Introduction to Critical Path Method Scheduling using Primavera P6.1 Client for Construction

Includes Analysis of Contractor’s CPM Progress Schedules & Construction Contract Administration Issues

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Introduction to Critical Path Method Scheduling using Primavera P6.1 Client for Construction

**CPM Schedule Analysis:**

**Course Purpose and Objectives**

Contracts include CPM Progress Schedule requirements for several reasons:

- Ensure that the Contractor and the Department have a detailed plan and resources to complete the project in accordance with contract time requirements;

- Provide a means of monitoring the progress of work;

- Aids in communication and coordination of activities among all affected parties;

- Is required to analyze the effect of changed conditions on any milestone dates or on the contract completion date;

- Is required to analyze the effect of change orders for extra work or deductions, and unanticipated delays, on the contract completion date;

- Establishes a standard methodology for time adjustment analysis based on the principles of the Critical Path Method of scheduling, to analyze delays and resolve construction disputes concerning time;

- Is required to determine appropriate extensions or reductions of Contract Time.

This course provides a comprehensive overview of CPM Scheduling with respect to it being implemented by NYSDOT for review of Contractor's Progress Schedule submissions. It explains how to use a Progress Schedule as a project management tool to minimize project delays and time-related disputes. Also included here is the guidance on using the various tools and features of Primavera P6 software to satisfy NYSDOT CPM Schedule requirements.
This course will cover the following topics:

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The course introduces you to CPM Scheduling and the software application, Primavera P6. At the completion of this course, you will be able to:

- Understand the key building blocks of a CPM Schedule and the various software tools that help to organize the schedule and create reports
- Understand how the CPM Progress Schedule is used both as a Project Management and Program Management tool
- Understand the differences between Project data and tools as compared to Enterprise data and tools
- Understand the requirements of the CPM Scheduling specifications and how to review the contractor’s Progress Schedule submissions
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Primavera Tools

This training covers one of the Client-Server tools in the figure above: the **Project Management** application
NYSDOT has selected Primavera P6 which is a multi-user web enabled application that can provide the Department comprehensive information at a program (multi-project) level through executive summaries, and also at the project level through detailed activity views for field office staff using a Department wide enterprise database located on network servers.

Primavera P6 is an integrated solution with Department users located in the Main Office or Regional Offices having access to the Client though an Icon on their desktop or through CITRIX or to the WebPM through Internet Explorer, and Construction Field Office users having access to the Client tool through CITRIX or the WebPM tool through Internet Explorer. Consultant and Contractor users have access to the Client tool through CITRIX. The software tools are role specific to satisfy each team member’s needs, responsibilities, and skills. This provides NYSDOT a common platform for NYSDOT program area managers, NYSDOT field office staff, Contractors and Consultants.

**Primavera is an enterprise-wide solution.**

- Works identically in single and multi-project modes.
- Scalable client/server architecture.
- Relational databases: Oracle (which is used by NYSDOT), SQL Server or MSDE.

*Note:* For specification references, go to page 132 (Description of NYSDOT CPM Specification) and page 140 (D. Progress Schedule, 1. General)
Lesson 1:

The Project Management Life Cycle

Objectives

This lesson provides an overview of how the Primavera software tool can assist in the various stages of the project management life cycle. At the completion of this lesson, you will be able to:

- Review the relationship between the various Primavera software features and the project management life cycle.
- Identify the five process groups in the project management life cycle.
- Identify your NYSDOT role in the project management life cycle.
Project Management Life Cycle

Project management is the process of achieving set goals within the constraints of time, budget and staffing restrictions.

Lessons in this curriculum will cover the processes applicable to the NYSDOT schedule analysis requirements.

Initiating process group

Planning process group

Executing process group

Controlling process group

Closing process group
Project Management Life Cycle *(continued)*

Each process can be broken down into these steps:

- **Initiating process**
  - Project information
  - Organization commitment
  - Team development
  - Scope definition
  - Activity definition

- **Planning process**
  - Schedule development
  - Resource and cost planning
  - Project plan development

- **Executing process**
  - Information distribution
  - Project plan execution
  - Performance reporting
  - Administrative closeout

- **Controlling process**
  - Are there changes?
  - Project complete?

- **Closing process**
  - Yes
  - Project closeout
  - Administrative closeout
  - Project completion
  - Substantial Completion, EIC Inspection, Punchlist, Engineer’s Acceptance

- **Yes**
  - Yes
  - Contractor’s Baseline Progress Schedule, (Project Plan)
  - Contractor’s Monthly Progress Schedule Submission & DOT review and comment

- **No**
  - No
  - Project Award
  - Contracts, Plans, Proposals
  - Contractor’s Baseline Progress Schedule, (Project Plan)
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Planning Process Group

(Contractor)

- Project objectives & scope of work are defined by contract documents
- Create project work activities
- Determine the work sequence and duration
- Establish resource requirements/availability
- Evaluate, optimize, and freeze baseline

Excerpt from Specification A. Project Scheduler:

The Contractor shall designate an individual, entitled the Project Scheduler, who will develop and maintain the construction progress schedule. The Project Scheduler shall be present at the Preconstruction Schedule Meeting, prepared to discuss, in detail, the proposed sequence of work and methods of operation, and how that information will be communicated through the Progress Schedule. The Project Scheduler shall attend all meetings, or receive meeting minutes that outline schedule related issues of those meetings, which may affect the CPM schedule, including but not limited to those between the Contractor and their Subcontractors and between the Contractor and the Department. The Project Scheduler shall be knowledgeable of the status of all aspects of the work throughout the length of the Contract, including but not limited to: original contract work, additional work, new work, and changed conditions of work.

Excerpt from Specification D. Progress Schedule, 1. General:

The Contractor will be the sole entity allowed to physically modify the following data within the progress schedule: activity IDs; activity descriptions; activity durations; relationships between activities; successors and predecessors, actual start and actual finish dates of activities; planned start and planned finish dates of activities; and activity resources.

The Department may modify certain data associated with the progress schedule to ensure conformance to the Department’s Enterprise Project Management standard schedule format. This means that the Department may: create additional layouts, filters and reports; create and edit additional user defined custom data fields; assign Project Codes; add and assign additional project Activity Codes; add and assign additional Cost Account Codes; add and assign additional Resource Codes; enter data in Notebook tabs; modify calendar ID’s (although not the calendar itself); etc; that do not alter the established activities or schedule logic of the Contractor. The Engineer shall communicate to the Project Scheduler the types and scope of changes planned to be made to the progress schedules prior to the implementation of those changes. The Contractor shall not delete or modify any schedule data entered by the Department without prior approval by the Engineer. The schedule data added by the Department shall be incorporated into future schedule submissions of the Contractor.

NYSDOT Project Field Office Staff will review and analyze the submitted schedule from the contractor to verify that it conforms to the contract document requirements. This includes the relevant CPM Special Specification, Special Notes, Section 100 of the Standard Specifications, and any Time-Related contract provisions.

Note: For specification references, go to pages 137 and 140
Controlling Process Group
(Contractor and DOT)

- Contractor updates the project plan to reflect Actual Start and Actual Finish of work activities, changes to sequencing of activities, and activity logic and duration
- DOT verifies progressed work activities Actual Start and Actual Finish dates on Remaining Duration using inspector reports or other project records
- DOT and contractor adjust the project plan to stay on schedule
- Reschedule the project
- Communicate project performance to the project team

Excerpt from Specification D, 4, b. Monthly Progress Schedule Submission:

b) Subsequent Monthly Progress Schedule Submissions - On a monthly basis, the Contractor shall submit a copy of the current Progress Schedule that includes all Progress Schedule Revisions and Progress Schedule Updates to reflect the actual and planned prosecution and progress of the contract work. Progress Schedule Updates shall reflect the status of activities that have commenced or have been completed, including the following items: (a) actual dates in activity Actual Start and Actual Finish columns as appropriate; (b) actual Remaining Duration for activities commenced and not complete; and (c) actual activity Suspend or Resume dates for activities commenced and not complete. Progress Schedule Revisions reflect modifications made to activities in the current project baseline schedule in any of the following items: (a) activity Original Duration; (b) changes in logic connections between activities; (c) changes in Constraints; (d) changes to Activity Descriptions; (e) activity additions or deletions; (f) changes in Activity Code assignments; (g) changes in activity Resource assignments; and (h) changes in Calendar assignments.

Note: For specification reference, go to 2nd paragraph of page 150
Excerpt from Specification E. Progress Schedule Review and Analysis, 1, 4:

1. Immediate Rejection of Progress Schedule Submissions.
   The following deficiencies in a Contractor’s progress schedule submission shall be grounds for the immediate rejection by the EIC, without further review, analysis and/or comments.
   a) Failure of the Project Scheduler to “schedule” the project, as of the data date.
   b) Failure to attach a copy of the complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by Primavera software application).
   c) Any activities without predecessors, or activities without successors, appearing in the Scheduling/Leveling Report with the exception of the first and last activity in the schedule.
   d) Any activity constraints appearing in the Scheduling/Leveling Report that have not been approved in writing by the EIC, or that are not specifically allowed by this specification.
   e) Any Activities with Actual Dates > Data Date appearing in the Scheduling/Leveling Report.
   f) Any Milestone Activities with invalid relationships appearing in the Scheduling/Leveling Report.
   g) Failure to have a clearly defined Critical Path from the Data date to the last activity in the schedule, using the Longest Path method. This would reflect logic errors in the project schedule.
   h) Failure to attach the schedule Narrative and required appendices.
   i) Failure to attach the Claim Digger Report (generated by the Department’s Primavera scheduling software application) providing a comparison between this Progress Schedule submission and the previous Progress Schedule submission. (Not required for baseline submissions)

   If any of these deficiencies are found, the Contractor’s submission shall be considered deficient, and Engineer will notify the Contractor immediately by return E-mail of the rejection of the schedule submittal.

4. Department Review and Acceptance of Progress Schedules.
   The Engineer will review the Monthly Progress Schedule submissions and will prepare a written response (Progress Schedule Review Report) to the Contractor’s submission within five (5) State Business Days following receipt of the Contractor’s complete schedule submission. The Engineer will either “accept” the schedule, “accept as noted”, or “reject” the schedule for re-submittal by the Contractor.

   If the Progress Schedule submission is not in compliance with contract requirements, the Engineer may reject the submittal and shall forward any comments and requests for schedule revisions to the Project Scheduler with a copy to the Contractor. The Project Scheduler shall address all comments in writing and/or make the requested revisions, and resubmit the revised schedule within three (3) State Business days of the Engineer’s reply. If the Engineer determines the revised submission still does not meet the contract requirements, any further revisions required thereafter shall also be submitted for acceptance within (3) business days of the request for revisions by the Engineer.

Note: For specification references, go to pages 154 and 155
Lesson 1: The Project Management Life Cycle

Review Questions

1. **True or False:** Only the Contractors should learn about Primavera as a CPM Scheduling tool since they are the project schedulers.

2. Who is the **Controlling Process Group** and what does this group do?


4. **True or False:** According to **Specification E. Progress Schedule Review and Analysis**, when any deficiencies are found, the Engineer will notify the Contractor after 5 days about the schedule submittal rejection.

5. How can CPM Scheduling be useful in monitoring and ensuring that projects complete successfully?
Lesson 2:

Navigating in Primavera P6

Objectives:

In this lesson, you will be introduced to the basic functions and features of Primavera P6. At the completion of this lesson, you will be able to:

- Log in
- Open and close an existing project
- Navigate the Home and Activities windows
- Understand EPS
- Understand WBS

Excerpt from Specification B. Scheduling Software, Paragraph 6:

Project schedules are developed from the Contractor’s knowledge of the project, and the means and methods represented in those schedules are based on the Contractor’s understanding of the contract documents, and the Contractor’s past experience, which are unique to the Contractor. Schedule activity data and logic are therefore the intellectual property of the Contractor and will not be made available to other Contractors. All other schedule data, and all Enterprise data residing on the network servers, are the sole property of the Department.

Note: For specification references, go to page 137
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Logging In: Citrix

Initial login to the NYSDOT server will be through Citrix remote access. Once you are logged on the server, you will then access Primavera.

Excerpt from Specification B. Scheduling Software, Paragraph 5:

Primavera software and schedule data on the Department’s EPMD will generally be available for the Contractor’s use at all times unless system maintenance (i.e. backups, upgrades, etc) is being performed. System maintenance will generally be conducted over short time periods between the hours of 10 PM – 6AM, Monday - Friday and on weekends. The Department does perform regular backup of data contained in the EPMD, and will make every effort to restore the latest historical copy of schedule submissions in the event of any data failure of the EPMD. The Contractor shall also be responsible for exporting copies of project progress schedules, recovery schedules, TIA schedules, after data modifications have been made as their backup of these submissions. In the event a Contractor’s authorized user cannot access the software from 6AM to 10PM Monday through Friday, the Contractor shall provide written notification to the Engineer.

Steps:

1. Access the NYSDOT Citrix website: http://www.nysdot.gov/citrix
2. Enter your Citrix user name and password
3. After a successful login, select the Primavera application icon. For training, click “Test - Primavera 61 for Construction.” For production project reviews, click “Primavera 61 for Construction.”

Note: For specification reference, go to the 3rd paragraph of page 137
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Logging In: Primavera

Before using Primavera, you must enter a valid login name and password. If you do not know your login name and password, contact your NYSDOT system administrator.

Steps:

1. Click Start, Programs, Primavera, Project Management (only when installed locally)

2. Type in your assigned Login Name and Password. During training, these will be provided for you. For production project reviews, the Office of Construction will provide you a user login name upon request and supervisory approval.


4. Click OK

Note: User names and passwords ARE case-sensitive!
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Welcome Dialog Box

Mark the Do Not Show This Window Again checkbox if you do not want the Welcome dialog box to appear each time you open the module. The last project used at startup automatically opens. To turn this option back on, choose Edit, User Preferences, then click the Application tab and mark the Show the Welcome Dialog at Startup checkbox.
**Home Window**

The home window is a starting point for navigating through various windows.

<table>
<thead>
<tr>
<th>Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Title Bar</td>
<td>Displays current application and name of open projects.</td>
</tr>
<tr>
<td>2. Menu Bar</td>
<td>Perform functions in Primavera</td>
</tr>
<tr>
<td>3. Directory Bar</td>
<td>Quickly display Primavera Windows</td>
</tr>
<tr>
<td>5. Status Bar</td>
<td>Displays user’s login name, data date of open projects, access mode, and current baseline.</td>
</tr>
</tbody>
</table>
Workspace

The main windows have different functions, but the navigation options are consistent.

When you first open a project, the Home workspace displays the main functions available in the module. For example, click Activities to focus on activity data and customize layouts. The workspace for each main window consists of a menu bar, navigation bar, directory bar, toolbar, and command bar.

- Use the toolbar to quickly access options that pertain to the window displayed and to change the look of your layout.
- Use the navigation bar to move between open windows, display and hide the directory, and open Help quickly for a specific window.
- Choose a menu to open a list of commands.
- Use the directory to switch your focus.
- Click the buttons in the Command bar to perform various functions specific to the open window.
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**Directory Bar**

Display the directory bar Use the directory to display windows quickly. Choose View, Toolbars, Directory, to display or hide the directory bar. To display or hide directory bar button text, choose View, Toolbars, Directory Button Text.

<table>
<thead>
<tr>
<th>Projects</th>
<th>Displays the Projects window. Use to globally review the global enterprise project structure (EPS), and to work with individual projects.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Resources</td>
<td>Displays the Resources window. Use to add or modify your organization's resources.</td>
</tr>
<tr>
<td>Reports</td>
<td>Displays the Reports window. Use to produce reports for all projects or the open project.</td>
</tr>
<tr>
<td>Tracking</td>
<td>Displays the Tracking window. Use to display and create tracking layouts for the open project.</td>
</tr>
<tr>
<td>WBS</td>
<td>Displays the Work Breakdown Structure window. Use to add or modify the open project's work breakdown structure (WBS).</td>
</tr>
<tr>
<td>Activities</td>
<td>Displays the Activities window. Use to work with activities in the open project.</td>
</tr>
<tr>
<td>Assignments</td>
<td>Displays the Resource Assignments window. Use to view, add, and delete resources assigned to activities.</td>
</tr>
<tr>
<td>WPs &amp; Docs</td>
<td>Displays the Work Products and Documents window. Use to create and assign work products/documents for the open project.</td>
</tr>
<tr>
<td>Expenses</td>
<td>Displays the Project Expenses window. Use to work with expense items for the open project.</td>
</tr>
<tr>
<td>Thresholds</td>
<td>Displays the Project Thresholds window. Use to add or delete thresholds for the open project.</td>
</tr>
<tr>
<td>Issues</td>
<td>Displays the Project Issues window. Use to add or delete issues for the open project, review issue history, and notify other team members of issues.</td>
</tr>
<tr>
<td>Risks</td>
<td>Displays the Project Risks window. Use to add, delete, or calculate risks for the open project.</td>
</tr>
</tbody>
</table>
Activities Window

The Activities window is used to create, view, and edit activities for open projects. It can be divided into a top and bottom layout.

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<thead>
<tr>
<th>Item</th>
<th>Functionality</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Toolbar</td>
<td>Displays icons that allow you to change look of layout.</td>
</tr>
<tr>
<td>2. Command Bar</td>
<td>Displays options for adding or removing activity data.</td>
</tr>
<tr>
<td>3. Gantt Chart</td>
<td>Provides graphical display of activity progress over time.</td>
</tr>
<tr>
<td>4. Activity Details</td>
<td>View/edit detailed information for selected activity</td>
</tr>
<tr>
<td>5. Horizontal Split Bar</td>
<td>Hide or show more information in top/bottom layouts.</td>
</tr>
<tr>
<td>6. Vertical Split Bar</td>
<td>Drag Bar to hide/show more information in each pane.</td>
</tr>
<tr>
<td>7. Activity Table</td>
<td>Displays activity information in spreadsheet format.</td>
</tr>
<tr>
<td>8. Layout Options Bar</td>
<td>Displays menu of available options for Activities window.</td>
</tr>
</tbody>
</table>
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What is an EPS?

Projects are arranged in a hierarchy called “enterprise project structure”. The EPS can be subdivided into as many levels or nodes as needed to parallel work in the organization.

Nodes at the highest or root level represent divisions within the agency, next level nodes represent Zones, then Regional Offices, then Construction Supervisors, then construction contracts; or they could be by other major groupings that reflect how or by whom projects are delegated and tasked.

NYSDOT Enterprise Project Structure (EPS)

The NYSDOT Enterprise Project Structure (EPS) is developed in a hierarchy to help the NYSDOT organize projects.

- The EPS is made up of roots and nodes.
  - Each root in the project structure can be subdivided into many nodes.
  - Nodes represent different levels within the NYSDOT project structure.
    - For example Divisions, Zones, Regions, Area Construction Supervisors, Construction Contracts, etc.

- All projects must be included in a node.
  - Each node can contain an unlimited number of projects.
  - Projects always represent the lowest level of the hierarchy.
  - Placement of a project in the hierarchy determines the summary level in which it is included.
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Displaying EPS

Steps:

In the command line, click **Enterprise, Enterprise Project Structure**.
NYSDOT Enterprise Project Structure (EPS)

The EPS offers many benefits:

- View project priorities, scope, budgets, and resources across the entire project structure or within a specific node.

- Manage projects separately while retaining the ability to roll up and summarize data across multiple projects.
  - Each node acts as a master project, rolling up all “child” nodes and projects.
  - A node can be opened to view all detailed activity information from the “member” projects.

- View resource allocation across projects.

- Assign security at any level of the project structure to provide users with appropriate access to project information.
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What is a WBS?

Work Breakdown Structure is a hierarchical arrangement of the products and services produced during and by the project. The project is the highest level while an individual activity (or an action item) to create a product or service is at the lowest level.

Excerpt from Specification 2. Baseline Progress Schedule @ Award:

iii) Work Breakdown Structure (WBS) - A multi level hierarchal WBS shall be incorporated. The levels (nodes) shall include, but not be limited to:
   - Level 1 - is the project level;
   - Level 2 - shall have three nodes; Preconstruction Activities, Construction Activities, and Post Construction Activities;
   - Level 3 - Preconstruction activities shall have two sub nodes; Submittals/Shop Drawing Activities, and Procurement/Fabrication Activities;
   - Construction activities shall be broken into nodes for various geographic “Areas” of work within the project limits;
   - Level 4 - the Areas of work shall have sub nodes for the various Stages of work;
   - Level 5 - the Stages of work shall have sub nodes for the various highway features: bridges, highway segments, interchanges, intersections/roundabouts, etc;
   - Level 6 - the highway features should be broken into their components (a bridge into components such as Piles, Substructure, Superstructure), and a highway segment into components such as pavement, drainage, earthwork, lighting, traffic signals, etc.

As an example, one product of an NYSDOT project could be a new bridge. One node of the WBS will represent this as “product” or “deliverable” for the project. All work activities to build the bridge would be assigned to this WBS node. The software then summarizes the total of all the activities under this node to allow the user to see what effort is required to build the bridge. If sub nodes are included under this node, the work will be broken up into various components such superstructure, substructure, deck, etc. Then, these sub nodes will summarize the work activities assigned to each of them.

Note: For specification reference, go to the last paragraph of page 144
NYSDOT Standard Work Breakdown Structure

The NYSDOT Work Breakdown Structure (WBS) is a hierarchical arrangement of the deliverables produced during and by a project. It enables you to divide a project into meaningful and logical pieces for the purpose of planning and control. NYSDOT has developed a template for baseline project schedule.

