the working and non-working days and hours for activities and resources. Different calendars can be assigned to activities and resources based on availability and work patterns.

6. Best Practices in Developing & Reviewing a Baseline Schedule

- **Define & review the Project Scope**
 - Ensure the project scope is well-defined and agreed upon by all stakeholders. This includes understanding the project objectives, deliverables, and boundaries.
- **Develop and review a Comprehensive Work Breakdown Structure (WBS)**
 - Break down the project scope into a hierarchical WBS, dividing it into manageable work packages.
 - Define work packages that are specific, measurable, and assignable.
- **Identify & check all Activities**
 - Identify all activities required to complete each work package. Ensure activities are clearly defined and detailed.
 - Determine the logical sequence of activities, establishing clear dependencies between tasks.
- **Review and create Logic and Sequence**
 - Ensure every activity has at least one predecessor and one successor, except for the start and finish activities.
 - Use logical dependencies (finish-to-start, start-to-start, finish-to-finish, start-to-finish) to create a realistic sequence of activities.
 - Minimize the use of hard constraints like "Must Start On" or "Must Finish On" to maintain scheduling flexibility.
 - Clearly identify and manage the critical path to focus on activities directly impacting the project completion date.
- **Review Activity ID and Naming**
 - Assign unique, consistent, and meaningful IDs to all activities. Avoid using arbitrary numbers.
 - Develop a structured ID system that reflects the WBS hierarchy and facilitates easy identification and tracking of activities.
 - Use clear, concise, and descriptive names for activities to convey the specific task and its purpose.
 - Establish and adhere to standard naming conventions to ensure consistency and avoid confusion.
 - Minimize the use of abbreviations and codes that may be unclear to others.
- **Review Duration Length**
 - Estimate activity durations realistically based on historical data, expert judgment, and analogous projects.
 - Prefer shorter activity durations to allow for more accurate tracking and control. Avoid excessively long durations that can obscure progress.

- Include reasonable buffers for activities with high uncertainty to account for potential delays.
- **Check Calendars**
 - Assign appropriate calendars to activities and resources, reflecting actual working days, holidays, and non-working periods.
 - Use specific resource calendars to account for individual resource availability and working hours.
 - Ensure consistency in calendar usage across the project to avoid conflicts and scheduling issues.
- **Check Float and Open Ends**
 - Monitor and manage total float to ensure critical activities remain on track. Utilize float to optimize resource allocation and activity sequencing.
 - Eliminate open-ended activities (activities without successors) by ensuring every activity has logical predecessors and successors.
 - Pay close attention to activities with zero or negative float, as they directly impact the project completion date.
- **Incorporate Milestones**
 - Define and include key milestones to mark significant points in the project, such as phase completions and major deliverables.
 - Use milestones to track progress and measure achievement against the baseline.
- **Review Resources and Costs**
 - Create resource calendars to account for resource availability and working hours.
 - Allocate costs to activities and resources, ensuring the budget aligns with the baseline schedule.
- **Internal coordination**
 - Conduct an internal review of the baseline schedule to ensure all elements are complete and accurate.
 - Present the baseline schedule to key stakeholders for feedback and approval. Incorporate their input as necessary.
- **Baseline Freeze:** Once approved, freeze the baseline schedule to serve as the reference point for measuring project performance.
- **Comprehensive Documentation:** Document the baseline schedule, including all assumptions, constraints, and dependencies.
- **Accessible Records:** Ensure the baseline schedule and its supporting documents are accessible to all relevant project team members.

NOTE: The attached checklist to this guide serves as a comprehensive checklist to identify potential defaults in baseline

7. Best Practices in Reviewing a Schedule Monthly Update and Reports.

7.1. Regular Updates:

- In regular updates, only progress changes are inserted into the schedule. No changes to duration, logic, or activities should be made by adding or removing them. The schedule should be realistic and reflect the reality of construction after the updates.
- **Regular Site Progress Monitoring**
 - Collect daily reports from site supervisors and team leaders to track the progress of ongoing activities.
 - Conduct regular site visits to visually inspect progress, verify reported data, and address any discrepancies.
 - Take photos and videos of key work areas to document progress and support progress reports visually.
- **Consistent Data Collection**
 - Use standardized forms and templates for data collection to ensure consistency and completeness.
 - Maintain detailed records of work completed, resources used, and any issues encountered.
 - Define clear progress metrics (e.g., percentage completion, quantities installed) for each activity.
- **Update Schedule with Actual Progress**
 - Update the schedule with actual start and finish dates for completed activities.
 - Enter the percentage completion for ongoing activities based on the work done.
 - Adjust the remaining duration for ongoing activities to reflect the time needed to complete the remaining work.
- **Review and Validate Data**
 - Cross-verify progress data with multiple sources (e.g., site reports, photos, team feedback) to ensure accuracy.
 - Hold regular progress meetings with site supervisors and project teams to discuss updates and resolve any discrepancies.
 - Incorporate feedback from key stakeholders to ensure all progress updates are accounted for.