- Each project has a unique WBS hierarchy.
  - The root level of the WBS is equal to the project ID and name.
- Elements within the WBS have a “child/parent” relationship, which means that you can roll up and summarize information from the lower levels.

**Steps:**

1. Select **File, Open, All Projects**; click the **Open** button.

2. In the **Directory Bar**, click on the **WBS** button.

---

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NYSDOT Standard Work Breakdown Structure

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**Steps:**

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2. In the **Directory Bar**, click on the **WBS** button.
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Opening an Existing Project

The open project dialog box lists all the projects you have access to open.

- Open a single project, indicated by

- Open a single node, indicated by ○ All projects under the node are opened.

- Open multiple projects under different nodes.
  ○ Press Ctrl+click to select more than one project.

Steps:

1. In the Directory Bar, click the Projects button.
2. At the File menu, click Open. At Open a Project box, click Open.

Access Modes

You have the option to select and access mode prior to opening a project:

Read Only
- View data, but cannot input or change data.

Shared
- Multiple users can view, input, and change data.
- This is the default setting.

Exclusive
- Current user is the only user who can edit data.
- Other users can access the project in Read Only mode.
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Closing a Project

You should close the project when you are finished working with it. You are prompted to verify that you want to close the project.

Closing the project takes you back to the Home window.

Steps:

1. In the File menu, click Close All.

2. When prompted, click Yes.
Lesson 2: Navigating in Primavera

Review Questions

1. Why is the WBS (Work Breakdown Structure) an important component in planning the CPM Schedule?

2. In Primavera, when you’re on the Project layout, how do you know that you have opened the right project?

3. Yes or No: According to NYSDOT Special Specification for CPM Scheduling, activities should have identifiable task, have definable start and finish dates; and can be used to plan, schedule and monitor a project.

4. Where do activities appear in the WBS?

5. True or False: NYSDOT EPS (Enterprise Project Structure) can be divided into as many levels or nodes as needed to parallel work in the organization.
Lesson 3:

Formatting Schedule Data Layouts

Objectives

This lesson examines the different CPM schedule data layouts. At the completion of this lesson, you will be able to:

- Open and understand Project layouts
- Open and change existing Activities layouts
- Customize data columns
- Display data using Group and Sort function
- Understand the different options for saving a layout
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**Data Layout**

A layout is a customizable view of information. It is a combination of all the visual elements that appear on the screen. Layouts are available in the Projects, WBS, Activities, Resource Assignments, and Tracking windows.

**Project**

Projects are created at the highest level (Level 1) of the Work Breakdown Structure (WBS).

**Project Layout**

The Projects window provides option of viewing data in top/bottom layouts. The department uses a standard global layout named “NYSDOT Projects.”

- Choose one of the following to show on top:
  - Project Table
  - Gantt Chart
  - Chart View

The bottom layout can only display Project Details.
Activity

Activities are the fundamental work elements of a project. They are the lowest level of a WBS and, as such, are the smallest subdivision of a project. Activities represent the work that must take place in a determined amount of time.

Activity Layouts

The Activities window provides the option of viewing data in top/bottom layouts.

- Choose one of the following to show on top:
  - Activity Table
  - Gantt Chart
  - Activity Usage Spreadsheet
  - Activity Network

- Choose one of the following to show on bottom:
  - Activity Details
  - Activity Table
  - Gantt Chart
  - Activity Usage Spreadsheet
  - Resource Usage Spreadsheet
  - Activity Usage Profile
  - Resource Usage Profile
  - Trace Logic
Opening an Existing Layout

You can choose from a number of layouts to present activity data from different perspectives, allowing you to spend more time managing projects instead of repeatedly preparing the displays.

You can create your own activity layouts or use Global layouts provided by NYSDOT.

Steps:

1. In the Layout Options bar, click Layout, Open

   If you make any modifications to the current layout, you will be prompted to save those changes. In most cases, you will choose No.

2. When prompted to save changes to the layout, click No.

3. Select Baseline Schedule Submission or Monthly Progress Schedule.

4. Click Open.

5. Examine the Gantt Chart. Click the Bars icon to check how the bar coding is defined.
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Gantt Chart

Excerpt from Specification 4. Monthly Progress Schedule Submission, d:

xix) The following appendix in Adobe Acrobat PDF file format, formatted to fit ANSI Size D paper (610 mm x 914 mm) (24 inch x 36 inch) paper, shall be included with the narrative.

- APPENDIX 1 – A listing of all work activities as of the data date, using the Classic Schedule Layout, sorted by Early Start Date, Total Float in increasing order, showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start date, Early Finish date, Start date, Finish date, and Calendar ID. The grouping of activities shall be by Area, Stage, WZTC Phase, and Type of Work. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

The Classic Schedule Layout displays a Gantt Chart in the top layout, and Activity Details in the bottom layout.

- Activity Table – Displays activity data in columns.

- Gantt Chart (known as Bar Area) – Provides a graphical display of activity progress over the duration of the project.

Note: For specification reference, go to the last paragraph of page 152
Activity Table

You can display the Activity Table on the screen if you want to analyze data in a tabular format.

- Enables you to see project data in spreadsheet format.
- You can modify the columns displayed in the Activity Table to meet your needs.

Steps:

In the Layout Options bar, click Show on Top, Activity Table.
Customizing Columns

You can use Hint Help to view a definition for any data item in the column list.

Steps:

1. Click the Layout Options bar, select Columns.

2. At Columns window, click the Available Options bar and select Hint Help.

3. Inside the Available Options column, click the “+” sign next to Percent Completes. Highlight Activity % Complete and click .

4. Highlight and click on Activity % Complete.

5. To move Hint Help dialog box, click icon. It will turn to icon. Drag the box to your desired location on the screen.

6. To disable Hint Help, click icon.
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Displaying Activity Details

Activity Details displays detailed information for the activity highlighted in the Activity Table or Activity Network.

Steps:

In the Layout Options bar, click Show on Bottom, Activity Details.
Selecting Detail Tabs

The tabs displayed in Activity Details are customizable.

Steps:

1. In the Layout Options bar, click Bottom Layout Options.

2. In the Available Tabs, select Feedback.

3. Double-click to move the selected data item into the Display Tabs column.

4. Click OK.
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**Grouping Data**

Grouping is a flexible way to organize data into categories that share a common attribute. You can group data to customize layouts, which can be used for reporting purposes.

You can quickly view subtotal data in the group title bands, view summary bars in the Gantt Chart, and summarize data for reporting purposes.

- Grouping is available in all the windows and most dialog boxes.
  - Each window or dialog box has its own grouping options.
  - Some windows have customized/pre-defined groups.

- Activities can be grouped by hierarchical fields such as WBS, activity codes, and project codes.

- Activities can be grouped by data fields such as dates, costs, total float, and other numeric data.

**Steps:**

1. Open your project and go to its’ activities
2. In the Layout Options Bar, right-click and select *Group and Sort.*
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**Group and Sort Dialog Box**

The Group and Sort dialog box is used to set up how you want to organize activities on screen.

- **Show Grand Totals** – Mark to display a grand total row at the top of the layout.
- **Show Summaries Only** – Mark to hide the activities within each group title band.
- **Group By** – Lists data items used to group the current display.
- **To Level** – Indicates the number of levels to display when grouping by hierarchical data item.
- **Group Interval** – Indicates the interval by which you want to group the selected data item.
- **Font & Color** – Displays the font/color for each group title band.
- **Show Title** – Mark to display the name of the field that the layout is grouped by; the value will also be displayed.
- **Hide if Empty** – Mark to hide the group title bands that do not contain activities.
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**Grouping by Weekly Actual Finish**

**Steps:**

1. Open a project. Go to Activities. Click the Layout Bar and select Classic Schedule Analysis.

2. Click the Layout Bar and select Group & Sort.

3. Click on the first row of the Group By column, select Actual Finish.

4. In the Group Interval column, select Week.

5. Click OK.
Saving Layouts

Layouts can be saved and shared with other users to facilitate project communication.

- **Layout, Save** – Saves changes to the existing layout.
- **Layout, Save As** – Prompts you to save the layout with a new name.
  - **Current User** – Only the user creating the layout will have access to it.
  - **All Users** – All licensed users will have access to the layout (Global). Only certain NYSDOT staff will have this capability to help maintain standards.
  - **Another User** – A specified user will have access to the layout. Note, however, that the current user will not have access to the layout. Only certain NYSDOT staff will have this capability to help maintain standards.
  - **Project** – Users who have access to the project will have access to the layout.

```
Steps:

1. In the Layout Options bar, click Layout, Save As.
2. Type a Layout Name <NYSDOT – Your Name>.
3. Verify Current User is selected in the Available to field.
4. Click Save.
```
Lesson 3: Formatting Schedule Data Layouts

Review Questions

1. **Specification 4. Monthly Progress Schedule Submission, d,** requires the submittal of the project schedule’s Gantt Chart. Why?

2. The same specification above also requires the grouping of activities by Area, Stage, WZTC Phase and Type of Work. What Primavera feature can assist you in “grouping” data layout?

3. How do you change the **Activity Layout** screen?

4. You want to change the data columns being displayed in your layout, what function will you use?

5. You just created a new layout and want to save it so that everyone who has access to the project will be able to use it. What do you do?
Lesson 4:
Working with Activities

Objectives

In this lesson, you will learn the features and details of the Activities layout. At the completion of this lesson, you will be able to:

- Differentiate between primary activity data versus secondary activity data
- Explain activity components, types and detail tabs
- Examine an activity’s calendar assignment
- Use filters to customize activities layout
- Use Activity Codes in combination with Filter and Group & Sort functions to produce custom views and reports

NYSDOT requires that the contractor provide a detailed CPM schedule for their project.

Excerpt from Specification 2. Baseline Progress Schedule @ Award, d, ii:

ii) Sufficient activities shall be included to assure that there was adequate planning for the entire project. The appropriate number of activities will be largely dependent upon the nature, size, and complexity of the project. In addition to all site construction activities, network activities shall include: activities necessary to depict the procurement/submittal process including shop drawings and sample submittals, and the fabrication and delivery of key and long-lead procurement elements; activities assigned to subcontractors, fabricators, or suppliers; activities assigned to the Department and other involved State agencies and authorities; punch list activities; close out activities; and activities assigned to other entities such as utilities, municipalities, County government/agencies, and other adjacent contractors. The schedule shall indicate intended submittal dates, and depict the review and approval periods as defined in the Contract Documents for Department review.

Note: For specification reference, go to the last paragraph of page 142
Working with Activities (continued)

As part of your schedule review, you will evaluate the detailed activity list that describes how the contractor will conduct their work. Your expertise in the construction process will be your guide to the validity of the schedule.

Suggestions for evaluating activities:

- Are the activities listed in enough detail?
  - Activities should not be more than 15 days long.
    - There may be some acceptable exceptions.

- Activities should have only one responsible organization.
  - For example: Contractor, NYSDOT, Utilities, other agencies

- Activities should include all phases of work including:
  - Submittals, procurement, fabrication, construction, etc.

- Do the activities meet the specification requirements?

Activity Components:

Note: When creating an Activity, all components on the Mandatory side are required. WPs & Docs are optional for now but will be a part of requirements in the future.
Activity Details

All of the activity components can be accessed through the Activity Details form and the details tabs.

Defining General Activity Information

Use the General tab to define general information for the selected activity, including duration type, WBS assignment, primary resource, activity type, and activity calendar.

In the Activities window, select the activity whose general information you want to define. Click the Layout Options bar, then choose Show on Bottom, Activity Details; click the General tab.

Excerpt from Specification D, Progress Schedule, 1. General, Paragraph 4:

The Contractor will be the sole entity allowed to physically modify the following data within the progress schedule: activity IDs; activity descriptions; activity durations; relationships between activities; successors and predecessors, actual start and actual finish dates of activities; planned start and planned finish dates of activities; and activity resources (with the exception that activities assigned resources labeled to reflect Department personnel may be changed to reflect specific individuals, or job roles, within the Department).

Note: For specification reference, go to the last paragraph of page 141
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Activity Types:

Start Milestone
- Typically used to mark the beginning of a phase or to communicate project deliverables.
- Zero duration activity.
- **Only has a start date.**
- Can assign constraints, expenses, work products, and documents.
- Can assign a primary resource.
- Cannot assign roles or resource assignments.

Finish Milestone
- Typically used to mark the end of a phase or to communicate project deliverables.
- Zero duration activity.
- **Only has a finish date.**
- Can assign constraints, expenses, work products, and documents.
- Can assign a primary resource.
- Cannot assign roles or resource assignments.

Task Dependent
- Typically used when the work needs to be accomplished in a given time frame, regardless of the assigned resources’ availability.
- The activity’s resources are scheduled to work according to the activity calendar.
- Duration is determined by the assigned calendar’s workweek.

  **NOTE:** This is the default activity type and will be the primary type for NYSDOT projects.

WBS Summary
- Compromises a group of activities that share a common WBS level.
- Dates calculated are based on the earliest start date and the latest finish date of the activities in the group.
- Duration is calculated based on the assigned calendar.
- Cannot assign constraints
- NYSDOT may use this type to assign resources and costs.

Level of Effort
- Typically used for ongoing tasks dependent on other activities.
- Duration is determined by its predecessor/ successor activities.
- Clerical work, security guard, meetings, and project management tasks.
- Cannot assign constraints.
Activity Types (continued):

Resource Dependent
- Typically used when multiple resources assigned to the same activity can work independently.
- The activity’s resources are scheduled according to their individual resource calendar.
- Duration is determined by the availability of the resources assigned to work on the activity.
**Status Tab**

Use the Status Tab to define or view the selected activity's duration, constraint, start and finish dates, labor and nonlabor units and costs, and material costs. You can also use the Status tab to view the selected activity's float, actuals, and remaining duration.

**Steps:**

1. Select an activity.

2. In the Tool Bar, click 

3. Click, Status tab.
Notebook Tab

The Notebook tab enables you to review and assign notes to an activity. The contractor may enter information in the notebook tab, by Notebook Topic. Notebook topics have been categorized by NYSDOT for specific types of information.

Steps:

1. Click Notebook tab.

2. In the Notebook Topic window, click Add.

3. Select Schedule Updates and click the Assign button.

4. Go to the Notebook window and write a memo.
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WPs and Docs Tab

Documents and other work products may be appended to the Activity or WBS Details using the WPs and Docs tab. This could be a useful way to centralize as well as standardize the location of project documents and narratives.

Steps:

1. Open a project.

2. On the Directory Bar click the WPs and Docs tab.

3. On Work Products and Documents window, click the Add button.

4. Provide a name for the document.

5. On the bottom layout, click the Ellipsis box and plug in the location of the document.
6. Click the **Assignments** tab and select the Activity or WBS to append document to.

7. Click the **General** tab and plug in the details about the document.
Calendar Assignments

Excerpt from Specification 2. Baseline Progress Schedule @ Award, d, xii:

xii) Calendars - Use clearly defined calendars that account for expected seasonal weather conditions (including winter shutdown periods) and environmental permit requirements, for the planning and scheduling of activities. Do not incorporate an activity with a description of “Winter Shutdown” that requires constraints. Provide the working days per week, holidays, the number of shifts per day, and the number of hours per shift by using the Calendar modifier in the P6 software. Incorporate any seasonal restrictions to the work within calendars assigned to activities.

- Calendars related to specific resources (i.e., a specific person or piece of equipment) shall be established as Resource Calendars, with the Calendar name clearly identifying the resource.
- All other calendars developed by a Contractor shall be established as Project Calendars, with the calendar name including the contract D# and describing the function (i.e., D260000 - Asphalt Calendar, D260000 - Concrete Calendar, D260000 - Landscape Calendar, D260000 - Painting Calendar, D260000 – Contractor’s 5 Day/8 Hour Workweek). All work activities of the Contractor shall be assigned to Project Calendars.
- Any Global calendars used in the progress schedule shall be those established by the Department. There are only two Global Calendars developed and maintained by the Department for use by Contractor's, they are the following:
  • NYSDOT Milestone/Curing 365 Day / 8 hour
  • State Business Days, 5 Day Work Week w/State Holidays, Field

Calendars may be created and assigned to each activity and resource. Calendar assignments are used to schedule activities and resources.

- An unlimited number of calendars can be created.
- The Activity Type determines whether the activity calendar of resource calendar is used during scheduling.

NYSDOT has developed a few predefined calendars for contractors to use for certain activities on their projects.

Note: For specification reference, go to the 2nd paragraph of page 146
Calendar Types

There are three calendar pools:

- **Global Calendar pool** – Developed by NYSDOT Admin users
  - Contains two calendars authorized by NYSDOT that can be used by all projects.
  - Available for all activities and resources.

- **Resource calendar pool**
  - Contains separate calendars for each resource.
  - Available for resources

- **Project calendar pool**
  - Contains a separate pool of calendars for each project.
  - Available for the current project only.
  - Developed by the Contractor
  - Must be reviewed by NYSDOT.

Steps:

Click **Enterprise, Calendars**. To see calendar details, click the **Modify** tab.
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Activity Codes

Activity codes are ways to classify and categorize activities according to the needs of NYSDOT and the Contractor.

You can use activity codes to view and roll up activities in the activity table; build reports in the Report Wizard or Report Editor; organize a layout by grouping activities into specific categories; and select and summarize activities.

Excerpt from Specification 2. Baseline Progress Schedule @ Award, d, xv:

xv) Activity Codes – The Contractor shall include a well-defined activity coding structure that allows project activities to be sorted and filtered. Activity Codes shall include, but not be limited to: Responsible Party; Stage; Area of Work; Type of Work; Subcontractor; and additionally as required by the Engineer to meet the needs of the specific contract work to facilitate the use and analysis of the schedule.

- **Activity codes can be global.**
  - Organize within a project or across the entire organization
  - The Department can create an unlimited number of global activity codes
- **Activity codes can be project specific.**
  - The Contractor can create up to 500 project-specific activity codes
- Each activity code (global, EPS, and project) may contain an unlimited number of activity code values.
- Activity codes can be organized in a hierarchy.

Steps:

Click **Enterprise, Activity Codes.**

Note: For specification reference, go to the 2nd paragraph of page 147
Filtering Activities

A filter is a set of instructions that determines which activities should display on screen.

Filters enable you to create customized layouts by limiting the number of activities displayed – helping you to focus on critical activities, for example.

- A set of pre-defined filters is provided, as is the ability to create user defined filters of your own.

- Filters divided into the following groupings:
  - **Default**
    - Available to all users
    - 15 pre-defined filters
    - Cannot be deleted or modified

  - **Global**
    - Available to all users

  - **User Defined**
    - Available to current users for all projects to which they have access

- One or more filters may be applied to a layout at a time.
- Multiple criteria for selection may be used within a single filter.
- Filter specifications can be saved and reapplied.
- Filters can be saved as part of a layout.
Filter Dialog Box

- **All Activities** – Click box to show all activities in the current layout.

- **Show activities that match** – When more than one filter is marked, you must define the join by selecting one of the following options:
  
  - All Selected Filters – Click to include the activities that meet the criteria of each selected filter.
  - Any Selected Filter – Click to include the activities that meet the criteria of at least one of the selected filters.

- **Replace Activities Shown in Current Layout** – Displays only the activities that meet the criteria of each selected filter.

- **Highlight activities in current layout which match criteria** – Highlights only the activities in the current layout that meet the criteria of each selected filter.

Steps:

In the **Layout Options** bar, click **Filters**.
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Using Filters to Customize Activity Layout

Steps:

1. Go to Activities. Click the Layout Bar and select Classic Schedule Analysis.

2. From the Toolbar, click the Filters icon. Click Completed, Critical and Not Started filters. Leave the selection to Any Selected Filter.

3. Go back to Filters and click All Selected Filter.

4. To find out how filters are defined, click the Help button in the Filters window. Type Default Filter Criteria and click the List Topics button.
Lesson 4: Working with Activities

Review Questions

1. According to Specification 2. Baseline Schedule @ Award, xiv – Activity Resources, how many entities should own the responsibility for an activity?

2. What are the differences between a Task Dependent and Resource Dependent activities?

3. Specification 4. Monthly Progress Schedule Submission, d. Monthly Progress Schedule Narrative, xix, Appendix 2 states the Activities details that must be checked on submittals. What are these and where do you find them?

4. In Primavera, what is the difference between the options All Selected Filters and Any Selected Filters when using the Filters tool?

5. How can Activity Codes be used by the contractor to develop a report in Primavera to generate a list of all submittals they have in their Progress Schedule?
Lesson 5:

Analyzing Relationships

Objectives

In this lesson, you will look at the different types of relationship between activities. At the completion of this lesson, you will be able to:

- Explain activities relationship types
- Know when to use certain relationship types
- Identify valid and invalid logic in the relationship
- Understand the difference between Mandatory and Discretionary Logic
- View activities relationships using Primavera
**Relationship Logic**

As part of your schedule review, you will scrutinize how the contractor has developed the schedule logic between activities. You will determine if the relationships between activities are valid, if relationships are missing, and if the relationship type is also valid. Primavera allows the network logic to be developed precisely the way the work will actually be done.

**Network Logic Diagram**

A network logic diagram is a logical representation of all the activities in a project showing their dependency relationships.

**Precedence Diagramming Method (PDM)**

Precedence Diagramming Method (PDM) is a technique for creating network logic diagrams.

A box or rectangle represents an activity.

- Lines with arrows connect the boxes and represent the logical relationships between the activities.
  - *Predecessor* – Controls the start or finish of another activity.
  - *Successor* – Depends on the start or finish of another activity.
- Start with either the first activity in the network and enter each successor, or start with the last activity in the network and enter each predecessor.
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**Relationship Types**

*Excerpt from Specification D. Progress Schedule, 1. General, Paragraph 4:*
The Contractor will be the sole entity allowed to physically modify the following data within the progress schedule: activity IDs; activity descriptions; activity durations; relationships between activities; successors and predecessors, actual start and actual finish dates of activities; planned start and planned finish dates of activities; and activity resources (with the exception that activities assigned resources labeled to reflect Department personnel may be changed to reflect specific individuals, or job roles, within the Department).

*Excerpt from Specification 4. Monthly Progress Schedule Submission, d, xiii: Paragraph 4:*
xiii) List all changes in relationships between activities included in this Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

There are four types of relationships. In the following diagrams, activity A represents the predecessor and activity B represents the successor.

**Finish to Start (FS) – When A finishes, then B can start.**
*(Default relationship type in Primavera)*

![Finish to Start Diagram](image1)

**Start to Start (SS) – When A starts, B can start.**

![Start to Start Diagram](image2)
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Finish to Finish (FF) – When A finishes, B can finish

Start to Finish – When A starts, B can finish
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Relationships with Lag

Excerpt from Specification 2. Baseline Progress Schedule @ Award, viii:

viii) Activity Relationships - Clearly assign predecessors and successors relationships to each activity, and assign appropriate logic ties between activities (Finish to Start, Start to Start, Finish to Finish, etc). Do not have any open ended activities, with the exception of the first activity and last activity in the schedule. An activity may only appear once as a predecessor or successor to another specific activity, but may be assigned as a predecessor or successor to many different activities. Do not include inappropriate logic ties with Milestone activities (i.e. – a finish milestone activity, and a predecessor assigned with a Finish to Start logic tie; or a start milestone, and a successor assigned with a Finish to Start logic tie). Lag time may not exceed 10 days. The Contractor shall not use negative Lag times.

Lag specifies an offset or delay between and activity and its successor. It can be added to any type of relationship and can be positive or a negative value. For NYSDOT contracts, all lags must positive.

Lag is scheduled based on the calendar selected in the General tab in the Schedule Options dialog box.

Examples of relationships with lag:

Finish to Start with Lag

Construct Building Foundation activity must be finished for seven days before the Construct Building Exterior and Structure activity can start.
Start to Start with Lag

**A**

Construct Building Exterior and Structure

**B**

Install Interior Belt Conveyors

*Install Interior Belt Conveyors* activity can start five days after *Construct Building Exterior and Structure* activity starts.
Viewing Relationships in Gantt Chart

You can view/modify relationships in the Activity Table and Gantt Chart.

1. **Activity Table** (left panel) – Displays the Predecessors and Successors columns.

2. **Gantt Chart** (right panel) – Click the Relationship Lines icon on the Toolbar to toggle relationship lines on and off.

Steps:

In the Toolbar, click to view the relationships between the activities.

**Note**: Even when relationships are modified or added, the activities won’t move until the project is scheduled.
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Viewing Relationships using Trace Logic

An activity may have a relationship from a predecessor that determines its Early Start. This logic tie is called a **driving relationship**.

- A solid relationship line indicates a driving relationship.
- A dashed relationship line indicates a non-driving relationship.

**NYSDOT staff should use this information when you question the dates of a particular activity. Many times, after analysis, missing or inappropriate relationships will be found and corrected to establish a more realistic schedule.**

### Steps:

1. Select activity **A04010**.
2. In the Tool Bar, click **Trace Logic**.
Lesson 5: Analyzing Relationships

Review Questions

1. Define “lag”.

2. True or False: Specification 2. Baseline Progress Schedule @ Award stipulates that lag time may not exceed 10 days.

3. What is a “driving relationship” between activities?

4. Can an activity have a driving relationship with another activity without being in the critical path?

5. In Primavera, how can you tell whether an activity has a Start-to-Start relationship with another activity?
Lesson 6:

CPM Scheduling Concepts

Objectives

This lesson describes how schedule dates are calculated. At the completion of this lesson, you will be able to:

- Perform a forward and backward pass
- Define float and its impact on a schedule
- Identify loops and open ends
- Calculate a schedule
- Analyze the scheduling log report
- Understand the importance of “scheduling” the project and reviewing the electronic schedule file instead of a report generated by contractor

<table>
<thead>
<tr>
<th>Key Terms</th>
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<tr>
<td>Forward Pass</td>
</tr>
<tr>
<td>Backward Pass</td>
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<td>Driving Relationship</td>
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<td>Loop</td>
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<tr>
<td>Early Dates</td>
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<tr>
<td>Late Dates</td>
</tr>
</tbody>
</table>
Critical Path Method (CPM) Scheduling

Excerpt from Specification B. Scheduling Software, Paragraph 3:

The Department will provide the Contractor either a Preliminary Construction Schedule or a project schedule template for the Contractor’s use in developing their CPM Progress Schedule. The Contractor shall develop, update, and revise the Progress Schedules using Primavera P6 software that has been loaded on the Department’s network servers and the Contractor shall store all Progress Schedule files on the Department’s network servers.

The Critical Path Method (CPM) scheduling technique is utilized to calculate NYSDOT schedules. CPM uses activity durations and relationships between activities to calculate schedule dates. This calculation is done in two passes through the activities in a project.

Critical Path

- The critical path is the path of activities through a project that determines the project duration and therefore, the anticipated project completion date.
- A delay in one activity delays other activities and the project as a whole.
- Primavera allows users to calculate the critical path either total float or the longest path in the project. However, NYSDOT requires the Contractor to schedule the project using the Longest Path and not Total Float when determining the Critical Path.

NYSDOT staff will use the Critical Path to focus on to determine if the project will finish on time or not. If the project is not going to finish on time, modifying non-critical activities will not help in bringing the project back on schedule.

FOCUS ON THE CRITICAL PATH!

Note: For specification reference, go to the 1st paragraph of page 137
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What is the Data Date?

Excerpt from Specification 4. Monthly Progress Schedule Submission, c, i:

i) **Data Date** - the “Data Date” shall be the date the Project Scheduler last edits the schedule prior to submission to the Engineer (generally the last working day of the contract payment period). The Project Scheduler can modify the project’s Data Date through the Schedule tool.

- The date used as the starting point for scheduling calculations.
- The date used to schedule all future work.
- For the baseline progress schedule submittal, the data date shall be the contractor award date.
- For monthly progress schedule submittal, the data date shall be consistent with the last working day of the monthly contract payment period.
Scheduling Concepts

Forward Pass

- Calculates an activity’s early dates.
- Early dates are the earliest times an activity can start and finish once its predecessors have been completed.
- The calculation begins with the activities without predecessors.
- Early Start + Duration - 1 = Early Finish

```
A
  5
ES 1   EF 5

B
  10
ES 1   EF 10

C
  15
ES 11  EF 25
```

Forward pass
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Backward Pass

- Calculates an activity’s late dates.
- Late dates are the latest times an activity can start and finish without delaying the end date of the project. The late dates are the NYSDOT contractual dates.
- The calculation begins with the activities without successors.
- Late Finish - Duration + 1 = Late Start

\[
\begin{align*}
LS_{A} & = 6 \\
LF_{A} & = 10 \\
ES_{A} & = 1 \\
EF_{A} & = 5 \\
LS_{B} & = 1 \\
LF_{B} & = 10 \\
ES_{B} & = 1 \\
EF_{B} & = 10 \\
LS_{C} & = 11 \\
LF_{C} & = 25 \\
ES_{C} & = 11 \\
EF_{C} & = 25 \\
\end{align*}
\]
Total Float

- The amount of time an activity can slip from its early start without delaying the project.
- The difference between an activity’s late dates and early dates.
- Activities with zero total float are critical.
- Late date – Early date = Total Float (TF)

Excerpt from Specification J. Float, Paragraphs 1, 2 & 5:
During the course of contract execution, Total Float generated due to the efficiencies of either party (State or Contractor) will generally be considered Project Float that is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Any party assigned activity responsibility within the schedule has the full use of the Project Float until it is depleted.

However, if the Contractor submits a request for an Early Completion that includes a revised Progress Schedule supplemented with resource allocations for each task activity and time-scaled resource histograms that is accepted by the Department, then Total Float actually resulting from additional Contractor resources, additional work shifts, longer work weeks or adoption of more aggressive scheduling and construction management practices of the Contractor’s work activities may be considered Contractor Owned Float for the exclusive use of the Contractor. Refer to paragraph I for resource loading requirements for Early Completion Dates.

For either the State or Contractor to reserve Total Float as State Owned Float or Contractor Owned Float the party must document within the schedule submission narrative in advance of generating the Total Float the additional resources or measures that will taken to shorten the critical path, and then document within the schedule submission narrative that immediately followed when the Total Float was actually generated the change to State or Contractor owned float based on entry of Actual Start and Actual Finish dates and percentage of work completed, and this must be agreed to by both parties in the next project Progress Meeting. Without this timely documentation any Total Float generated will be considered project float.

Note: For specification reference, go to the 1st paragraph of page 158
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- **Positive float**
  - ES to EF
  - LS to LF

- **Zero float (critical)**
  - ES to EF
  - LS to LF

- **Negative Float (extremely critical)**
  - LS to EF
  - ES to LF

Positive float

Zero float (critical)

Negative float (extremely critical)
Total Float (*continued*)

An activity’s total float is automatically calculated each time you schedule the project. You cannot edit an activity’s float values directly.
Backward Pass with Required Finish

- One of the most common NYSDOT project scenarios is a contract (completion date) “Must Finish by” date for the project.
- Used only during the backward pass.
- Required finish date specifies when the project must finish regardless of the network’s duration and logic.
  - Contractor should not submit a baseline schedule with negative float.
Open Ends

- Activities without a predecessor or successor.
  - No predecessor - activity uses data date as its early start
  - No successor - activity uses project finish as its late finish
- Open ended activities can portray an unrealistic amount of positive total float.

**NOTE:** NYSDOT requires that each project have only two open ends, the first activity and the last activity.

*Excerpt from Specification 2. Baseline Progress Schedule @ Award, viii:*

viii) **Activity Relationships** - Clearly assign predecessors and successors relationships to each activity, and assign appropriate logic ties between activities (Finish to Start, Start to Start, Finish to Finish, etc). Do not have any open ended activities, with the exception of the first activity and last activity in the schedule.

**Note:** For specification reference, go to the 1st paragraph of page 145
Scheduling a Project

When scheduling a project, activity dates are calculated according to duration and logic.

Click the **Log to file** checkbox to record scheduling results in a log file (.txt).

![Schedule Window](image)

**Steps:**

1. Open project **D260688-ISUx**
2. In the **Directory Bar**, click on **Activities**
3. In the **Tools** menu, click **Schedule (or press F9)**
4. Accept the contractor’s data date.
5. Ensure that the **Log to File** box is clicked.
6. Click **Schedule**.
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Schedule Log

- Primavera generates a Schedule Log that displays:
  - Scheduling/Leveling settings
  - Statistics
  - Errors
  - Warnings
  - Scheduling/leveling results
  - Exceptions

Steps:

1. In the **Tools** menu, click **Schedule (or press F9)**.
2. Click **View Log**.
3. Go to the **Activity Layout** and display **2 Week Lookahead** Layout.

Excerpt from Specification 4.Monthly Progress Schedule Submission, d, xix:
APPENDIX 2 – A complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by the Department’s Primavera scheduling software application) which includes the Schedule Settings, Statistics, Errors, Warnings, Scheduling/Leveling Results, Exceptions, Activities with unsatisfied constraints, Activities with unsatisfied relationships, and Activities with external dates. The statistics shall include, # of Activities, # of Activities Not Started, # of Activities In Progress, # of Activities Completed, # of Activity Relationships, and # of Activities with Constraints. Total number of activities on the critical path, percent complete, activities without predecessors, activities without successors, and activities out of sequence.
Lesson 6: CPM Scheduling Concepts

Review Questions

1. Explain “Early Start.”

2. Typically, an effective CPMscheduled project should only have two open-ended activities. What are these?

3. How do you calculate the “float”?

4. How much float should there be in the critical path? Why?

5. When scheduling a project in Primavera, where do you select the different scheduling options? What are the NYSDOT requirements regarding these options?
Lesson 7:

Evaluating Constraints

Objectives

This lesson provides the definition and usage of a constraint. At the completion of this lesson, you will be able to:

- Identify the different types of constraints
- Review project schedule constraints
- Evaluate when and when not to use constraints
Defining Constraints

Constraints are imposed date restrictions used to reflect project requirements that cannot be built into the logic.

**NYSDOT allows constraints that are in the contract such as project completion date and B clock dates. Other constraints must be approved by the NYSDOT.**

Constraints are used to build a schedule that more accurately reflects the real-world aspects of the project, provide added control to the project, and impose a restriction on the entire project or an individual activity. Typically, only contractual constraints such as the contract completion date will be allowed in the original baseline schedule. The EIC needs to identify and approve any constraints used in the schedule. Upon approval by the EIC, the contractor may add constraints in monthly progress schedule to reflect situations such as dates provided for in a Utility Relocations Agreement, etc. Many times when Contractor’s state they need a constraint for an activity where a date needs to be met in the contract, instead these dates just need to be monitored to assure that they are not exceeded.

- Constraints are user-imposed.
- Two constraints can be assigned to an activity.
- After applying a constraint, the project must be rescheduled to calculate the new dates.

*Excerpt from Specification 2. Baseline Progress Schedule @ Award, d, x*:

x) **Activity Constraint Dates** – The Contractor shall not have any constrained activities, with the exception of contractual dates, unless the Engineer accepts such constraints in writing. Milestone activities shall be included for the Contract Award which shall have a primary constraint of “Finish On” and the date of contract signature by the State Comptroller, and for the Contract Completion which shall have a primary constraint of “Finish on or before” and the contract completion date indicated in the contract documents. Only contractual/owner-designated constraints are allowed unless specifically authorized by this specification or the Engineer.

*Note:* For specification reference, go to the 1st paragraph of page 145
Commonly Used Constraints

**Must Finish By** (*Required per NYSDOT specification*)

This is a project-level constraint that is used when an overall project deadline (contract completion date) must be met.

Attempts to schedule all activities in the project to finish by the date specified.

Calculates the Late Finish Dates in a Backward Pass when scheduling the project.

Must be applied in the Projects window on the dates tab (only NYSDOT admin staff can edit). When an Extension of Time is granted the EIC should notify the CPM Scheduling Section@dot.state.ny.us to modify this date.

---

**Steps:**

1. Open your project
2. In the **Directory Bar**, click **Projects**
3. Click the **Dates** tab.
4. Highlight your project
5. Click the **Ellipsis** box in the **Must Finish By** field.
6. Select a date.
7. **Reschedule (F9)**.
**Other Constraints**

**Start On or After**

Use the Start *On or After* constraint to set the earliest date an activity can begin.

- Forces the activity to start no earlier than the constraint date.
- Pushes the early start date to the constraint date.
- Affects early dates of its successors.

**Finish On or Before**

Use the *Finish On or Before* constraint to set intermediate completion points in the project.

- Forces the activity to finish no later than the constraint date.
- Pulls the late finish date to the constraint date.
- Affects the late dates of its predecessors.

**Start On**

- Forces the activity to *start on* the constraint date.
  - Shifts both early and late start dates
  - Delays an early start or accelerates a late start.
  - Used to specify dates submitted by contractors or vendors.

**Start On or Before**

- Forces the activity to start no later than the constraint date.
  - Shifts the late start to the constraint date.
  - Affects the late dates of its predecessors.
  - Used to place a deadline on the start of the activity.
Other Constraints (continued)

Finish On

- Forces the activity to finish on the constraint date.
  - Shifts both early and late finish dates.
  - Delays an early finish or accelerates a late finish.
  - Used to satisfy intermediate project deadlines.

Finish On or After

- Forces the activity to finish no earlier than the constraint date.
  - Shifts the early finish to the constraint date.
  - Affects the early dates of its successors.
  - Used to prevent an activity from finishing too early.

As Late As Possible

- Delays an activity as late as possible without delaying its successors.
  - Shifts the early dates as late as possible.
  - Also called zero free float constraint.

Mandatory Start and Finish

- Forces early and late dates to be equal to the constraint date.
  - Affects late dates of predecessors and early dates of successors.
  - May violate network logic.
  - Not recommended for most projects.
**Reviewing Constrained Dates**

To review the project completion constraint or any other date constraints:

**Steps:**

1. In the **Tools** bar, click the filter icon.
2. Click **Any selected filter**.
3. Select **Has Start Constraint**.
4. Select **Has Finish Constraint**.
5. Click **OK**.

![Filter settings](Image)
Lesson 7: Evaluating Constraints

Review Questions

1. As a standard specification, NYSDOT requires a constraint on what activity?

2. In Primavera’s Activity Details layout, what tab has information about constraints?

3. Under Specification 2. Baseline Progress Schedule @ Award, d, x, how many constraints in the schedule can the Contractor create?

4. What are the effects of Mandatory Start and Finish constraints?

5. True or False: Unless approved by the EIC, a constraint cannot be put into the project schedule.
Lesson 8:

Resource Analysis

Objectives

In this lesson, you will examine what activity resources are. At the completion of this lesson, you will be able to:

- Define the three categories of a resource
- Create, review and assign resources to activities
- Explain the different NYSDOT Resource Loading requirements

Excerpt from Specification 2. Baseline Progress Schedule @Award, d, xiv:

xiv) Activity Resources – The Contractor will generally not be required to develop Labor resources, Equipment resources or Contract Pay Item resources in the Resource Dictionary, or assign them to schedule activities. The Contractor may be required by the Engineer to assign Labor and Equipment resources if submitting a Progress Schedule when contract milestone activities are projected to have Early Completion dates, as described in paragraph I of this specification. The Contractor will not be required to assign costs to resource assignments in the schedule. The Department will assume when reviewing the schedule that the Contractor’s resources are unlimited; unless the Contractor either assigns equipment, labor and contract pay item resources to each activity in the schedule (and performs resource leveling), or indicates in the schedule narrative what resource limitations are present. If labor, equipment and contract pay item resources are not assigned to activities in the schedule, it shall be the Contractor’s responsibility to assure the activity logic in the schedule properly reflects their resource limitations. If labor and equipment resources are not assigned to activities in the schedule, and the Contractor anticipates multiple crews for the same schedule activity, these resources shall be documented in the schedule narrative. As an activity can have only one responsible party, no activity shall involve multiple crews comprised of the Contractor and a subcontractor, or multiple subcontractors.
Continued:

**Excerpt from Item Specification 2. Baseline Progress Schedule @Award, d, xix:**

xix) **Narrative** - Include a narrative in Microsoft Word and/or Adobe Acrobat format that describes:
- The Contractor’s general approach to construct the Work outlined in the baseline schedule. Address the reasons for the sequencing of work and describe any resource limitations, potential conflicts, and other salient items that may affect the schedule and how they may be resolved.
- If not provided in the contract plans, or if modified by the Contractor, provide copies of the appropriate contract plan sheets marked up as Key Plans, to correlate values on the contract plans (for Area of Work, Stage of Work, and WZTC Phase) to the Contractor’s planned breakdown of the project (i.e., Activity Codes, Activity Descriptions) for scheduling purposes.
- The justification(s) for each activity with a duration exceeding 15 working days.
- The reason for any lags assigned to any activities.
- The justification(s) for Contractor imposed activity constraints proposed in the schedule.
- A list of calendars which have been used in the schedule, along with the general reason for their use.
- The project critical path and challenges that may arise associated with the critical path.
- Anticipated coordination issues related to work activities by other entities, that require additional information from or action by the Engineer.
- Appendix 1 to the narrative shall be the “Schedule Log” report created when the project was scheduled.
- Appendix 2 to the narrative shall be an electronic schedule plot (Adobe Acrobat format) using the Global Layout named “Baseline Schedule submission”, with activities sorted by Start Date in ascending order, Grouping of activities by WBS, and only the “Longest Path” filter applied. This plot shall provide a clear critical path from the Data Date to the last activity in the schedule.

*Note:* For specification reference, go to pages 146 and 148
Defining Resources

A resource is anything used to complete an activity. Resources are divided into three categories:

- **Labor** (people, crews)
  - Measured in units of time.
  - Generally reused between activities/projects.
    - Exception will be individual contractor’s resources.
  - Recorded in terms of days or hours (e.g. $50.00/hour)

- **Nonlabor** (Equipment)
  - Measured in units of time.
  - Recorded in terms of days or hours (e.g. $465.00/hour)

- **Material** *(contract pay items)*
  - Measured in units other than time, meters, square meters, etc. (e.g. $4.50/square foot.)

The contractor is responsible to meet the NYSDOT specification to resource load their schedules based on project type and contract requirements.

**For NYSDOT, different projects can have different Resource Loading requirements:**

**For Type 1** Non CPM Progress Schedules – No resource loading required ever.

**For Type 2** CPM Progress Schedules – Generally no resource loading required. However, if a Recovery Schedule or Early Completion Schedule is requested then, resource loading must be presented.

**For Type 3** CPM Progress Schedules – Resource loading required for Labor resources at the Crew level & Equipment resources for specialty equipment.

**For Type 4** CPM Progress Schedules – Resource loading required for Labor resources at the Title Classification level, Equipment resources , and Pay Item resources.
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**Viewing the Resource Dictionary**

The Resources window contains information about all resources within NYSDOT, allowing for centralized resource management. Contractors will still be able to load their schedules with their approved resources that meet their contract specs.

**Steps:**

1. Open your project.
2. In the Directory bar, click Resources.
Resource Details

Use Resource Details to add, view, and edit detailed information about the selected resource.