7.2. Major changes “Working schedule Update”:

- If the schedule becomes unrealistic and does not reflect the construction site conditions, dates or status, then major changes will be required in the update. Sometimes, no revised schedule is allowed until an agreed extension of time. In this case, the below changes can be executed in the schedule, and a change log that records all the changes must be submitted with the update. At this point, the updated schedule will be called a Working schedule, and any increase in time and duration doesn't constitute an automatic exemption of time claim.
- **Adjust Activity Sequences and Dependencies**
 - Adjust activity sequences and dependencies based on actual progress and any changes in site conditions.
 - Add new dependencies if activities are now linked due to changes in the work plan.
 - Recalculate the critical path to identify any new critical activities and potential impacts on the project timeline.
- **Resource Allocation and Adjustment**
 - Reallocate resources based on actual progress and any changes in resource availability or requirements.
 - Use resource leveling techniques to resolve any over-allocation or conflicts in resource assignments.
 - Update resource calendars to reflect any changes in working hours, shifts, or resource availability.
- **Incorporate Approved Changes**
 - Incorporate any approved changes to the project scope, schedule, or resources into the updated schedule.
 - Document and include any change orders that impact the schedule, ensuring all stakeholders are informed.
 - Maintain a detailed change log that records all changes to the baseline logic, sequence, or resources. Document the reason for each change, the impact on the project, and the approval status.
- **Update Milestones and Key Dates**
 - Update the status of project milestones based on actual progress and any changes in activity sequences.
 - Adjust milestone dates if necessary, ensuring they align with the current project status and objectives.
 - Review and update the status of key deliverables to reflect actual progress and any changes.

7.3. Reporting

- **Ask for and review the Schedule Analysis**
 - Perform variance analysis to compare progress against the baseline and identify deviations.
 - Assess the impact of any delays or changes on the overall project schedule and critical path.
 - Develop and implement recovery plans for any activities or milestones that are behind schedule.
 - S-Curves: Generate S-curves to represent cumulative progress over time graphically. Compare the actual S-curve with the planned S-curve to visualize performance and identify trends or deviations.

- **Communicate Updates to Stakeholders**
 - Prepare and distribute monthly progress reports to all relevant stakeholders, highlighting key updates and changes.
 - Hold regular stakeholder meetings to review the updated schedule, discuss any issues, and obtain feedback.
 - Ensure transparent and open communication with all stakeholders to maintain alignment and support.

- **Document and Archive Updates**
 - Maintain detailed records of each monthly schedule update, including changes made, reasons for changes, and updated progress data.
 - Use version control to track changes and maintain an audit trail of all schedule updates.
 - Archive historical data and progress reports for future reference and analysis.

- **Progress Presentation**
 - Use visual aids such as Gantt charts, S-curves, and progress photos to present updates.
 - Summarize key progress, changes, and impacts in a clear and concise manner.
 - Provide an executive summary highlighting major achievements, delays, and plans for the upcoming period.
 - Include detailed analysis and explanations for any significant deviations or changes.

8. General Recommendations for Project Managers Overlooking Critical Path Analysis

7.1 Check the Critical Path.

- **Impact:** Delays in critical activities can significantly affect the project timeline.
- **Solution:**
 - Regularly review the critical path.
 - Ensure it reflects the current project status.
 - Ask for the main critical path drivers and their effect
 - Mitigate the impact of the main drivers
 - Ask for the sub-critical path and do the same review as the critical path

7.2 Review Resource Constraints

- **Impact:** Resource shortages can lead to project delays and increased costs.
- **Solution:**
 - Plan and manage resources effectively by considering the availability
 - Review resource constraints and usage
 - Define site constraints that might obstruct the resources
 - Ensure resources are calculated based on standard well known productivity

7.3 Clearly Define Activities

- **Impact:** Ambiguity in activity definitions can cause misunderstandings and delays.
- **Solution:** Ensure activities are clearly defined with specific descriptions and durations.

7.4 Ensure Regular Updates

- **Impact:** Outdated schedules can lead to poor decision-making and missed deadlines.
- **Solution:** Regularly update the schedule to reflect actual progress and changes.

7.5 Conduct Regular Communication

- **Impact:** Poor communication can result in misaligned expectations and coordination issues.
- **Solution:** Foster open communication channels and ensure all stakeholders are informed.

8.1 Detect and address deviations from the plan promptly.