The resource tabs show all of the information maintained for each resource. NYSDOT staff should be aware that there is an option on the Details tab that allows for Auto Compute Actuals. This is marked to automatically calculate the resource’s actual quantity of work according to the project plan. This means that the resource usage was exactly as it was planned, rarely the case. An exception would be if the contractor is working on a set amount regardless of his actual usage. Depending on your project requirements, you may want the contractor to turn that option OFF.

Steps:

Click the Details tab.
Creating Resources

Steps:

1. On the Directory Bar, click Resources button.

2. On the Command Bar, click the Add button.

3. On Resource Wizard window, type the ID and Name of the resource.

4. Select the Resource Type.

7. Select Units/Time & Prices, Phone and Email, Roles, Resource Calendar, Auto-Compute Actuals, etc.

8. When you get to the Congratulations screen, click Finish.
Assigning Resources

Steps:

1. Select an Activity.

2. Click the Resources tab in the Activity Details Form.

3. Click the Add Resource button.

4. Select the Resource to be assigned to the Activity.

5. Click the Assign icon.
Analyzing Resources for NYSDOT

Resources are assigned, typically, at the activity level. When evaluating the contractor's resource loading, care should be taken to determine if a reasonable number of resources are assigned to the particular activity especially when the same resources are used on activities that are scheduled to happen at the same time. For example, if the contractor has one crane and that crane is assigned full time to three activities that are scheduled to happen at the same time. The schedule would require 3 cranes for that time period, when only one is available. If you feel that the amount of work can be reasonably be accomplished by the one crane, then it should be assigned to each of the three activities 33% each.

Cost Accounts, which correlate to the NYSDOT Contract Pay Item, are assigned for each resource.

Special note: resources can also be assigned to WBS Summary activity types. This allows the contractor, if authorized, to make these assignments at a higher level than the activity level.

Steps:

To view an activities resource assignments,

1. Select the activity.
2. Click the Resources tab in the Activity Details Form.
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Analyzing Costs for NYSDOT

NYSDOT does not currently require the Contractor to COST load their schedules.

Where required, material quantities and activity costs will be used to verify the reasonableness of the activity durations and to ensure that all work required by the contract is accounted for within the schedule.

Costs, in Primavera, are planned and managed at the activity level.

There are two types of costs:

- **Resource** – Calculated based on resource assignments.
- **Expense** – Lump sum costs that are manually entered.

Resource

The cost of a resource can be calculated based on the price/unit defined in the resource dictionary and the Budgeted Units assigned to the activity.

**Budgeted Cost = Budgeted Units X Price/Unit**
Resource Analysis Settings

- Determine the level of detail displayed on resource usage profiles/spreadsheets.
- **All Projects**
  - All closed projects – select to display resource/cost usage across all projects that have been summarized in the Project Structure
  - Open projects only – select to focus on resource/cost usage in the projects currently opened on screen
- **Time-Distributed Data**
  - Display data based on Remaining Early or Forecast dates
  - Select the time interval for storing live resource allocations: Hour, Day, Week, Month

**Steps:**

1. In the **Edit** menu, click **User Preferences**.
2. Click the **Resource Analysis tab**.
Resource Usage Profile

The Resource Usage Profile provides a graphical view of unit/cost distributions over time. It displays the amount of effort the contractor has assigned for each resource on the project during each time period.

Use the profile to determine how many hours each resource is scheduled to work; identify over-allocated resources; track expenditures per time period; and display a “banana curve to compare early and late dates.

- View unit/cost distributions from a specific project or across all projects in the Project Structure.
- View resource or role allocations.
- Can display separate bars for one or all of the following:
  - Budgeted units/costs
  - Actual units/costs
  - Remaining Early units/costs
  - Remaining Late units/costs.
- The Resource Usage profile timescale matches the timescale for the Gantt Chart.
- Format columns, group, sort, and filter resources in the profile.
- The Resource Usage profile can be saved as part of the layout.

Steps:

In the Layout Options bar, click Show on Bottom, Resource Usage Profile.
Lesson 8: Resource Analysis

Review Questions

1. What are the different types of Resource?

2. NYSDOT contracts normally do not require Resource Loading. Under what scenarios does the Department require Resource Loading in their projects?

3. According to NYSDOT specification, what are the Resource Loading Requirements for a Type2 project?

4. How do you display the Resource Usage Profile layout?

5. In Primavera, when should you create a new resource? How?
Lesson 9:

Optimizing the NYSDOT Project Plan

Objectives

This lesson explains the steps for optimizing a project plan. At the completion of this lesson, you will be able to:

- Define project management’s *Triple Constraints* and how they impact each other
- Analyze project schedule dates and settings to identify a potential problem
- Explain the ways of shortening a project schedule
Project Management’s Triple Constraints

Once you have received the schedule from the contractor, verify that it meets the Statewide CPM Special specification including activities, dates and resource requirements. If a disconnect exists between the information in the project plan and the specifications, you will be able to identify the source of the problem and define a solution.

- Analyzing schedule activities and dates – Evaluate the schedule to ensure that activities are properly defined and that milestone and project dates are achieved.

- Analyzing resource allocation – Evaluate the resources to ensure that the proper allocations are made to achieve the project goals.
Analyzing Schedule Dates

The most important date in the schedule is the calculated project finish date. If the calculated finish date of the project is beyond the required project finish date, the project must be shortened. In addition, each deliverable in the project should be scheduled to finish by the dates imposed by the contract.

Steps for analysis:

- Compare the calculated finish to the Must Finish By date.
- Backup your project plan.
- Focus on the Critical Path (Longest Path).
- Shorten the project.

Note: The contract finish date can be entered either in the Must Finish By date or as a Finish On or Before constraint on the contract finish milestone.

Comparing Finish Date to Must Finish By Date

<table>
<thead>
<tr>
<th>Schedule Dates</th>
<th>Anticipated Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planned Start</td>
<td></td>
</tr>
<tr>
<td>11-Jul-03</td>
<td></td>
</tr>
<tr>
<td>Date Date</td>
<td>Finish</td>
</tr>
<tr>
<td>11-Jul-03</td>
<td>15-Aug-03</td>
</tr>
<tr>
<td>Actual Start</td>
<td>Actual Finish</td>
</tr>
<tr>
<td>11-Mar-03</td>
<td></td>
</tr>
</tbody>
</table>

Steps:

1. In the Directory Bar, click the Projects button.
2. Open your project.
3. In Project Details, click the Dates tab.
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**Focusing On the Critical Path (Longest Path) Activities**

If the project is coming in late (showing negative total float), the project must be shortened to meet the contract date. To achieve this, you should focus on the Critical Path activities. These are the activities that will bring in the finish date to comply with the contract. Modifying non-critical path activities will not help.

The critical path (longest path) activities are the longest continuous path of activities through a project that determines the project finish date. If you adjust a critical path activity, this should adjust the project finish.

Steps:

1. In the **Directory Bar**, click the **Projects** button.

2. Open your project.

3. In **Project Details**, click the **Settings** tab.
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Shortening the Project

If the schedule analysis leads you to conclude that the contract finish date cannot be met, you need to have the contractor concentrate his efforts on shortening the schedule. Several methods can help you accomplish this goal.

- *Refine duration estimates.*
  - Assign additional resources to reduce duration.

- *Use relationships to overlap activities.*

- *Apply/modify constraints.*

- *Change calendar assignments*
  - Put critical path activities on a longer workweek.
  - Add exceptions to non-worktime.
Lesson 9: Optimizing the NYSDOT Project Plan

Review Questions

1. Explain the relationship behind Scope, Resources and Cost.

2. Explain the different ways to shorten a project using CPM.

3. In Primavera, how do you know when a project is coming in late?

4. How do you define the project’s critical activities to “Longest Path”?

5. According to NYSDOT specification, where should the “Must Finish By” date be found?
Lesson 10:

Baselining the Project Plan

Objectives

In this lesson, you will understand the term “baselining”. At the completion of this lesson, you will be able to:

- Define the functionalities of a baseline
- Create and assign a baseline
- Review layouts using baseline and current project files

Excerpt from E. Progress Schedule Review and Analysis, 2:

2. Schedule Analysis Method.
   Events, actions, and progress that cause delays or gains to the Progress Schedule will be analyzed solely by the “Contemporaneous Period Analysis” method.

The Contemporaneous Period Analysis evaluates delays or gains in the period in which it occurred. The analysis period for the purpose of these provisions shall be the period covered in each regular progress update to the schedule, as they coincide with contract payments to the Contractor.
**What is a Baseline?**

A baseline is a copy of a project. It is a “snapshot” of an older or original project. You can compare a baseline to the current project to evaluate progress and track cost, schedule and performance. Before updating a schedule for the first time, the contractor will submit an “As Planned at Award Baseline Project Schedule in a Critical Path Method (CPM) format for the Engineer's review and acceptance.”

When the contractor submits schedule updates, the previous update will be used as a baseline for contemporaneous schedule analysis.

**Baseline functionality in Primavera enables you to:**

- Save an unlimited number of baselines per project.
- Designate one project baseline and up to three user baselines at a time for comparison to the current project.
- Assign a baseline type to categorize a baseline. Examples include As Planned at Award, Updates, Recovery Proposals, What-if, etc.
Creating a Baseline

You can create a baseline either by:

- Copying the currently opened project, or
- Converting another project into a baseline.

When you create a baseline, you must select the project to which it will be associated. Baselines can be assigned only to open projects. All open projects are displayed in the Maintain Baselines dialog box. (For presentation purpose only – only admin staff does this)

Steps:

1. Open your project. In the Project menu, click Maintain Baselines.

2. Click Add. Select “Convert another project to a new baseline of the current project.”

3. Click OK.

4. Select the project to be used as baseline. Click the Select button.
Assigning a Baseline

Use the Assign Baselines dialog box to choose a project baseline and/or user baseline for the project. If no baseline is designated as active, the current project plan is used as the baseline.

- Project baseline is the baseline selected by the project manager for the project.
  - Used for schedule, resource, and cost comparison.
  - Controlled by the security privilege Maintain Project Baselines.

- User baseline assignments are user-specific.
  - Used for schedule comparison only.
  - Each user can choose a different baseline for comparison to the current project.

Steps:

1. In the Projects menu, click Assign Baselines.

2. Select the baseline project for Project Baseline field. Click OK.

3. On the Directory Bar, click the Activity button.

4. Click the Layout Bar and open Current vs Baseline Schedule Analysis Layout.
Project Execution and Control

The Data Date

When the contractor updates the project, actuals are recorded for each activity relative to the *data date*. The data date is the date up to which actual performance data is reported and the date from which future work is scheduled.

Updating the Project:

- Once a project has started, update actual schedule information and resource usage at regular intervals.
- Establish a standard update procedure.
- Standard update procedures include how often data is collected and how often it is updated.

*Excerpt from E. Progress Schedule Review and Analysis, 2:*

i) **Data Date** - the “Data Date” shall be the date the Project Scheduler last edits the schedule prior to submission to the Engineer (generally the last working day of the contract payment period). The Project Scheduler can modify the project’s Data Date through the Schedule tool.
Lesson 10: Baselining the Project Plan

Review Questions

1. What is a “baseline”? 

2. What are the functions or uses of a baseline? 

3. Define Contemporaneous Period Analysis. 

4. In Primavera, what Activity Layout is useful for examining baseline and current project files? Why? 

5. How do you check if you have the correct Data Date in your baseline?
Lesson 11:

Monthly Progress Schedule Submissions

Objectives

In this lesson, you will learn the monthly submittal review process. At the completion of this lesson, you will be able to:

- Understand each step specified in the review process
- Run Claim Digger to compare projects’ performance
- Review Claim Digger logs to identify project issues

Excerpt from 4. Monthly Progress Schedule Submission, b, g:

b) Subsequent Monthly Progress Schedule Submissions - On a monthly basis, the Contractor shall submit a copy of the current Progress Schedule that includes all Progress Schedule Revisions and Progress Schedule Updates to reflect the actual and planned prosecution and progress of the contract work. Progress Schedule Updates shall reflect the status of activities that have commenced or have been completed, including the following items: (a) actual dates in activity Actual Start and Actual Finish columns as appropriate; (b) actual Remaining Duration for activities commenced and not complete; and (c) actual activity Suspend or Resume dates for activities commenced and not complete. Progress Schedule Revisions reflect modifications made to activities in the current project baseline schedule in any of the following items: (a) activity Original Duration; (b) changes in logic connections between activities; (c) changes in Constraints; (d) changes to Activity Descriptions; (e) activity additions or deletions; (f) changes in Activity Code assignments; (g) changes in activity Resource assignments; and (h) changes in Calendar assignments. All "Out of Sequence" activities noted in the scheduling log shall be corrected to reflect the current construction operations.

When preparing a formal submission of the progress schedule, the Contractor shall make a copy of the current Progress Schedule and name it according to the file naming convention provided by the Department in Table 1.
g) **Schedule Submission Method** - The Contractor shall submit the schedule to the Engineer electronically for review and acceptance. The filename shall conform to the requirements of Table 1. The Project Scheduler can change the Project ID and Name through the WBS at the top node, as they do not have privileges to edit data through the Project Details tab. The Contractor’s submission shall be documented by an E-mail to the Engineer, with a copy to CPMSchedulingSection@dot.state.ny.us and all appropriate project participants, that the project schedule on the network is ready for review. The Contractor’s E-mail to the Engineer shall also consist of the following:

   i) The subject of the E-mail shall include the Region #, contract D number, the Project Name, the Progress Schedule’s ProjectID, and construction company name. (i.e. – Region 8, D260000, Rehabilitation of Main Street viaduct, D260000-1UD2, ABC Contractors)

   ii) The E-mail message shall include the name of the EIC, the current anticipated Finish date of the last activity in the project schedule, a statement as to how that date compares to the current Contract Completion Date, and the name of the Area Construction Supervisor.

   iii) Electronic files of all Narrative Reports and required attachments associated with the schedule shall be submitted by the Contractor in Adobe Acrobat format.
**Submittal Review Process**

- Contractor submits updated schedule.
  - Moves the data date to the current reporting period.
  - Enters activity progress.
  - Reports resource use to date.

- NYSDOT Main Office Admin staff copies the project and notifies project review team by email.

- DOT project team reviews updated schedule. Uses Chapter IV of the CPM Scheduling Manual.

- Verify correct Data Date, “Must Finish By” date and that scheduling options are consistent with last submission.

- Review Schedule Log.

- Create and assign new baseline from the previous update.

- Run Claim Digger and analyze report.

- Monitor project progress with reports and layouts. Project team ensures Contractor’s Actual Start, Actual Finish and Remaining Duration of activities are consistent with Inspector’s Report for that work.

- Determine whether project objectives are being met.
  - Will the project finish on time?
  - Does contractor have adequate resources on the project?
  - Are there unauthorized changes, such as logic, durations, etc.?
Excerpt from 4. Monthly Progress Schedule Submission, d:

d) Monthly Progress Schedule Narrative - For each Monthly Progress Schedule submission, the Contractor shall submit a narrative in Microsoft Word, or Adobe Acrobat format that includes, but is not limited to: (The narrative may be an annotated copy of the Claim Digger Report that includes the information below.)

i) The contract D number, project name, project location, and name of Prime Contractor.

ii) Actual contract Award Date, current contract Completion Date, and scheduled completion of all project work.

iii) Any contact Interim Milestone dates (I/D, B-Clock, LD, etc), and scheduled Start and Finish dates for those Milestone activities.

iv) List all activities on the Critical Path (include Activity ID’s and Activity Descriptions) where work is currently being delayed, and for each such activity provide detailed information including:

   • the events that caused the delay.
   • the party(s) responsible for the delay event(s).
   • the number of days the activity has been delayed (negative float).
   • the activities in the construction schedule affected by the events.
   • the reasonable steps needed to minimize the impact of the delay, and which party needs to take the action(s).

v) List any other problems experienced during this Progress Schedule submission period, the party responsible for the problems, and the Contractor’s intentions to resolve the problems.

vi) List all activities for procurement of long lead time materials that are behind schedule and the reason(s) why.

vii) For major work items describe the differences between the actual work performed and the work planned for the period as represented in the preceding Progress Schedule submission, including explanations for the deviations.

viii) For all suspended work activities that could otherwise logically be progressed, identify the responsible party prohibiting the progression of the work, as well as the detailed reasons why.

ix) Description of any changes to the critical path since the last Monthly Progress Schedule submission and the impacts of such changes.

x) Change to State Owned Float and/or Contractor Owned Float based on changes to the critical path.

xi) List of all added or deleted activities included in this Monthly Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

xii) List all changes in activity Original Durations, the justification for such change(s), and the impact(s) of such changes.

xiii) List all changes in relationships between activities included in this Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

xiv) List any addition or deletion of activity or project constraints, and the reason(s) for and the impact(s) of such changes.

xv) List all changes to the project calendars, and the reason(s) for and the impact(s) of such changes.

xvi) The major work elements, as defined in the WBS, to be accomplished during the next monthly work period.
Continued:

xvii) Any potential problems that are anticipated for the next monthly work period and the proposed solutions to such problems. Identify potential problems or risks that either the Department or Contractor may be potentially responsible for. Explain what action the responsible party (i.e. - Department or Contractor) needs to take and the date by which time the action needs to taken to avoid the problem.

xviii) Any planned acceleration of activities that the Contractor anticipates to undertake within the next monthly work period that either the Department directed, or that the Contractor believes is necessary.

xix) The following appendix in Adobe Acrobat PDF file format, formatted to fit ANSI Size D paper (610 mm x 914 mm) (24 inch x 36 inch) paper, shall be included with the narrative.

- APPENDIX 1 – A listing of all work activities as of the data date, using the Classic Schedule Layout, sorted by Early Start Date, Total Float in increasing order, showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start date, Early Finish date, Start date, Finish date, and Calendar ID. The grouping of activities shall be by Area, Stage, WZTC Phase, and Type of Work. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

The following appendices in Adobe Acrobat PDF file format, formatted to fit 216 mm x 279 mm size (8.5 inch x 11 inch) paper, shall be included with the narrative.

- APPENDIX 2 – A complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by the Department’s Primavera scheduling software application) which includes the Schedule Settings, Statistics, Errors, Warnings, Scheduling/Leveling Results, Exceptions, Activities with unsatisfied constraints, Activities with unsatisfied relationships, and Activities with external dates. The statistics shall include, # of Activities, # of Activities Not Started, # of Activities In Progress, # of Activities Completed, # of Activity Relationships, and # of Activities with Constraints. Total number of activities on the critical path, percent complete, activities without predecessors, activities without successors, and activities out of sequence.

- APPENDIX 3 – Claim Digger Report (generated by the Primavera software application) providing a comparison between this Progress Schedule submission and the previous Progress Schedule submission.
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Excerpt from K. Progress Schedule Updates and Weekly Status Reports:

1) The Contractor shall perform a Progress Schedule Update on a minimum of a weekly basis, and every fourth schedule update period shall be consistent with monthly contract payment period.

2) The Contractor shall generate a Weekly Status Report after performing the Progress Schedule Update and Scheduling the project with a Data Date of day the schedule was updated, and submit it to the Engineer within one (1) State Business Day of the Data Date for that update period. The Weekly Status Report shall be generated using the activity Layout named Weekly Status Report, with activities grouped by the WBS, and using the standard default filter named Longest Path. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

3) During any time periods within the contract that special time-related contract provisions are in effect, including B-Clock periods or Incentive/Disincentive Periods, the Engineer may require more frequent Progress Schedule Updates and/or Progress Schedule Status Reports.

METHOD OF MEASUREMENT:
The quantity shall be measured for payment on a Lump Sum basis.
The minimum lump sum bid for this item shall be the unit price shown in the itemized proposal.
Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor’s bid to include the minimum bid amount for this item.

BASIS OF PAYMENT:
The lump sum price bid for CPM Progress Schedules shall include all labor, material, equipment, and incidentals, required to complete the work.

Progress payments will be made as follows:
A. A total of twenty-five (25) percent will be paid upon achieving all of the following:
   1. Attendance at the Preconstruction Schedule Meeting
   2. Acceptance of the Baseline Progress Schedule @ Award.
   3. Acceptance of the Final Baseline Progress Schedule @ Award.
B. A total of forty five (45) percent will be paid for acceptance of Monthly Progress Schedule submissions, acceptance of any necessary Time Impact Analysis, and acceptance of any necessary Recovery Schedules.
   Progress payments for this item will be calculated by multiplying the Daily Payment Amount by the calendar days in the estimate period, less any deductions for unsatisfactory CPM Progress Schedules, Time Impact Analysis, or Recovery Schedules. The Daily Payment amount will be calculated by taking 45 percent of the total item cost divided by the number of calendar days in the contract duration as designated in the proposal, without regard to any extension of time.
C. A total of twenty five (25) percent will be paid for submittal of Weekly Status Reports, participation in progress meetings, and submittal of Look-Ahead Schedules.
   Progress payments for this item will be calculated by multiplying the Bi-weekly Payment amount by the number of Bi-weekly periods (1 or 2) in the estimate period, less any deductions for unsatisfactory Status Reports or Look-Ahead Schedules, or non attendance at progress meetings. The Bi-weekly Payment amount will be calculated by taking 25 percent of the total item cost divided by the number of bi-weekly periods in the contract duration as designated in the proposal, without regard to any extension of time
D. A total of five (5) percent will be paid upon acceptance of the As-Built Progress Schedule.
Continued:

Following notification by the Engineer that there are deficiencies in compliance with the specification requirements, as described in paragraph E.1, with the submittal of any Progress Schedule no payment will be made under CPM Progress Schedules for each calendar day during which those deficiencies continue to exist. The amount of such calendar day non-payment will be the Daily Payment Amount as calculated above multiplied by the number of days there are deficiencies in compliance with the specification requirements.

Non-refundable liquidated damages may be assessed for each subsequent calendar day or part thereof that a cited deficiency resulting in non-payment is not corrected or is permitted to recur. Non-refundable liquidated damages will be assessed at the rate equal to four times the Daily Payment Amount as calculated above.

In the event the contract completion date is extended, no additional payment will be made for CPM Progress Schedules for Non-compensable Delays. If the contract completion date is extended due to a Compensable Delay than payment for maintaining and submitting additional CPM Progress Schedules, Weekly Status Reports, and weekly Look-Ahead Schedules shall be equal to the Daily Payment Amount as calculated above multiplied by the number of calendar days the contract is extended plus the Bi-weekly Payment Amount multiplied by the number of bi-weekly periods the contract is extended.

**Payment will be made under:**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>639.1022 01</td>
<td>CPM (Critical Path Method) Progress Schedule – Type 2</td>
<td>LS</td>
</tr>
</tbody>
</table>
Claim Digger

Claim Digger is a utility that compares two projects – a revised project and a base project – and creates a report on the differences between the project’s schedules, including:

- Items added
- Items deleted
- Changed values

Key Claim Digger functionality:

- Report is created in either HTML, CSV, or text format. HTML format suggested.
- Select the baseline and revised projects to be used for comparison.
- Comparison options can be turned on/off based on your needs.

Launching Claim Digger:

Steps:

1. In the Tools menu, click Claim Digger to launch the utility.
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2. At Primavera Schedule Comparison window, click the box under “Select original project or baseline.”
   Click the Ellipsis box to select the baseline project.

3. Click the Advanced button and select the Advanced Project Comparison Options. Click OK.


5. Enter the path of the output file by clicking the Ellipsis box.

6. Select “View file when done” by clicking the box.

7. Click the Compare button.

Note: When HTML file is chosen, the output can be edited and saved in Word and Adobe PDF format. When CSV file is chosen, the output file can be edited and saved in Excel format.
Schedule Analysis Checklist – See Chapter IV of the CPM Scheduling Manual

**Items to look for in the electronic schedule:**

- □ Recalculate the schedule (F-9) (in What-If area) and verify the correct data date
- □ “Must Finish By” date in the Project details equals the contract completion date.
- □ “Open End” listing report in the “Schedule Statistics Report”
- □ “Constraints” listing report in the “Schedule Statistics Report”
  - o You may also run filters “Has Start Constraint” or “Has Finish Constraint”
  - Note that constraints will reduce float.
- □ “Longest Path” filter
- □ Create filter for NYSDOT responsibilities
  - o Evaluate activities, durations, and relationships
  - Are activities Actual Start and Actual Finish dates consistent with Daily Diary reports?
  - o Are the NYSDOT activities “Front Loaded”?
  - o What NYSDOT activities are on the Longest Path?

**Verify that the Department is not unduly exposed for delay claims**

- □ Convert last update to the Primary Baseline
- □ Review “Claim Digger” report for unauthorized changes from the last update
  - o Were actual dates removed from the last update
  - o Were logic ties changed
  - o Were durations changed
  - □ May be done to support a delay claim
- □ In Primavera, use the “**Current vs Baseline Schedule Analysis**” layout to graphically see changes
Analyzing Performance

Analyzing the contractor’s electronic schedule file is an important part of your project responsibilities. It is generally regarded that an owner’s “acceptance” of a Progress Schedule is seen as a tacit approval, unless the owner’s documented review comments back to the Contractor indicate it is rejected or accepted as noted citing deficiencies that need to be corrected.

A printed schedule plot/report may not display key performance indicators for the project which may be affecting the schedule to the detriment of the Department. It is important that the Department’s review of the Progress Schedule consist of an analysis of the electronic schedule file used to generate the printed report/plot.

The report below is an example of what could be submitted on a paper report showing the schedule performance for the project that has a contract end date of July 2, 2003. The dates shown on the report would indicate conformance to the contract date.

---

The project's contractual finish date is July 2, 2003
Analyzing Performance (cont.)

The second example report shows the same project data, but with additional data that shows a more accurate project status. In this extreme example, the current finish date is June 28, 2004.

The project's contractual finish date is July 2, 2003.
Lesson 11: Monthly Progress Schedule Submissions

Review Questions

1. Why is it important to review the Schedule Log on a monthly basis?

2. What are things to look out for in the Schedule Log?

3. What are the ways to determine whether the project objectives are being met?

4. What can you find in a Claim Digger report?

5. How can we best utilize the functions of Claim Digger?
Lesson 12:

Reporting Performance

Objectives

In this lesson, you will look at the different methods of generating reports in Primavera. At the completion of this lesson, you will be able to:

- Compare the different reporting tools available
- Run each printing option for generating reports
- Create and print a customized report
Printing Existing Reports:

There are many methods to distribute schedule, resource, and cost performance information to the project team, including:

- Printed Layouts (cut and paste from the layout window)
- Printed reports from the Report Wizard
- Printed reports from Report tools.
- Primavera web applications

Steps:

1. From the **Directory Bar**, click **Reports**.
2. Select report.
3. In the **Command Bar**, click **Run Report**.
Creating New Reports using Report Wizard

1. On the **Menu Bar**, click **Tools**. Select and click **Report Wizard**.

2. On the **Create or Modify Report** window, select **New Report** and click **Next**.

3. On **Select Subject Area** window, choose the subject area for the report. Select **Activities** and click **Next**.

4. On **Select Additional Subject Areas**, select **Activity Steps, Predecessors** and **Successors**. Click **Next**.

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5. On **Configure Selected Subject Areas**, set the **Columns, Group & Sorts** and **Filter** configurations by clicking on each of the buttons. After setting configurations, click **Next**.

6. Add a title to your report. Click **Next**.

7. Click **Run Report**.

8. Determine where you want to send the report. Click **OK**. Click **Next**. Click **Finished**.
Lesson 12: Reporting Performance

Review Questions

1. What are the different methods for generating reports in Primavera?

2. What method is best to use when customizing reports?

3. What are the different configuration options that can be used in customizing reports in Primavera?

4. Why does NYSDOT’s new specification require contractors to develop and maintain their schedules on NYSDOT network servers only?

5. Why is it in the best interests of the contractors to comply with this specification?
Appendix:

**NYSDOT CPM Specification**

NYSDOT has implemented an updated Statewide CPM (Critical Path Method) Special Specification. The new specification will provide NYSDOT a common platform for enterprise level program management and standards for project level management. NYSDOT project field office staff will coordinate with the contractors to establish detailed CPM project schedules that will be closely monitored to track performance, reduce delays and claims, and aid in the successful delivery of contracts.

Following is the Statewide Special CPM Specification:
DESCRIPTION
This work shall consist of preparing, maintaining and submitting a Progress Schedule using the Critical Path Method on Primavera P6 software, or newer release, which demonstrates complete fulfillment of all work shown in the contract documents. All work to prepare, and maintain the CPM Progress Schedule shall be performed using the scheduling software application provided by the Department on network servers and accessed through the Internet with Department provided user accounts. The Contractor shall regularly revise and update the Progress Schedule, and use it in planning, coordinating, and performing all work. Schedule activities shall accurately depict the entire scope of work to be performed to complete the project including, but not limited to, all work to be performed by the Contractor, subcontractors, fabricators, suppliers, consultants, the Department, and others, contributing to the project.

DEFINITIONS

Activity - A discrete, identifiable task or event that usually has an expected duration, has a definable Start Date and/or Finish Date, and can be used to plan, schedule, and monitor a project.

Activity, Controlling - The first incomplete activity on the critical path.

Activity, Critical - An activity on the critical path.

Actual Start date - At the activity level, the Actual Start date represents the point in time that a meaningful work actually started on an activity.

Actual Finish date - At the activity level, the Actual Finish date represents the point in time that work actually ended on an activity (Note: in some applications areas, the activity is considered “finished” when work is “substantially complete.”); at the project level, the Actual Finish date represents the point in time that the Contractor completes all work on the project and it is accepted by the Engineer.

Backward Pass – Calculation of the late start and late finish dates for each activity, based on the start or finish dates of successor activities as well as the duration of the activity itself. Also known as the second pass.

Baseline Progress Schedule @ Award- The Progress Schedule submitted by the Contractor and accepted by the Department that shows the plan to complete the construction contract work. The Baseline Progress Schedule @ Award represents the Contractor’s plan at the time of contract Award for completing the Project.

Bid Date – The date the contract is let and there is an announcement by the Department of an apparent low bidder.

Completion Date, Contract - The date specified in the Contract for completion of the project or a revised date resulting from properly executed time extensions.

Completion Date, Scheduled - The date forecasted by the Progress Schedule for the completion of the Project.

Constraint - A schedule restriction imposed on the Start or Finish date(s) of an activity that modifies or overrides an activity’s relationships.

Progress Schedule Delay - An event, action, or other factor that delays the critical path of the Progress Schedule and extends the time needed for completion of the construction project.
**Contemporaneous Period Analysis Method** – A technique for evaluating schedule delays or time savings. The analysis period for the purpose of these provisions shall be the period covered in each regular progress update to the schedule, as they coincide with contract payments to the Contractor.

**Contractor Owned Float Activity** – The activity that documents time saved on the critical path by actions of the Contractor. It is the last activity prior to the contract Completion Date milestone activity.

**Contractor Start Work date** – The actual date the Contractor starts field work of a contract pay item, which is entered as a Start milestone activity in the schedule. Contractually no work may start until after the contract is awarded by the Office of State Comptroller, and the Contractor has received a Notice to Proceed from the Contract Management Bureau. Should the Contractor choose to show activities in the schedule that reflects their plan of work prior to the contract award, the Department does not incur any liability and such work being performed between the bid date and the contract award date shall be considered at risk work.

**Critical Path** – In the Progress Schedule the critical activities shall be those activities being on the longest path. In a project network diagram, the series of activities which determines the earliest completion of the project. The critical path will generally change from time to time as activities are completed ahead of or behind schedule.

**Critical Path Method (CPM)** – A network analysis technique used to predict project duration by analyzing which sequence of activities (which path) has the least amount of scheduling flexibility (the least amount of float). A scheduling technique utilizing activities, durations, and interrelationships/dependencies (logic), such that all activities are interrelated with logic ties from the beginning of the project to the completion of the project. Early dates are calculated by means of a forward pass using a specified start date. Late dates are calculated by means of a backward pass starting from a specified completion date (usually the forward pass’ calculated project early finish date).

**Data Date** – The date entered in the Project Details, in the Dates tab, which is used as the starting point to calculate the schedule. For the Baseline Progress Schedule @ Award submission the Data Date shall be the contract Award Date; for Monthly Progress Schedule submissions, the Data Date shall be the date up to which the Contractor is reporting progress (generally the last working day for the corresponding contract payment period, and for Weekly Status Reports the Data Date shall be the Saturday of that week). If the Contractor submits a Baseline Progress Schedule @ Bid submission, the Data date shall be the date of the schedule submission to the Engineer and not prior to the bid date. Everything occurring earlier than the data date is "as-built" and everything on or after the data date is "planned."

**Deliverable** – Any measurable, tangible, verifiable outcome, result, or item that must be produced to complete a project or part of a project. Often used more narrowly in reference to an external deliverable, which is a deliverable that is subject to approval by the Department.

**Duration, Original** - The original estimated number of working days (not including holidays or other non-working periods) in which the work task associated with the activity is expected to be performed. (The number of calendar days may be different based on the calendar assigned to the activity.) For certain activities such as concrete curing, or others approved by the Engineer, the calendar shall reflect no non-working days.

**Duration, Remaining** - The estimated time, expressed in working days (not including holidays or other non-working periods), needed to complete an activity that has started but has not finished.

**Early Dates** – The earliest date an activity can start or finish based upon logic and durations. Calculated by the software application when scheduling the project.
**Early Completion Date(s)** - A progress schedule shall be considered to have an early completion date when the schedule submitted by the Contractor indicates an anticipated completion date(s) that is/are earlier than the specified contract milestone date(s), which includes:

(i) the Scheduled Completion Date appearing as the “Finish” date in the Project Details, in the Dates tab, is earlier than the current contract Completion Date as of the Data Date of the progress Schedule.

(ii) the Finish Date of any interim Milestone activity, that describes an item of work in the contract with a required completion date, is earlier than the date specified in the contract as of the Data Date of the progress Schedule. This includes, but is not limited to, B-Clock activities, activities subject to Incentive/Disincentive provisions, activities subject to specific Liquidated Damages provisions, and Lane Rental activities.

**Enterprise Project Management Database (EPMD)** – The Department’s database of construction project Progress Schedules.

**Final Baseline Progress Schedule @ Award** - The original plan against which the Contractor’s progress is measured. The Final Baseline Progress Schedule @ Award represents the original plan at the award of the contract, of what is expected to happen. Once the Final Baseline Progress Schedule @ Award is accepted by the Engineer it is saved and used as a basis to compare against Progress Schedules Updates.

**Float Suppression** - Utilization of zero free float constraints which allows an activity to start as late as possible by using all its’ available free float. This technique allows activities to appear more critical than if the activity's total float was based on early dates. Assigning zero free float prevents true sharing of total float between Department and the Contractor. Examples of float suppression techniques include preferential sequencing (arranging the critical path through activities more susceptible to State caused delay), extending activities durations, incorporating several activities that actually require a half day or less of effort with Finish to Start relationships but showing each as full day durations where one activity would be appropriate, manipulating calendars, or any other such methodology.

**Float, Free** - The amount an activity can slip without delaying the immediate successor activities. Free Float is the property of an activity and not the network path.

**Float, Total** - The amount of time an activity (or chain of activities) can be delayed from its early start without delaying the contract completion date. Float is a mathematical calculation and can change as the project progresses and changes are made to the project plan. Total Float is calculated and reported for each activity in a network, however, Total Float is an attribute of a network path and not associated with any one specific activity along that path.

**Fragnet** – A subdivision of a project network diagram usually representing some portion of the project.

**Global data** – Data classified by Primavera software as Global, including Project Codes, Global Activity Codes, Global Calendars, Resource Calendars, Global Filters, Resources, Global Reports, User Defined Fields and Unit of Measure. Global Activity Codes are used to organize project activities across the enterprise project structure according to specific categories, such as the Code Value STG1 for Stage 1 under the Global Activity Code STAGE. Whereas Project Activity Codes are used to organize project activities for a specific project only.

**Initial Baseline Progress Schedule** – The Contractor’s schedule prior to submittal to the Engineer of the Baseline Progress Schedule @ Award, that reflects the Contractor’s plan to perform work during the time period while the full Baseline Progress Schedule is being developed, reviewed and accepted.

**Key Plans** - Key Plans are graphic representations made by the Contractor’s project Scheduler on paper copies of the appropriate contract plan sheets that reflect the Contractor’s planned breakdown of the project.
for scheduling purposes to efficiently communicate the Contractor’s activity coding scheme to State scheduling staff. The key plans prepared by the Contractor shall clearly define the boundaries of the work for each designated Area, the operations contained in various Stages of work, and work in the Work Zone Traffic Control (WZTC) Phases. The alphanumeric codes on the key plans shall match the code values for the activity code "Area", “Stage”, and “WZTC Phase” in the Progress Schedule.

**Late Dates** – “Drop dead dates”. The latest an activity can start or finish without delaying the day of completion. Calculated by the computer during the backward pass.

**Longest Path** - The sequence of activities through the Progress Schedule network that establishes the Scheduled Completion Date

**Look-Ahead Schedule** – Commonly a one or two week time segment generated from the accepted Progress Schedule that forecasts the work planned for the one or two week period following the Data Date, and includes any major materials to be delivered and any lane closings or anticipated shifts in WZTC.

**Milestone** – An activity with zero duration that typically represents a significant event, usually the beginning and end of the project, milestones set forth in the contract proposal, construction stages, a major work package, or the contract interim time-related clauses.

**Narrative Report** - A descriptive report submitted with each Progress Schedule. The required contents of this report are set forth in this specification.

**Open End** - The condition that exists when an activity has either no predecessor or no successor, or when an activity’s only predecessor relationship is a finish-to-finish relationship or only successor relationship is a start-to-start relationship.

**Predecessor** - An activity that is defined by Schedule logic to precede another activity. A predecessor may control the Start Date or Finish Date of its successor.

**Progress Schedule** – A general Primavera P6 Schedule as defined by this Specification.

**Progress Schedule Update** – Changes to the Progress Schedule that reflect the status of activities that have commenced or have been completed, including the following items: (a) Actual Start date and or Actual Finish date as appropriate; (b) Remaining Duration for activities commenced and not complete; and (c) Suspend or Resume dates for activities commenced and not complete.

**Progress Schedule Revision** – Revisions to the Progress Schedule ensure it accurately reflects the current means and methods of how the project is anticipated to progress, including modifications made to any of the following items: (a) changes in logic connections between activities; (b) changes in constraints; (c) changes to activity descriptions; (d) activity additions or deletions; (e) changes in activity code assignments; (f) changes in activity resource assignments; and (g) changes in calendar assignments.

**Project Scheduler** – The person that is responsible for developing and maintaining the Progress Schedule.

**Projects Planned Start Date** – The date entered in the Project Details, in the Dates tab, that reflects the Contractor’s planned start of work (based on contract requirements, and reasonable expectation for a Notice to Proceed) at the time the bid was submitted to the Department.

**Projects Must Finish By Date** – A date constraint entered in the Project Details, in the Dates tab, that reflects the Contract Completion Date set in the Contract Documents or through a formal contract extension of time.
Recovery Schedule – A schedule depicting the plan for recovery of significant time lost on the project. This separate CPM schedule submission shall provide the resolution and include appropriate changes in network logic, calendar adjustments, or resource assignments.

Relationships - The interdependence among activities. Relationships link an activity to its predecessors and successors. Relationships are defined as:
- **Finish to Start** - The successor activity can start only when the current activity finishes.
- **Finish to Finish** – The finish of the successor activity depends on the finish of the current activity.
- **Start to Start** – The start of the successor activity depends on the start of the current activity.
- **Start to Finish** – The successor activity cannot finish until the current activity starts.

Resources, Contract Pay Item – Contract Pay Item resources shall be identified as a Material resource type. When required, Contract Pay Item resources are developed for each Pay Item in the contract, with the Resource ID matching the contract Pay Item and the Resource Name matching the description of the contract Pay Item.

Resources, Equipment – Equipment resources shall be identified as a Nonlabor resource type. A unique identifier shall be used in the Resource Name or Resource Notes to distinguish this piece of equipment from a similar make and model of equipment used on the project.

Resources, Labor – Labor resources shall be identified as a Labor resource type. Labor Resources shall identify resources that encompass direct labor at the Crew level.

Scheduling/Leveling Report – The report generated by the software application when a user “Schedules” the project. It documents the settings used when scheduling the project, along with project statistics, errors/warnings, scheduling/leveling results, exceptions, etc.

State Business Days – Monday through Friday, with the exception of State Holidays.

State Owned Float Activity – The activity that documents time saved on the critical path by actions of the State. It is the last activity prior to the Completion Date activity and any Contractor Owned Float activity.

Substantial Completion - the day, determined by the Engineer, when all of the following have occurred:
1. The public (including vehicles and pedestrians) has full and unrestricted use and benefit of the facilities both from the operational and safety standpoint, and
2. All safety features are installed and fully functional, including, but not limited to, illumination, signing, striping, barrier, guard rail, impact attenuators, delineators, and all other safety appurtenances, and
3. Only minor incidental work, replacement of temporary substitute facilities or correction or repair remains for the Physical Completion of the Contract, and
4. The Contractor and Engineer mutually agree that all work remaining will be performed without lane closures, trail/sidewalk closures, or further delays, disruption, or impediment to the public.

Successor - An activity that is defined by Schedule logic to succeed another activity. The Start Date or Finish Date of a successor may be controlled by its predecessor.

Time Impact Analysis - A technique to demonstrate the comparison of a time impact of a Progress Schedule revision prior to a change in the Contract work, against the current accepted Progress Schedule. Also known as a “What-If” analysis.

Weekly Status Report – The report generated weekly from the updated Progress Schedule in an electronic Adobe Acrobat PDF format that reflects a Data Date for that Progress Schedule Update period.
shall be formatted to fit ANSI Size D paper (610 mm x 914 mm) (24 inch x 36 inch), listing all work activities from the date data to contract completion, using the NYSDOT Status Report Layout, sorted by Early Start Date, Total Float in increasing order, showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start date, Early Finish date, Start date, Finish date and Calendar ID.

**Work Breakdown Structure (WBS)** - A deliverable-oriented grouping of project elements, which organizes and defines the total scope of the project. Each descending level represents an increasingly detailed definition of project components or work packages.

**Work Package** - A deliverable at the lowest level of the work breakdown structure. A work package contains activities.

**Working Day** - A Working Day is a calendar day scheduled for active prosecution of the work.

**CONSTRUCTION DETAILS**

**A. Project Scheduler:**
The Contractor shall designate an individual, entitled the Project Scheduler, who will develop and maintain the construction progress schedule. The Project Scheduler shall be present at the Preconstruction Schedule Meeting, prepared to discuss, in detail, the proposed sequence of work and methods of operation, and how that information will be communicated through the Progress Schedule. The Project Scheduler shall attend all meetings, or receive meeting minutes that outline schedule related issues of those meetings, which may affect the CPM schedule, including but not limited to those between the Contractor and their Subcontractors and between the Contractor and the Department. The Project Scheduler shall be knowledgeable of the status of all aspects of the work throughout the length of the Contract, including but not limited to: original contract work, additional work, new work, and changed conditions of work.

**B. Scheduling Software:**
The State will provide Primavera P6 software, or newer release, and computer system for use by the Engineer to review the schedules submitted by the Contractor. The Department has installed Primavera P6 software, or newer release, on internet accessible servers for use by the Department’s construction inspection staff. Appropriate Department personnel, Consultants, and Contractors will also have access to these schedules on the Department’s Enterprise Project Management Database (EPMD). The Department will determine the location to store the project schedule files on the EPMD, and will provide the Contractor the naming convention for all progress schedule submissions.

The Contractor shall submit Request for Access Forms to the Regional Construction Engineer for each proposed Primavera user to obtain the User ID’s and Passwords for access to software and data on the Department’s network servers. The form can be downloaded from the following web page https://www.nysdot.gov/main/business-center/contractors/construction-division/primavera, or can be provided by the Department’s Construction Supervisor. These forms may submitted any time following the contract letting date and announcement by the Department that the Contractor is the apparent low bidder. The Department will process these requests and should generally provide the User ID’s and Passwords within two weeks of receipt by the Regional Construction Engineer. Upon approval and authorization by the Regional Construction Engineer, required User ID’s and passwords will be provided to the Contractor (for the Project Scheduler plus one other person) to obtain secure Internet access to the Primavera software and project schedule data. If the Contract is not awarded to this Contractor, the Contractor’s access to this project will be removed. Department provided User Id’s and Passwords are assigned to specific individuals and shall not be shared with any other users.
The Department will provide the Contractor either a Preliminary Construction Schedule or a project schedule template for the Contractor’s use in developing their CPM Progress Schedule. The Contractor shall develop, update, and revise the Progress Schedules using Primavera P6 software that has been loaded on the Department’s network servers and the Contractor shall store all Progress Schedule files on the Department’s network servers.

Primavera software and schedule data on the Department’s EPMD will generally be available for the Contractor’s use at all times unless system maintenance (i.e. backups, upgrades, etc) is being performed. System maintenance will generally be conducted over short time periods between the hours of 10 PM – 6AM, Monday - Friday and on weekends. The Department does perform regular backup of data contained in the EPMD, and will make every effort to restore the latest historical copy of schedule submissions in the event of any data failure of the EPMD. The Contractor shall also be responsible for exporting copies of project progress schedules, recovery schedules, TIA schedules, after data modifications have been made as their backup of these submissions. In the event a Contractor’s authorized user cannot access the software from 6AM to 10PM Monday through Friday, the Contractor shall provide written notification to the Engineer.

Project schedules are developed from the Contractor’s knowledge of the project, and the means and methods represented in those schedules are based on the Contractor’s understanding of the contract documents, and the Contractor’s past experience, which are unique to the Contractor. Schedule activity data and logic are therefore the intellectual property of the Contractor and will not be made available to other Contractors. All other schedule data, and all Enterprise data residing on the network servers, are the sole property of the Department.

C. Preconstruction Schedule Meeting:

The Contractor shall contact the Regional Construction Engineer after notification they are the apparent low bidder, but no later than two (2) State Business Days following the notice of contract award to schedule a Preconstruction Schedule Meeting. The purpose of this meeting will be to discuss all essential matters...
pertaining to the satisfactory scheduling of project activities, and to resolve any known questions regarding interpretation of the contract requirements for this work.

The Project Scheduler shall be prepared to discuss the following:

1. The proposed hierarchal Work Breakdown Structure (WBS) for the Progress Schedules. The Project Scheduler shall provide a paper copy at the meeting.
2. The proposed project calendars.
3. The proposed project activity codes, and various code values for each activity code. The Project Scheduler shall provide a paper copy at the meeting.
4. Specifics of any contract Time-Related Clauses (A+B Bidding, Incentive/Disincentive, Liquidated Damages, Lane Rental, etc.);
5. The Contractor’s schedule methodology to be employed, proposed work sequence and any proposed deviations from the contract plans with respect to Staging or Work Zone Traffic Control phasing.
6. The Key Plans shall be provided at the meeting.
7. The factors that the Contractor determines to control the completion of the project and any milestone activity completion dates contained therein.
8. The Project Scheduler shall provide an outline for the content of the Narrative report for future Progress Schedule submissions.
9. Schedule submission protocol for Final Baseline Progress Schedule @ Award and Monthly Progress Schedule submissions.

The Engineer will be available to answer questions regarding scheduling, including: the availability of Department supplied electronic file(s) containing sample project schedule information, sample progress schedule narratives, Special Notes for CPM Scheduling, and required standard format for CPM Progress Schedules for contract work.

The Contractor shall schedule meetings as necessary with the Engineer to discuss schedule development and resolve schedule issues, until the Final Baseline Progress Schedule @ Award is accepted by the Engineer.

The Contractor is encouraged, but not required, to submit an Initial Baseline Progress Schedule that demonstrates a sample of how the Project Scheduler’s proposed alphanumeric coding structure and the activity identification system for labeling work activities in the CPM progress schedule will conform to the detailed requirements of this specification. The review and comment by the Engineer of the sample schedule should assist the Project Scheduler in assuring the first submittal of the Baseline Progress Schedule @ Award will be in general conformance with the requirements of the specification and other contract requirements, and that major rework of the Baseline Progress Schedule @ Award will not be required. This submission shall reflect the Contractor’s anticipated plan to complete the contract work in accordance with the contract documents, as envisioned by the Contractor at the time of contract bid. This submittal may be made anytime following notice to the Contractor that they are the anticipated low bidder on the contract. Critical items for this review should include but are not limited to: the proposed WBS for subsequent progress schedules; the proposed project Calendars; project Planned Start date; project Must Finish By date; major milestone activities (i.e. - Award, Notice to Proceed, Contract Completion); and between fifty to one hundred summary activities for the major work deliverables of the contract (i.e. - pave EB from STA x to STA y, construct roundabout 1, construct bridge xyz, etc) that have assigned Activity Ids, Activity Descriptions, Activity Durations, Predecessors, Successors, and Activity Relationships. These summary activities will be broken down into, or supplemented with, individual work activities for the baseline submission. If any Crew resources are included, the composition of the staffing (the number and titles of the various staff) shall be listed in the Notes tab of the Crew resource, and the composition of the crews shall be included in the narrative. To the extent practicable, the Initial Baseline Progress Schedule should include administrative and procurement activities to be accomplished during the contract; planned submittal, review, and approval dates
Item 639.1022 01 – CPM (CRITICAL PATH METHOD) PROGRESS SCHEDULES – TYPE 2

for shop drawings, working drawings, fabrication drawings, and contractor supplied plans, procedures, and specifications.

If the Contractor proposes deviations to the construction staging or Work Zone Traffic Control Plans shown on the contract documents, then the Contractor must present a second Baseline Progress Schedule submission that reflects these proposed changes.

Any submission of a Initial Baseline Progress Schedule should be accompanied by a written Narrative that provides details of the Calendar assignments of working days versus non-working days, outlines the sequence of planned operations to complete the project work, and provides the proposed Activity Codes and Code values to be assigned to activities in future submissions of project progress schedules. The Engineer will review the logic diagram, coding structure, activity identification system, and Narrative; and provide comments for required changes by the Project Scheduler for implementation in the submission of the Baseline Progress Schedule @ Award. **The Engineer will provide written comments on major deficiencies within five (5) State Business Days of receipt.**

The Department reviews Initial Baseline Progress Schedules solely for format, and will not consider any submission of an Initial Baseline Progress Schedule for approval as an Early Completion Schedule.

**The Contractor shall schedule meetings as necessary with the Engineer to discuss schedule development and resolve schedule issues, until the Baseline Progress Schedule at Award is accepted by the Engineer.**

As an Initial Baseline Progress Schedule is being reviewed solely for format, the Department will not consider any submission of an Initial Baseline Progress Schedule for approval as an Early Completion Schedule.

**D. Progress Schedule:**

1. **General**

In addition to the attributes of the Progress Schedule provisions as set forth in §108-01, the Contractor shall prepare, furnish, and maintain a computer-generated Progress Schedule using the Critical Path Method (CPM) utilizing Primavera scheduling software on the Department’s network servers. The CPM Progress Schedule shall be prepared based on the principles defined by the latest issue of the Construction Planning & Scheduling Manual published by the Associated General Contractors of America, except where superseded by the contract documents such as the CPM Special Notes and this specification.

The Contractor and the Department shall use the Progress Schedule to manage the work, including but not limited to the activities of subcontractors, fabricators, the Department, other involved State agencies and authorities, other entities such as utilities and municipalities, and all other relevant parties involved with the project.

No work other than installation of the Engineer’s Field Office, mobilization, procurement and administrative activities, installation of construction signs, installation of erosion and pollution protection, clearing and grubbing, field measurements, and survey and stakeout will be permitted to start until the Baseline Progress Schedule @ Award has been submitted to the Engineer, and the Engineer determines there are no deficiencies consistent with those identified in paragraph E.1.

The Contractor will be the sole entity allowed to physically modify the following data within the progress schedule: activity IDs; activity descriptions; activity durations; relationships between activities; successors and predecessors, actual start and actual finish dates of activities; planned start and planned finish dates of
activities; and activity resources (with the exception that activities assigned resources labeled to reflect
Department personnel may be changed to reflect specific individuals, or job roles, within the Department).

The Department may modify certain data associated with the progress schedule to ensure conformance to the
Department’s Enterprise Project Management standard schedule format. This means that the Department may:
create additional layouts, filters and reports; create and edit additional user defined custom data fields; assign
Project Codes; add and assign additional project Activity Codes; add and assign additional Cost Account
Codes; add and assign additional Resource Codes; enter data in Notebook tabs; modify calendar ID’s
(although not the calendar itself); etc; that do not alter the established activities or schedule logic of the
Contractor. The Engineer shall communicate to the Project Scheduler the types and scope of changes planned
to be made to the progress schedules prior to the implementation of those changes. The Contractor shall not
delete or modify any schedule data entered by the Department without prior approval by the Engineer. The
schedule data added by the Department shall be incorporated into future schedule submissions of the
Contractor.

The Contractor shall develop the Progress Schedule using, to the maximum extent practicable, the Global
Activity Codes (DOT GLOBAL) and Resources (NYSDOT Pay Item Resources) identified in the
Department’s Primavera enterprise solution. Any schedule “Layouts”, “Filters” and “Report” formats that the
Contractor develops for the various Progress Schedules submissions to the Engineer shall be saved and made
available to all other users of the project schedule with a name that includes the contract D#.

The Department may make copies of the progress schedules to perform what-if type analysis, which may
involve any type of modification to those copies of the schedules.

The purpose of the Progress Schedule shall be to:

● ensure adequate planning and staffing during execution of the work by the parties to the contract;
● ensure communication and coordination of activities among all affected parties;
● assist the Contractor and the Department in monitoring the progress of the work, and evaluating
  proposed changes to the contract and/or requests for additional time to project completion;
● establish a standard methodology for time adjustment analysis based on the principles of the
  Critical Path Method of scheduling, for use in time-related dispute resolution;
● determine appropriate extensions or reductions of Contract Time.

In scheduling and executing the work, the Contractor shall:

a) Sequence the work commensurate with the Contractor’s abilities, resources and the contract
documents. The scheduling of activities is the responsibility of the Contractor.
b) Ensure that Progress Schedules prepared by the Project Scheduler for submission to the Department
are in compliance with the Contract. The intent should be that Schedule submissions and
accompanying Narratives are timely, complete, accurate, and in compliance with the Contract.
c) Communicate all Contract changes, and decisions or actions taken by the Contractor and all
subcontractors, fabricators, etc, that effect the Progress Schedule to the Project Scheduler in a timely
manner to allow appropriate development, maintenance, and update of the Progress Schedule.
d) Include all work contained in the Contract and all work directed in writing by the Engineer. Work
activities directed by the Engineer to be added to the Contract shall be included in the next Monthly
Progress Schedule submission.
e) Assure that Progress Schedule Updates reflect the actual dates that work activities started and
completed in the field.
f) Break a schedule activity into multiple activities to reflect a discontinuity in the work if a work
activity is suspended in the field and restarted at a later date, and the break between when the work
was suspended to when it was resumed is significant compared to the original activity duration.
g) Ensure the Progress Schedule contains all work constraints and Milestones defined in the Contract.

h) Schedule the work using such procedures and staging or phasing as required by the Contract. Work designated as part of separate stages may be performed concurrently with other stages where allowed by the Contract or where approved by the Department.

Failure by the Contractor to include any element of work required by the Contract in the accepted progress schedule does not relieve the Contractor from its responsibility to perform such work.

Errors or omissions on schedules shall not relieve the Contractor from finishing all work within the time limit specified for completion of the contract.

2. **Baseline Progress Schedule @ Award**

a) The Contractor shall ensure the schedule accurately reflects the proposed approach to accomplish the work outlined in the Contract documents and conforms to all requirements of this specification.

b) The schedule shall define a complete logical plan that can realistically be accomplished, to execute the work defined in the Contract.

c) The schedule shall comply with the work constraints and milestones defined in the Contract as well as all other contractual terms and conditions. The schedule shall be consistent in all respects with the specific interim Time-Related Contract Provisions, and any order of work requirements of the contract documents. The schedule shall meet all interim milestone dates and shall not extend beyond the contract completion date. This submission shall reflect the Contractor’s plan at the time of contract award, and prior to the start of any work. **No negative float is allowed in the Baseline Progress Schedule @ Award submission.**

d) Detailed Schedule Requirements - As a minimum, the Contractor shall address the following in the Baseline Progress Schedule:

i) Defining Project details and defaults – Within the Dates tab, the “Planned Start” shall be either the Letting Date or the contract Award Date, the “Data Date” shall be the date of Contract Award, the “Must Finish By” date shall be the contract Completion Date. Within the Settings tab, define the Critical Activities as the “Longest Path”. The Project Scheduler role does not have security privileges to change this data in the project Details tab, so requests for changes to this data needs to be forwarded to the CPMSchedulingSection@dot.state.ny.us; include in your request the contract Dnumber and the ProjectID.

ii) Sufficient activities shall be included to assure that there is adequate planning for the entire project. The appropriate number of activities will be largely dependent upon the nature, size, and complexity of the project. In addition to all site construction activities, network activities shall include: activities necessary to depict the procurement/submittal process including shop drawings and sample submittals; the fabrication and delivery of key and long-lead procurement elements; testing of materials, plants, and equipment; settlement or surcharge periods activities; sampling and testing period activities; cure periods; activities related to temporary structures or systems; activities assigned to subcontractors, fabricators, or suppliers; erection and removal of falsework and shoring; major traffic stage switches; activities assigned to the Department and other involved State agencies and authorities, including final inspection; activities to perform punch list work; and activities assigned to other entities such as utilities, municipalities, County government/agencies, and other adjacent contractors. The schedule shall indicate intended submittal dates, and depict the review and approval periods as defined in the Contract Documents for Department review.
The following activities shall be incorporated into the Progress Schedule:

<table>
<thead>
<tr>
<th>Activity ID</th>
<th>Activity Description</th>
<th>Duration (Min)</th>
<th>Follows</th>
<th>Logic Tie</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>00001</td>
<td>Contract Letting Date</td>
<td>0 - Start Milestone</td>
<td>----</td>
<td>SS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00005</td>
<td>Preconstruction Schedule Meeting</td>
<td>1 Working Day</td>
<td>00001</td>
<td>SS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00010</td>
<td>Preconstruction Meeting</td>
<td>1 Working Day</td>
<td>00001</td>
<td>SS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00011</td>
<td>DMWBE Goals Submitted</td>
<td>00001</td>
<td>SS</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>00015</td>
<td>DMWBE Goals Approved</td>
<td>15 Working Days</td>
<td>000011</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00020</td>
<td>Contract Award Process</td>
<td>45 Calendar Days</td>
<td>00001</td>
<td>SS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00025</td>
<td>Contract Award Date</td>
<td>0 - Finish Milestone</td>
<td>00020</td>
<td>FF</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00030</td>
<td>Submit Proof of Insurance</td>
<td>1 Working Day</td>
<td>00001</td>
<td>SS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00035</td>
<td>Notification to Proceed</td>
<td>1 Working Day</td>
<td>00025, 00030</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00040</td>
<td>Submit Safety &amp; Health Plan</td>
<td>1 Working Day</td>
<td>00001</td>
<td>SS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00045</td>
<td>Approve Safety &amp; Health Plan</td>
<td>20 Working Day</td>
<td>00040</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00050</td>
<td>Contractor Starts Contract Work</td>
<td>0 - Start Milestone</td>
<td>00035, 00045</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00055</td>
<td>Set Up Engineer’s Field Office</td>
<td></td>
<td>00035</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00060</td>
<td>Prepare &amp; Submit Baseline Progress Schedule @ Award</td>
<td>See Note 1</td>
<td>00005</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00065</td>
<td>Review Baseline Progress Schedule @ Award</td>
<td>See Note 2</td>
<td>00060</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00070</td>
<td>Accept Baseline Progress Schedule @ Award</td>
<td>1 Working Day (see Note 3)</td>
<td>00065</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>00075</td>
<td>Mobilization</td>
<td>20 Working Days</td>
<td>00050</td>
<td>SS</td>
<td>Contractor</td>
</tr>
<tr>
<td>00100</td>
<td>Field Work Begins</td>
<td>0 duration</td>
<td>00050, 00055, 00060</td>
<td>Contractor</td>
<td></td>
</tr>
<tr>
<td>09000</td>
<td>Substantial Completion</td>
<td>0 duration</td>
<td>See definition</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>09010</td>
<td>Other Agency Inspection</td>
<td>20 Working Days</td>
<td>09000</td>
<td>FS</td>
<td>Others</td>
</tr>
<tr>
<td>09020</td>
<td>NYSDOT Inspection</td>
<td>20 Working Days</td>
<td>09000</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
<tr>
<td>09030</td>
<td>Punchlist work</td>
<td>20 Working Days</td>
<td>09020</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>09040</td>
<td>Demobilization</td>
<td>10 Working Days</td>
<td>09020</td>
<td>FS</td>
<td>Contractor</td>
</tr>
<tr>
<td>09100</td>
<td>Project Acceptance by the Engineer</td>
<td>0 duration</td>
<td>09040</td>
<td>FS</td>
<td>NYSDOT</td>
</tr>
</tbody>
</table>
Note 1 – Use Timeframe required in Table 2 column 1 of specification for Item 639.1022 xx.

Note 2 – Use Timeframe required in Table 2 column 2 of specification for Item 639.1022 xx.

Note 3 – Acceptance Date should not exceed Timeframe from Notice of Award required in Table 2 column 3 of specification for Item 639.1022 xx.

The Logic Ties shown shall be used as a relationship to the predecessor activities contained in the column named Follows.

iii) **Work Breakdown Structure (WBS)** - A multi-level hierarchical WBS shall be incorporated. The levels (nodes) shall include, but not be limited to:

- **Level 1** - is the project level;
- **Level 2** - shall have three nodes; Preconstruction Activities, Construction Activities, and Post Construction Activities;
- **Level 3** - Preconstruction activities shall have two sub-nodes; Submittals/Shop Drawing Activities, and Procurement/Fabrication Activities;
  - Construction activities shall be broken into nodes for various geographic “Areas” of work within the project limits;
- **Level 4** - the Areas of work shall have sub-nodes for the various Stages of work;
- **Level 5** - the Stages of work shall have sub-nodes for the various highway features: bridges, highway segments, interchanges, intersections/roundabouts, etc;
- **Level 6** - the highway features should be broken into their components (a bridge into components such as Piles, Substructure, Superstructure), and a highway segment into components such as pavement, drainage, earthwork, lighting, traffic signals, etc.

An example Work Breakdown Structure is shown below in Figure 1
iv) **Activity ID** - Include a unique identification number for each activity. Activity ID numbers shall not be changed, or reassigned.

v) **Activity Name** - Clearly and uniquely define each activity name with a description of the work that is readily identifiable to inspection staff and the progress of each activity can be measured. Each Activity shall have a narrative description consisting at a minimum of a verb or work function (i.e. form, pour, excavate, etc), an object (i.e. slab, footing, wall, etc), and a location (i.e. STA, bridge or retaining wall number, street, etc). The work related to each Activity shall be limited to one Area of the contract, one Stage of the contract, one WZTC Phase of the contract, and one Responsible Party of the contract.

vi) **Milestone Activities** - Include activities for all contract milestones that define significant contractual events such as Contract Award, Notice to Proceed, Contractor Start Work, Substantial Completion, Physical Completion, Contract Completion, and coordination points with outside entities such as utilities, State agencies, Authorities, municipalities, Time-Related Contract Provisions, etc.

All milestone activities in the schedule shall be assigned the standard Global calendar named “NYSDOT Milestone/Curing 365 Day / 8 hour”, this calendar should also be assigned to any activities for concrete curing.

- The Contract Award milestone shall have a primary constraint of “Finish On” and the date of Contract signature by the State Comptroller,
- The Contract Completion milestone shall have a primary constraint of “Finish on or before” and the contract Completion Date,
- The Contractor Start Work” Start milestone activity, that will eventually reflect the actual date the Contractor started work authorized under the contract.

vii) **Activity Durations** – Define the Original Duration of each activity in units of whole work days, except for activities of less than one day duration which should be shown in units of tenths of a day. Except submittal/procurement activities, durations shall not exceed 15 work days unless approved by the Engineer. Durations for Department submittal reviews shall meet the requirements set forth in the contract documents. If requested by the Engineer, the Contractor shall justify the reasonableness of planned activity time durations.

viii) **Activity Relationships** - Clearly assign predecessors and successors relationships to each activity, and assign appropriate logic ties between activities (Finish to Start, Start to Start, Finish to Finish, etc). Do not have any open ended activities, with the exception of the first activity and last activity in the schedule. An activity may only appear once as a predecessor or successor to another specific activity, but may be assigned as a predecessor or successor to many different activities. Do not include inappropriate logic ties with Milestone activities (i.e. – a finish milestone activity, and a predecessor assigned with a Finish to Start logic tie; or a start milestone, and a successor assigned with a Finish to Start logic tie). **Lag time may not exceed 10 days. The Contractor shall not use negative Lag times.**

ix) The Contractor shall assign the “Contract Award Date” activity as a predecessor to all Review and Approval type activities to be performed by Department staff.

x) **Activity Constraint Dates** – The Contractor shall not have any constrained activities, with the exception of contractual dates, unless the Engineer accepts such constraints in writing. Milestone activities shall be included for the Contract Award which shall have a primary constraint of “Finish On” and the date of contract signature by the State Comptroller, and for the Contract Completion which shall have a primary constraint of “Finish on or before” and the contract completion date indicated in the contract documents. Only contractual/owner-designated constraints are allowed unless specifically authorized by this specification or the Engineer.

xi) **Activity Dates** – With the exception of contract Milestone dates, “Actual Start” and “Actual Finish” dates and “Planned Start” and “Planned Finish” dates, activity dates shall be calculated by the project scheduler tool within the Primavera software. No Actual Start or Actual Finish dates
shall be entered in the Baseline Progress Schedule @ Award, with the exception of activities that were completed prior to the Contract Award.

xii) **Calendars** - Use clearly defined calendars that account for expected seasonal weather conditions (including winter shutdown periods) and environmental permit requirements, for the planning and scheduling of activities. Do not incorporate an activity with a description of “Winter Shutdown” that requires constraints. Provide the working days per week, holidays, the number of shifts per day, and the number of hours per shift by using the Calendar modifier in the P6 software. Incorporate any seasonal restrictions to the work within calendars assigned to activities.

- Calendars related to specific resources (i.e., a specific person or piece of equipment) shall be established as Resource Calendars, with the Calendar name clearly identifying the resource.
- All other calendars developed by a Contractor shall be established as Project Calendars, with the calendar name including the contract D# and describing the function (i.e., D260000 - Asphalt Calendar, D260000 - Concrete Calendar, D260000 - Landscape Calendar, D260000 - Painting Calendar, D260000 – Contractor’s 5 Day/8 Hour Workweek). All work activities of the Contractor shall be assigned to Project Calendars.
- Any Global calendars used in the progress schedule shall be those established by the Department. There are only two Global Calendars developed and maintained by the Department for use by Contractor’s, they are the following:
  - NYSDOT Milestone/Curing 365 Day / 8 hour
  - State Business Days, 5 Day Work Week w/State Holidays, Field
- Changes desired for these calendars shall be forwarded to CPMSchedulingSection@dot.state.ny.us, and if appropriate these changes will be performed by the Office of Construction system admin staff. This will be accomplished by making a copy of the existing Global calendar, then the new calendar will be renamed and modified as necessary.
- Activities for shop drawing reviews and other approvals by Department personnel shall be assigned the Department’s standard Global – “State Business Day, 5 Day Work Week w/State Holidays, Field” Calendar that reflects all holidays observed by the State.

xiii) Clearly define significant interaction points between the Contractor, the Department, and other entities including but not limited to: Federal, State and local agencies/authorities; and utilities. All activities of the Department, utility companies, adjacent contracts, and other entities that affect progress and influence any contract required dates including durations shall be shown in the schedule. This includes dates related to all Permits or Agreements. The schedule shall give special consideration to sensitive areas such as road closures and parklands and shall indicate any time frames when work is restricted in these sensitive areas as outlined in the permits issued by the regulatory agencies, and provided in the contract documents.

xiv) **Activity Resources** – The Contractor will generally not be required to develop Labor resources, Equipment resources or Contract Pay Item resources in the Resource Dictionary, or assign them to schedule activities. The Contractor may be required by the Engineer to assign Labor and Equipment resources if submitting a Progress Schedule when contract milestone activities are projected to have Early Completion dates, as described in paragraph I of this specification. The Contractor will not be required to assign costs to resource assignments in the schedule. The Department will assume when reviewing the schedule that the Contractor’s resources are unlimited; unless the Contractor either assigns equipment, labor and contract pay item resources to each activity in the schedule (and performs resource leveling), or indicates in the schedule narrative what resource limitations are present. If labor, equipment and contract pay item resources are not assigned to activities in the schedule, it shall be the Contractor’s responsibility to assure the activity logic in the schedule properly reflects their resource limitations. If labor
and equipment resources are not assigned to activities in the schedule, and the Contractor anticipates multiple crews for the same schedule activity, these resources shall be documented in the schedule narrative. As an activity can have only one responsible party, no activity shall involve multiple crews comprised of the Contractor and a subcontractor, or multiple subcontractors.

**Activity Codes** – The Contractor shall include a well-defined activity coding structure that allows project activities to be sorted and filtered. Activity Codes shall include, but not be limited to: Responsible Party; Stage; Area of Work; Type of Work; Subcontractor; and additionally as required by the Engineer to meet the needs of the specific contract work to facilitate the use and analysis of the schedule.

- No Global Activity Codes shall be incorporated in any progress schedule submission to the Engineer except those established by the Department.
- The Global activity codes established by the Department shall be used to the maximum extent practicable. The Contractor shall assign the appropriate activity code values to each activity in the progress schedule for the following Global Activity Codes that are in the Department’s enterprise database:
  1. RESPONSIBLE PARTY (DOT GLOBAL)
  2. STAGE (DOT GLOBAL)
  3. AREA (DOT GLOBAL)
  4. TYPE OF WORK (DOT GLOBAL)
  5. PAY ITEM (DOT GLOBAL)
  6. CHANGED (ADDED/DELETED) WORK (DOT GLOBAL)
  7. TIME Related Clauses (DOT GLOBAL)
  8. DELAY (DOT GLOBAL)
- Additional Activity Codes developed for specific projects shall be established as Project Activity Codes.

**Activity Code Values** – Each Activity Code shall be broken down into various Activity Code Values that are then assigned to activities. For example, the Activity Code “Stage” shall include a hierarchal arrangement of Activity Code Values as shown below in Figure 2:
xvii) **Activity Code Assignments** - For each activity, within the activity details the Contractor shall assign Activity Code values to identify the “Responsible Party” (i.e. – Contractor, NYSDOT, Utility Co, Municipality) for the work to be performed (one and only one responsible party shall be assigned to each activity), the “Stage” of the contract for the work that will be performed, the “Area” where the work is to be performed, the “WZTC Phase”, and the Type of Work (i.e. - Procurement, Paving, Embankment, Excavation, Electrical, Signing, etc). For activities included in work governed by time-related contract provisions, the appropriate “Time Related” activity code shall be utilized. For activities included in work added and/or changed within an Order-On-Contract, the appropriate “Added/Changed Work” code shall be utilized. For all work activities performed by the Contractor or subcontractors/fabricators/suppliers, “Contractor” shall be designated as the Responsible Party. If the Contractor wants a separate activity code to enable sorting the activities of subcontractors, fabricators, or suppliers a separate “Subcontractor” code shall be utilized.

xviii) **Interim Milestone Dates with Liquidated Damages and Special Time-Related Contract Provisions** (i.e. – A+B Bidding, Incentive/Disincentive provisions, Lane Rental) – Each time-related contract provision in the contract shall be represented in the progress schedule by having a start and finish milestone, with appropriate predecessors and successors assigned to all schedule activities considered part of that time-related contract provision work including the start and finish milestone activities. In addition, the Start milestone for the time-related contract work shall have predecessors and/or date constraints assigned that include those defined in the contract documents, and the Finish milestone for the time-related contract work shall have successors and/or date constraints assigned that include those defined in the contract documents. All schedule activities associated with each specific time-related contract provision shall be assigned to a separate node within the project WBS and the WBS node description shall be labeled accordingly, in addition these activities shall be assigned the appropriate Time-Related Clauses (DOT GLOBAL) activity code value. A Level Of Effort activity shall be used for each time related contract provision (i.e - “Incentive 1 Duration” or “B Clock 1 Duration”), this activity shall have the Start Milestone as a predecessor with a SS relationship and the Finish Milestone as a successor with a FF relationship and the duration of this activity shall be calculated when the project is scheduled.

xix) **Narrative** - Include a narrative in Microsoft Word and/or Adobe Acrobat format that describes:

- The Contractor’s general approach to construct the Work outlined in the baseline schedule. Address the reasons for the sequencing of work and describe any resource limitations, potential conflicts, and other salient items that may affect the schedule and how they may be resolved.
- If not provided in the contract plans, or if modified by the Contractor, provide copies of the appropriate contract plan sheets marked up as Key Plans, to correlate values on the contract plans (for Area of Work, Stage of Work, and WZTC Phase) to the Contractor’s planned breakdown of the project (i.e- Activity Codes, Activity Descriptions) for scheduling purposes.
- The justification(s) for each activity with a duration exceeding 15 working days.
- The reason for any lags assigned to any activities.
- The justification(s) for Contractor imposed activity constraints proposed in the schedule.
- A list of calendars which have been used in the schedule, along with the general reason for their use.
- The project critical path and challenges that may arise associated with the critical path.
- Anticipated coordination issues related to work activities by other entities, that require additional information from or action by the Engineer.
Appendix 1 to the narrative shall be the “Schedule Log” report created when the project was scheduled.

Appendix 2 to the narrative shall be an electronic schedule plot (Adobe Acrobat format) using the Global Layout named “Baseline Schedule submission”, with activities sorted by Start Date in ascending order, Grouping of activities by WBS, and only the “Longest Path” filter applied. This plot shall provide a clear critical path from the Data Date to the last activity in the schedule.

**List of Submittals** – The Contractor shall submit with the Progress Schedule a list of all Submittals (i.e. - Shop Drawings, required permits, Erection/Demolition plans, Heath and Safety Plan, etc.) generated from the Baseline Progress Schedule for review and approval by the Engineer. The Contractor shall use a Filter to limit the schedule activities shown in the report to only the prepare/submit, and review/approve activities related to submittals. For construction contracts that utilize Primavera Contract Manager, Shop Drawing submittal activities in the Progress Schedule shall be at the Submittal Package level. The report shall be in Adobe PDF format and transmitted to the Engineer by email.

e) Schedule Submission

  i) Within the timeframe indicated in Table 2 column 1, submit one electronic copy of the Baseline Progress Schedule @ Award in a Critical Path Method (CPM) format for the Engineer’s review and acceptance.

<table>
<thead>
<tr>
<th>Timeframe from receipt of Notice of Award to Submission of complete Baseline Schedule. (Column 1)</th>
<th>Timeframe for Engineer’s Review (Column 2)</th>
<th>Timeframe from Notice of Award to acceptance by the Engineer not to exceed (Column 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>10</td>
<td>40</td>
</tr>
</tbody>
</table>

  ii) The Engineer will review the schedule and return it, accept it with comments, or reject it within the timeframes indicated in Table 2 column 2, following the date of receipt of the Contractor’s submission.

  iii) If the schedule is returned with comments, the Contractor shall address all comments and revise the schedule as necessary. The Contractor shall complete the Final Baseline Progress Schedule @ Award and obtain the acceptance of the Engineer within the timeframe required in Table 2 column 3.

  iv) If the schedule is accepted by the Engineer without any comments, the Contractor shall copy the schedule and rename it for submission as the Final Baseline Progress Schedule @ Award.

  v) In no way does the Baseline Progress Schedule modify the contract documents.

  vi) The Contractor shall assign appropriate Activity Codes and provide custom Layouts, Filters, and/or report formats necessary to allow the Engineer to generate a report from the each Progress Schedule submission of all submittals required under the contract (i.e., shop drawings, required permits, erection/demolition plans, etc). The list shall show scheduled submission date, review date, and acceptance date for each submittal and identify the earliest activity affected by each of these submittals. This list shall be generated from each Progress Schedule submission until all such activities are completed.
3. **Final Baseline Progress Schedule @ Award**

   a) If the Baseline Progress Schedule @ Award is returned to the Contractor with comments, the Contractor shall make a copy of the schedule and rename it as the Final Baseline Progress Schedule @ Award with comments addressed and revisions made as necessary. The Contractor shall complete the Final Baseline Progress Schedule @ Award and obtain acceptance of the Engineer within the timeframe required in column 3 of Table 2, or within one week of the Contractor’s receipt of the final comments by the Engineer, whichever is sooner.

   b) The Engineer shall review the schedule and return it, accepted or with comments, within 5 State Business days following the date of receipt of the Contractor’s submission.

   c) The Final Baseline Progress Schedule @ Award must be “accepted” or “accepted as noted” by the Engineer prior to the Department evaluating any Contractor disputes associated with time impacts. This does not preclude the Contractor from submitting a dispute while the schedule is being reviewed for acceptance.

4. **Monthly Progress Schedule Submissions.**

   a) **First Monthly Progress Schedule Submission** – Within three State Business Days following acceptance of the Final Baseline Progress Schedule @ Award or the closing date for the first month’s contract payment period whichever is later, the Contractor shall perform a Progress Schedule Update to reflect the status of all activities where work was performed in the time period between the start of work and acceptance of the Final Baseline Progress Schedule @ Award. This shall include actual dates entered in the Actual Start and Actual Finish columns, and percentage of work complete for uncompleted activities, in addition the Contractor shall incorporate any Progress Schedule Revisions that reflect any changes in how future work activities are to be completed.

   b) **Subsequent Monthly Progress Schedule Submissions** - On a monthly basis, the Contractor shall submit a copy of the current Progress Schedule that includes all Progress Schedule Revisions and Progress Schedule Updates to reflect the actual and planned prosecution and progress of the contract work. Progress Schedule Updates shall reflect the status of activities that have commenced or have been completed, including the following items: (a) actual dates in activity Actual Start and Actual Finish columns as appropriate; (b) actual Remaining Duration for activities commenced and not complete; and (c) actual activity Suspend or Resume dates for activities commenced and not complete. Progress Schedule Revisions reflect modifications made to activities in the current project baseline schedule in any of the following items: (a) activity Original Duration; (b) changes in logic connections between activities; (c) changes in Constraints; (d) changes to Activity Descriptions; (e) activity additions or deletions; (f) changes in Activity Code assignments; (g) changes in activity Resource assignments; and (h) changes in Calendar assignments. All “Out of Sequence” activities noted in the scheduling log shall be corrected to reflect the current construction operations. When preparing a formal submission of the progress schedule, the Contractor shall make a copy of the current Progress Schedule and name it according to the file naming convention provided by the Department in Table 1.

   c) **Additional Schedule Requirements** - In addition to the schedule requirements detailed for the submission of the Baseline Progress Schedule @ Award, the following shall be provided by the Contractor:

      ii) **Data Date** - the “Data Date” shall be the date the Project Scheduler last edits the schedule prior to submission to the Engineer (generally the last working day of the contract payment period). The Project Scheduler can modify the project’s Data Date through the Schedule tool.

      iii) **Activity Status** -

         a. Durations – the Original Duration shall not be changed without prior written justification by the Contractor, and written approval by the EIC. The Contractor shall edit the Remaining Duration to reflect progress made on work activities, and shall not use Duration %. If a proposed change to Original Duration is due to additional or changed work to the contract the Contractor shall instead add an activity to reflect this additional work, and assign the appropriate Activity Code.
b. Started and Finished dates – for each activity where work was started during the month, the Contractor shall enter the date the work Started. For each activity where work was completed during the month, the Contractor shall enter the date the work Finished.

c. Suspended work – The first time that work has been suspended on a schedule activity, the Contractor shall enter the Suspend and Resume fields within the Project Details under the Status tab. For any subsequent suspensions of work to that activity the Contractor shall break that activity into two or more activities to accurately reflect the suspension and resumption of work dates in the field, and to more accurately reflect the relationship to other work activities.

iv) Activity Resources – For each activity that resource limitations are affecting the prosecution of work, as determined by the Engineer, labor and equipment resources shall be entered in the schedule. Unit costs or pricing is not required. Labor Resources shall identify resources that encompass direct labor at the Crew level (i.e. – Grade Crew 1, Paving Crew 1, Pipe Crew 1, Bridge Footing Crew 1, Bridge Deck Crew 1, etc), the makeup of the Crew shall include the various Labor classes and equipment that comprise the Crew along with the quantity of each labor class and type of equipment. The Contractor shall provide the makeup of each Crew in the Schedule Narrative, and assign those Crews to the appropriate activities in the Progress Schedule. Equipment resources shall be shown for major or specialty equipment such as tower cranes, pile drivers, barges, asphalt pavers, concrete pavers, dozers, front end loaders, backhoes, rollers, excavators, graders, long line striping trucks or other equipment that cannot be rented easily.

v) Calendars – To change a project calendar for activities scheduled in the future, the Contractor shall copy the calendar and use a revised name that includes a reference to which Monthly Update the change was incorporated (i.e. - D260000 - Concrete Calendar should be revised to D260000 – 2 - Concrete Calendar to reflect the 2nd Monthly Update when the change was made to the calendar). The reason for the change in the calendar shall be documented in the Narrative.

vi) Notebook - For any activities on the critical path that are delayed, the Contractor shall enter the dates the activity was delayed and the reason for such delay in the Notebook tab of that activity.

d) Monthly Progress Schedule Narrative - For each Monthly Progress Schedule submission, the Contractor shall submit a narrative in Microsoft Word, or Adobe Acrobat format that includes, but is not limited to: (The narrative may be an annotated copy of the Claim Digger Report that includes the information below.)

i) The contract D number, project name, project location, and name of Prime Contractor.

ii) Actual contract Award Date, current contract Completion Date, and scheduled completion of all project work.

iii) Any contact Interim Milestone dates (I/D, B-Clock, LD, etc), and scheduled Start and Finish dates for those Milestone activities.

iv) List all activities on the Critical Path (include Activity ID’s and Activity Descriptions) where work is currently being delayed, and for each such activity provide detailed information including:

• the events that caused the delay.
• the party(s) responsible for the delay event(s).
• the number of days the activity has been delayed (negative float).
• the activities in the construction schedule affected by the events.
• the reasonable steps needed to minimize the impact of the delay, and which party needs to take the action(s).
v) List any other problems experienced during this Progress Schedule submission period, the party responsible for the problems, and the Contractor’s intentions to resolve the problems.

vi) List all activities for procurement of long lead time materials that are behind schedule and the reason(s) why.

vii) For major work items describe the differences between the actual work performed and the work planned for the period as represented in the preceding Progress Schedule submission, including explanations for the deviations.

viii) For all suspended work activities that could otherwise logically be progressed, identify the responsible party prohibiting the progression of the work, as well as the detailed reasons why.

ix) Description of any changes to the critical path since the last Monthly Progress Schedule submission and the impacts of such changes.

x) Change to State Owned Float and/or Contractor Owned Float based on changes to the critical path.

xi) List of all added or deleted activities included in this Monthly Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

xii) List all changes in activity Original Durations, the justification for such change(s), and the impact(s) of such changes.

xiii) List all changes in relationships between activities included in this Progress Schedule submission, and the reason(s) for and the impact(s) of such changes.

xiv) List any addition or deletion of activity or project constraints, and the reason(s) for and the impact(s) of such changes.

xv) List all changes to the project calendars, and the reason(s) for and the impact(s) of such changes.

xvi) The major work elements, as defined in the WBS, to be accomplished during the next monthly work period.

xvii) Any potential problems that are anticipated for the next monthly work period and the proposed solutions to such problems. Identify potential problems or risks that either the Department or Contractor may be potentially responsible for. Explain what action the responsible party (i.e. Department or Contractor) needs to take and the date by which time the action needs to taken to avoid the problem.

xviii) Any planned acceleration of activities that the Contractor anticipates to undertake within the next monthly work period that either the Department directed, or that the Contractor believes is necessary.

xix) The following appendix in Adobe Acrobat PDF file format, formatted to fit ANSI Size D paper (610 mm x 914 mm) (24 inch x 36 inch) paper, shall be included with the narrative.

- APPENDIX 1 – A listing of all work activities as of the data date, using the Classic Schedule Layout, sorted by Early Start Date, Total Float in increasing order, showing the Activity ID, Activity Description, Original Duration, Remaining Duration, Total Float, Early Start date, Early Finish date, Start date, Finish date, and Calendar ID. The grouping of activities shall be by Area, Stage, WZTC Phase, and Type of Work. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

The following appendices in Adobe Acrobat PDF file format, formatted to fit 216 mm x 279 mm size (8.5 inch x 11 inch) paper, shall be included with the narrative.

- APPENDIX 2 – A complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by the Department’s Primavera scheduling software application) which includes the Schedule Settings, Statistics, Errors, Warnings, Scheduling/Leveling Results, Exceptions, Activities with unsatisfied constraints, Activities with unsatisfied relationships, and Activities with external dates. The statistics shall include, # of
Activities, # of Activities Not Started, # of Activities In Progress, # of Activities Completed, # of Activity Relationships, and # of Activities with Constraints. Total number of activities on the critical path, percent complete, activities without predecessors, activities without successors, and activities out of sequence.

- **APPENDIX 3** – Claim Digger Report (generated by the Primavera software application) providing a comparison between this Progress Schedule submission and the previous Progress Schedule submission.

e) **The Contractor shall include a Time Impact Analysis (TIA) with any request for an extension of contract time.**

f) **Schedule Submission** - The Contractor shall submit the Monthly Progress Schedule to the Engineer monthly using the closing date for the monthly contract payment. The schedule submission to the Engineer shall be made within three (3) State Business Days of the Data Date, whether or not the Engineer has accepted the previous Monthly Progress Schedule submission. Schedule submittals will only be considered complete when all documents and data have been provided. Immediately prior to submitting the schedule the Project Scheduler shall “Schedule” the project, when scheduling the project the Scheduling Options shown in Figure 3 shall be used unless approval to vary from these settings is given by the Engineer, or if the schedule has an Early Completion Date(s) as outlined in paragraph I of this specification the option to Level Resources during Scheduling shall be checked. **The Project Scheduler shall use the same Scheduling Options for all Progress Schedule submittals for the duration of the contract, unless directed otherwise by the Engineer.**

![Schedule Options](image)

**FIGURE 3**

g) **Schedule Submission Method** - The Contractor shall submit the schedule to the Engineer electronically for review and acceptance. The filename shall conform to the requirements of Table 1. The Project Scheduler can change the Project ID and Name through the WBS at the top node, as they do not have privileges to edit data through the Project Details tab. The Contractor’s submission shall be documented by an E-mail to the Engineer, with a copy to CPMPlanningSection@dot.state.ny.us
and all appropriate project participants, that the project schedule on the network is ready for review.

The Contractor’s E-mail to the Engineer shall also consist of the following:

i) The subject of the E-mail shall include the Region #, contract D number, the Project Name, the Progress Schedule’s ProjectID, and construction company name. (i.e. – Region 8, D260000, Rehabilitation of Main Street viaduct, D260000-1UD2, ABC Contractors)

ii) The E-mail message shall include the name of the EIC, the current anticipated Finish date of the last activity in the project schedule, a statement as to how that date compares to the current Contract Completion Date, and the name of the Area Construction Supervisor.

iii) Electronic files of all Narrative Reports and required attachments associated with the schedule shall be submitted by the Contractor in Adobe Acrobat format.

5. **As-Built Progress Schedule.** The Contractor shall submit the As-Built Progress Schedule with Actual Start and Actual Finish dates for all activities, within ten (10) State Business Days following final acceptance of work by the Regional Director.

6. **Look-Ahead Schedule.**

   Except during winter shutdown periods the Contractor shall prepare a Look-ahead Schedule as either a plotted report from the current progress schedule, or as a narrative report, and provide it to the EIC on a weekly basis, or if approved by the Engineer on a mutually agreed upon interval. The Look-ahead schedule shall include work activities planned for the next one or two week period, as determined by the Engineer, and shall include, but is not limited to: anticipated lane closures, road closures and detours, environmental issues, and utility issues. The Engineer will provide the Project Scheduler with guidelines for determining the begin dates and end dates for the one or two week reporting periods, along with the how the plotted schedule report or narrative report shall be formatted.

   The Department generally uses this Look-ahead schedule to facilitate communication with other Federal or State agencies, local municipalities, utility companies, railroads, emergency service providers, public news media and other affected parties.

**E. Progress Schedule Review and Analysis:**

1. **Immediate Rejection of Progress Schedule Submissions.**

   The following deficiencies in a Contractor’s progress schedule submission shall be grounds for the immediate rejection by the EIC, without further review, analysis and/or comments.

   a) Failure of the Project Scheduler to “schedule” the project, as of the data date.

   b) Failure to attach a copy of the complete Scheduling/Leveling Report (SCHEDLOG.TXT file generated by Primavera software application).

   c) Any activities without predecessors, or activities without successors, appearing in the Scheduling/Leveling Report with the exception of the first and last activity in the schedule.

   d) Any activity constraints appearing in the Scheduling/Leveling Report that have not been approved in writing by the EIC, or that are not specifically allowed by this specification.

   e) Any Activities with Actual Dates > Data Date appearing in the Scheduling/Leveling Report.

   f) Any Milestone Activities with invalid relationships appearing in the Scheduling/Leveling Report.

   g) Failure to have a clearly defined Critical Path from the Data date to the last activity in the schedule, using the Longest Path method. This would reflect logic errors in the project schedule.

   h) Failure to attach the schedule Narrative and required appendices.

   i) Failure to attach the Claim Digger Report (generated by the Department’s Primavera scheduling software application) providing a comparison between this Progress Schedule submission and the previous Progress Schedule submission. (Not required for baseline submissions)

   If any of these deficiencies are found, the Contractor’s submission shall be considered deficient, and Engineer will notify the Contractor immediately by return E-mail of the rejection of the schedule submittal.
If the Contractor fails to submit a CPM Progress Schedule conforming to the provisions required under this specification, to the degree that such failure is deemed by the Regional Construction Engineer to adversely affect the management of the project and/or the administration of the construction contract, liquidated damages will be assessed as determined under Basis of Payment.

2. **Schedule Analysis Method.**
   
   Events, actions, and progress that cause delays or gains to the Progress Schedule will be analyzed solely by the "Contemporaneous Period Analysis" method.

3. **Project Progress Meetings.**
   
   One topic of the regular progress meetings held by the Engineer and attended by the Contractor shall be a review of the Weekly Status Report generated from the Progress Schedule. The Contractor shall be represented by the Field Superintendent and Project Scheduler. The Project Scheduler shall bring a copy of the printed plot of the current Weekly Status Report to the progress meeting, the report shall show the current anticipated schedule for all remaining work with the critical path activities highlighted.

   a) The review of the Status Report serves as the forum to discuss project progress and delays, suggested remedies, necessary Progress Schedule revisions, coordination requirements, change orders, potential Contractor time extension requests, and other relevant issues. If contract work is falling behind the Progress Schedule, the responsible party (i.e.- Contractor or Department) shall be ready to discuss what measures it will take in the next thirty (30) days to put the work back on schedule so as to meet the contract Completion Date specified in the contract.

   b) Items of discussion will include, but are not limited to: project progress; schedule progress; near term and long-term schedule issues, including RFIs, Shop Drawing submittals, permit work, utility relocations, mitigation work; project issues and risks; proposed solutions; and any relevant technical issues that are schedule related.

   c) At the meeting the Project Scheduler shall compile an action item list that describes who is responsible for existing or pending issues and the date by which the issue needs to be resolved to avoid delays. The Contractor shall forward a copy of the action item list to the Engineer within 2 business days following the meeting.

4. **Department Review and Acceptance of Progress Schedules.**
   
   The Engineer will review the Monthly Progress Schedule submissions and will prepare a written response (Progress Schedule Review Report) to the Contractor’s submission within five (5) State Business Days following receipt of the Contractor’s complete schedule submission. The Engineer will either “accept” the schedule, “accept as noted”, or “reject” the schedule for re-submittal by the Contractor.

   If the Progress Schedule submission is not in compliance with contract requirements, the Engineer may reject the submittal and shall forward any comments and requests for schedule revisions to the Project Scheduler with a copy to the Contractor. The Project Scheduler shall address all comments in writing and/or make the requested revisions, and resubmit the revised schedule within three (3) State Business days of the Engineer’s reply. If the Engineer determines the revised submission still does not meet the contract requirements, any further revisions required thereafter shall also be submitted for acceptance within (3) business days of the request for revisions by the Engineer.

   For schedules that are “accepted as noted” the Engineer shall forward any comments, or requests for revisions, to the Contractor. The Project Scheduler shall address all comments in writing and/or make the requested revisions as part of the next scheduled Progress Schedule submission.

   The Project Scheduler shall make adjustments to the Progress Schedule in accordance with the Engineer’s comments and resubmit copies for review consistent with the requirements of this section.
The Engineer, by accepting the progress Schedule, does not agree that the Progress Schedule is reasonable or that by following the Progress Schedule the Contractor can complete the work in a timely manner. If, after a Progress Schedule has been accepted by the Engineer, either the Contractor or the Engineer discover that any aspect of the Schedule is on error, or something significant has been omitted, the Contractor shall correct the Progress Schedule in the next Progress Schedule submission and describe this revision in the Narrative report.

Acceptance of progress schedules by the Engineer shall not be construed to imply approval of any particular construction methods or sequence of construction or to relieve the Contractor from its responsibility to provide sufficient materials, equipment and labor to guarantee the completion of the contract in accordance with the contract documents.

Acceptance of the progress schedule by the Engineer does not attest to the validity of assumptions, activities, relationships, sequences, resource allocations, or any other aspect of the progress schedule. Within the contractual constraints, the Contractor is solely responsible for the planning and execution of the work.

Acceptance of the progress schedule by the Engineer shall not be construed to modify or amend the contract agreement or the date of completion therein. Completion dates can only be modified or amended by standard contractual means, through an official HC-250b Request For Extension of Completion Date.

If any resources are included in the Progress Schedule, it is not intended that the Engineer, by accepting the schedule should use the Contractor’s resource data for anything other than determining the reasonableness of achieving the Contractor’s production rates. Resources included with the accepted CPM schedule shall not be misconstrued as a cost benchmark for the performance of planned or actual work.

Once the progress schedule has been accepted, the Contractor shall not deviate from it without first notifying the Engineer in writing.

Upon receipt from the Contractor of the corrected schedule, a new review period by the Engineer of five (5) State Business days will begin.

F. Changes to Progress Schedule due to Added/Deleted/Changed Work:

1. Changes to the contract. In the event a notice of a change to the contract is received, the appropriate changes to the progress schedule shall be made, as necessary, to incorporate the anticipated added/deleted/changed work and the Contractor shall notify the Engineer in writing within 10 (ten) calendar days if there is any effect of such change to the schedule. Change to the contract includes, but is not limited to, extra work, Agreed Prices, Orders on Contracts, Suspensions of Work Directed by the Engineer, Changed Condition, and Value Engineering Change Proposals. Added, deleted and/or extra work associated with Orders On Contract shall be reflected in the next Monthly Progress Schedule Submission in anticipation of and prior to the date in which the work physically takes place without regard to the dates when the actual Order On Contract was approved. The effect of the change to the contract on the projects Critical Path shall be stated. Extra work or additional work that does not affect the controlling operation on the critical path will not be considered as the basis for a time extension. All schedule activities effected by added, deleted or changed work that is included in a signed Order-On-Contract, Field Change Order, or Authorization of Extra Work (with the exception of minor quantity changes that do not impact contract milestones), or work activities performed by the Contractor at risk in anticipation of such Department approval,
shall be assigned the appropriate Activity Code (Added/Changed Work) and Code Value (sequentially numbered) to denote which “Changed Contract Work” order number correlates to those activities of work.

2. Time Impact Analysis.

A Time Impact Analysis (TIA) shall be submitted to the Engineer for each request by the Contractor for an adjustment of contract time, or when the Contractor or Engineer consider that an approved or anticipated change to the contract may impact the critical path and contract progress by more than a calendar month. The TIA shall be based on a revised Progress Schedule and shall be submitted as an electronic file (using Microsoft Word for the narrative) containing:

a) The TIA shall illustrate the impacts of each change or delay on the current scheduled completion date or internal milestone, as appropriate.

b) The analysis shall use the accepted Monthly Progress Schedule that has a data date closest to and prior to the event as the “Current Baseline”, this shall then be compared against the “What-if Project Plan Baseline” for the purpose of the TIA.

c) If the Engineer determines that the accepted schedule used does not appropriately represent the conditions prior to the event, the accepted schedule shall be updated to the day before the event was analyzed.

d) The TIA shall include an impacted schedule (“What-if Project Plan Baseline”) developed from incorporating the actual or anticipated event into the accepted schedule by adding or deleting activities, or by changing durations or logic of existing activities.

e) If the impact schedule shows that incorporating the event negatively modifies the critical path and scheduled completion date of the accepted schedule, and the Engineer accepts the impacted schedule, the difference between scheduled completion dates of the two schedules shall be equal to the proposed adjustment of contract time.

f) The Engineer may construct and utilize an appropriate project schedule or use another recognized method to determine adjustments in contract time until the Contractor provides the TIA.

g) The Contractor shall submit a TIA within fifteen (15) State Business Days of receiving a written request for a TIA from the Engineer.

h) The Contractor shall allow the Engineer ten (10) State Business Days after receipt to accept or reject the submitted TIA. All accepted TIA schedule changes shall be included in the next Monthly Progress Schedule submission.

i) If a TIA submitted by the Contractor is rejected by the Engineer, the Contractor shall meet with the Engineer to discuss and resolve issues related to the TIA. If agreement is not reached, the Contractor will give notice in conformance with §104-06 Notice & Recordkeeping, and submit in accordance within the provisions in §105-14.E "Required Content of Dispute Submissions".

j) The Contractor shall only show actual as-built work, not unapproved changes related to the TIA, in subsequent Monthly Progress Schedules submissions. If agreement is reached at a later date, approved TIA schedule changes shall be included in the next Monthly Progress Schedule submission.

k) Request for a contract time extension will not be processed until the receipt and approval of a Time Impact Analysis.

G. Failure to Submit Progress Schedules and/or Recovery Schedules:

1) No progress payment for this item of work shall be made until the progress schedule is “accepted” or “accepted as noted” by the Engineer.

2) If the Contractor’s Progress Schedule submission is rejected due to any deficiency noted in paragraph E.1(a) through (i), it shall be considered an incomplete submission and therefore substantially deficient.
3) If the Contractor’s revised Progress Schedule submission does not address the written comments provided by the Engineer, and does not include a written explanation with a reasonable rational for not addressing those comments, the submission shall be considered deficient.

II. Recovery Schedule
1) If the latest completion time for any work on the current Progress Schedule results in an activity being delayed ten percent or more of the time beyond the required Contract duration or any specified Milestone duration, as adjusted if appropriate, the Engineer may require the Contractor to submit a Recovery Schedule and written description of the plan to recover all lost time and maintain the required Completion Date or specified Interim Milestone Date(s).
2) With the Recovery Schedule the Contractor shall submit a narrative that identifies where additional labor and/or equipment resources will be allocated. Alternately, the Contractor may elect to provide the makeup of their Crew resources in the narrative, and assign those Crew resources to the appropriate activities in the Progress Schedule. The makeup of the Crew shall include the various Labor classes and equipment that comprise the Crew along with the quantity of each labor class and type of equipment. Equipment resources shall be shown for major or specialty equipment such as tower cranes, pile drivers, barges, asphalt pavers, concrete pavers, dozers, front end loaders, backhoes, rollers, excavators, graders, long line striping truck or other equipment that cannot be rented easily. Either of these alternatives may be supplemented with a request for a Contract Time Extension. The Contractor shall provide a reasonable plan for accomplishing the work of the contract within the current completion date, or to the requested contract extension date. The Engineer will use the Recovery Schedule to evaluate time extensions, with or without charges.

I. Additional requirements for progress schedules with projected Early Completion date(s):
1) The Contractor may show a projected early completion date on any progress schedule submission provided that all of the requirements of the contract are met. The Contractor may increase early completion time by incorporating a longer work week (6 Day/8 Hr Workweek instead of 5 Day/8 Hr Workweek), adding additional shifts, increasing the number of crews, reallocating resources to be more efficient, or adopting aggressive scheduling and construction management processes.
2) If the Contractor submits a progress schedule that indicates an anticipated early completion date(s) that is/are less than 90% of the specified contract milestone duration, the Progress Schedule submission shall be supplemented with Labor and Equipment resources assigned to every task activity in the schedule. The Contractor shall use resource leveling when scheduling the project and include time-scaled resource histograms with the Progress Schedule submission. The resource allocations must be shown to a level of detail that facilitates report generation based on labor crafts and equipment classes for the Contractor and subcontractors work. The Contractor shall, as a minimum, use average composite crew resources to display the labor loading of on-site construction activities and these crew resources in the resource dictionary shall identify the individual labor crafts comprised within the crew under the Notes tab of the crew resource. The Contractor shall optimize and level labor to reflect a reasonable plan for accomplishing the work of the contract and to assure that resources are not duplicated in concurrent activities.

J. Float
During the course of contract execution, Total Float generated due to the efficiencies of either party (State or Contractor) will generally be considered Project Float that is not for the sole use of the party generating the float; rather it is a shared commodity to be reasonably used by either party. Any party assigned activity responsibility within the schedule has the full use of the Project Float until it is depleted.

However, if the Contractor submits a request for an Early Completion that includes a revised Progress Schedule supplemented with resource allocations for each task activity and time-scaled
resource histograms that is accepted by the Department, then Total Float actually resulting from additional Contractor resources, additional work shifts, longer work weeks or adoption of more aggressive scheduling and construction management practices of the Contractor's work activities may be considered Contractor Owned Float for the exclusive use of the Contractor. Refer to paragraph I for resource loading requirements for Early Completion Dates.

The Department may accrue State Owned Float by generating Total Float through different means. This includes: change(s) to the contract that relaxes restrictions on the Contractor, removes contract work or reduces quantities of items of work; early completion of Utility company activities; and early completion of Shop Drawing or submittal reviews. State Owned Float is considered a resource for the exclusive use by the State. The Engineer documents State Owned Float by directing the Contractor to update the State Owned Float activity on the next Monthly Progress Schedule submission. The Engineer may use State owned Float to mitigate past, present or future State delays by offsetting potential time extensions for contract change orders.

For either the State or Contractor to reserve Total Float as State Owned Float or Contractor Owned Float the party must document within the schedule submission narrative in advance of generating the Total Float the additional resources or measures that will taken to shorten the critical path, and then document within the schedule submission narrative that immediately followed when the Total Float was actually generated the change to State or Contractor owned float based on entry of Actual Start and Actual Finish dates and percentage of work completed, and this must be agreed to by both parties in the next project Progress Meeting. Without this timely documentation any Total Float generated will be considered project float.

**K. Progress Schedule Updates and Weekly Status Reports:**

1) The Contractor shall perform a Progress Schedule Update on a minimum of a weekly basis, and every fourth schedule update period shall be consistent with monthly contract payment period.

2) The Contractor shall generate a Weekly Status Report after performing the Progress Schedule Update and Scheduling the project with a Data Date of day the schedule was updated, and submit it to the Engineer within one (1) State Business Day of the Data Date for that update period. The Weekly Status Report shall be generated using the activity Layout named Weekly Status Report, with activities grouped by the WBS, and using the standard default filter named Longest Path. The Gantt Chart shall clearly indicate the project critical (longest) path. Graphical representations shall be shown at a suitable scale to be legible and readable.

3) During any time periods within the contract that special time-related contract provisions are in effect, including B-Clock periods or Incentive/Disincentive Periods, the Engineer may require more frequent Progress Schedule Updates and/or Progress Schedule Status Reports.

**METHOD OF MEASUREMENT:**
The quantity shall be measured for payment on a Lump Sum basis.

The minimum lump sum bid for this item shall be the unit price shown in the itemized proposal. Failure of the Contractor to bid at least the minimum amount will result in the Department adjusting the Contractor’s bid to include the minimum bid amount for this item.
**BASIS OF PAYMENT:**
The lump sum price bid for CPM Progress Schedules shall include all labor, material, equipment, and incidentals, required to complete the work.

**Progress payments will be made as follows:**

A. A total of twenty-five (25) percent will be paid upon achieving all of the following:
   1. Attendance at the Preconstruction Schedule Meeting
   2. Acceptance of the Baseline Progress Schedule @ Award.
   3. Acceptance of the Final Baseline Progress Schedule @ Award.

B. A total of forty five (45) percent will be paid for acceptance of Monthly Progress Schedule submissions, acceptance of any necessary Time Impact Analysis, and acceptance of any necessary Recovery Schedules.

   Progress payments for this item will be calculated by multiplying the Daily Payment Amount by the calendar days in the estimate period, less any deductions for unsatisfactory CPM Progress Schedules, Time Impact Analysis, or Recovery Schedules. The Daily Payment amount will be calculated by taking 45 percent of the total item cost divided by the number of calendar days in the contract duration as designated in the proposal, without regard to any extension of time.

C. A total of twenty five (25) percent will be paid for submittal of Weekly Status Reports, participation in progress meetings, and submittal of Look-Ahead Schedules.

   Progress payments for this item will be calculated by multiplying the Bi-weekly Payment amount by the number of Bi-weekly periods (1 or 2) in the estimate period, less any deductions for unsatisfactory Status Reports or Look-Ahead Schedules, or non attendance at progress meetings. The Bi-weekly Payment amount will be calculated by taking 25 percent of the total item cost divided by the number of bi-weekly periods in the contract duration as designated in the proposal, without regard to any extension of time.

D. A total of five (5) percent will be paid upon acceptance of the As-Built Progress Schedule.

Following notification by the Engineer that there are deficiencies in compliance with the specification requirements, as described in paragraph E.1, with the submittal of any Progress Schedule no payment will be made under CPM Progress Schedules for each calendar day during which those deficiencies continue to exist.

The amount of such calendar day non-payment will be the Daily Payment Amount as calculated above multiplied by the number of days there are deficiencies in compliance with the specification requirements.

Non-refundable liquidated damages may be assessed for each subsequent calendar day or part thereof that a cited deficiency resulting in non-payment is not corrected or is permitted to recur. Non-refundable liquidated damages will be assessed at the rate equal to four times the Daily Payment Amount as calculated above.

In the event the contract completion date is extended, no additional payment will be made for CPM Progress Schedules for Non-compensable Delays. If the contract completion date is extended due to a Compensable Delay than payment for maintaining and submitting additional CPM Progress Schedules, Weekly Status Reports, and weekly Look-Ahead Schedules shall be equal to the Daily Payment Amount as calculated above multiplied by the number of calendar days the contract is extended plus the Bi-weekly Payment Amount multiplied by the number of bi-weekly periods the contract is extended.

**Payment will be made under:**

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<thead>
<tr>
<th>Item No.</th>
<th>Item</th>
<th>Pay Unit</th>
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<tr>
<td>639.1022 01</td>
<td>CPM (Critical Path Method) Progress Schedule – Type 2</td>
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