
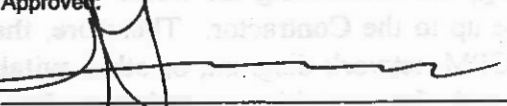


To: SUPERSEDED BY EB 21-057 EFFECTIVE 11/24/21		<i>New York State</i> <i>Department of</i> <i>Transportation</i> ENGINEERING INSTRUCTION	EI 04-042
Title: SPECIAL SPECIFICATION ITEM 637.3551--20 - CPM SCHEDULING			
Distribution: <input type="checkbox"/> Manufacturers (18) <input checked="" type="checkbox"/> Local Govt. (31) <input checked="" type="checkbox"/> Agencies (32) <input type="checkbox"/> Surveyors (33) <input checked="" type="checkbox"/> Consultants (34) <input checked="" type="checkbox"/> Contractors (39)		Approved:  _____ James F. Tyran, Director, Construction Division Date <u>12-7-04</u>	

ADMINISTRATIVE INFORMATION:

- This EI is effective with projects submitted for the letting of 05/05/05.
- This EI supersedes EI 04-007, "Item 637.3550--20-CPM Scheduling".
- This EI issues special specification "Item 637.3551--20 - CPM Scheduling" with general-use approval.
- The special specification transmitted by this EI will reside in the Special Specifications Directory of the Toolbox server until it is incorporated into a future revision of the Standard Specifications.

PURPOSE:

This EI transmits a revised contract specification relating to Critical Path Method (CPM) scheduling.

TECHNICAL INFORMATION:

- The project selection criteria for CPM scheduling are being issued concurrently in EI 04-043.
- Changes from the existing CPM scheduling specifications include:
 - ▶ The use of the Special Note for CPM Schedule has been discontinued.
 - ▶ A requirement has been added for a PRE-CONSTRUCTION SCHEDULING MEETING.
 - ▶ The requirement for a 90-Day Schedule has been removed.
 - ▶ The requirements for RESOURCES have been simplified.
 - ▶ The requirements for the content of the NARRATIVES have been defined with greater specificity.
 - ▶ A method for Schedule delay/advancement analysis has been prescribed.
 - ▶ The Basis of Payment has been modified.

IMPLEMENTATION:

- This EI disapproves the following specifications:
 637.3550--20 CPM Scheduling
- This EI issues the following new Section 637 special specification:
 637.3551--20 CPM Scheduling Lump Sum

EI 04-042 Page 2 of 2

TRANSMITTED MATERIALS:

Special specification "637.3551--20 - CPM Scheduling" is transmitted with this EI.

BACKGROUND:

Standard Specification §108-01, *Start and Progress of Work*, contains the contract provisions for planning, scheduling, and monitoring the work. The standard scheduling provision leaves the choice of scheduling technique up to the Contractor. Therefore, the Contractor can meet the requirements by submitting a bar chart, a CPM network diagram, or other suitable graphical representation of the proposed work plan. For projects with few activities or activities that can proceed without significant interaction, bar charts are normally used and are an acceptable method of communicating the proposed work plan. The advantage of CPM is its ability to depict the interrelationships between activities and identify activities that are critical to contract completion. For contracts that have many activities that must continuously interact, a CPM network diagram is more appropriate and should be used.

CONTACT:

Direct questions regarding this Engineering Instruction to Larry Palaski of the Construction Division at Phone: (518) 457-6472, Email: mo-construction@dot.state.ny.us. Include the EI number and title along with the contact person's name in the phone message/email when making inquiries regarding this EI.

ITEM 637.3551--20 CPM SCHEDULING

DESCRIPTION. The work shall consist of furnishing and maintaining a computerized CPM (Critical Path Method) Scheduling System. The requirements of Section 108-01, shall apply except where superceded by this specification.

The purpose of the computerized CPM Scheduling System is to ensure timely completion of the contract and to establish a standard methodology for time adjustment analysis based on the principles of the Critical Path Method of Scheduling. The CPM 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.

MATERIALS.

The Contractor shall furnish the Engineer with a licensed copy of the latest available version of Primavera SureTrak Project Manager.

The Contractor shall ensure that any and all computer files submitted to the Engineer are in a format that can be imported directly into SureTrak Project Manager.

CONSTRUCTION DETAILS.

A. PRE CONSTRUCTION SCHEDULING MEETING

The Engineer will schedule and conduct a Pre construction Scheduling Meeting with the Contractor within fifteen (15) calendar days after the contract has been awarded. The requirements of this specification will be reviewed at this meeting. Additionally the following topics will be discussed:

- Specifics of any contract Time-Related Clauses (A+B, I/D, Liquidated Damage, etc.).
- The representation in the schedule of the Time Related work.
- The calendar, activity coding, and resource definition requirements unique to and consistent with the contract.
- The Contractor's schedule methodology employed, proposed work sequence and any proposed deviations from the contract plans.
- The factors that the Contractor determines to control the completion of the project and any milestone completions contained therein.
- Narrative content for Initial Baseline and Monthly Updates.
- Schedule submission protocol for Initial Baseline and Monthly Updates.

The Contractors attendance at the Pre construction Scheduling Meeting is mandatory. No field work will be allowed, with the exception of set up of the Engineer's field office, until this meeting is held.

B. INITIAL BASELINE CPM CONSTRUCTION SCHEDULE

Within thirty (30) calendar days following the Pre-Construction Scheduling Meeting, the Contractor shall prepare and submit to the Engineer the Initial Baseline CPM Construction Schedule for the entire project. This submission shall include the electronic Schedule file and paper reports as listed in paragraph B - 2 below.

The Initial Baseline Schedule shall represent the Contractor's plan to construct the project. This schedule shall include all work and activities necessary to complete the project including but not limited to activities for the preparation, submittal, review, approval, fabrication, and delivery of all shop drawing and procurement related items. The Initial Baseline CPM Construction Schedule must be set up to

ITEM 637.3551--20 CPM SCHEDULING

conform with the staging/phasing and other requirements defined in the contract.

The Initial Baseline Schedule shall meet all interim milestone dates and shall not extend beyond the contract completion date.

1. SCHEDULE REQUIREMENTS

The Contractors Initial Baseline CPM Construction Schedule shall meet the following requirements:

a. CPM ACTIVITY NETWORK FORMAT

The schedule network shall use the Precedence Diagramming Method.

b. PROJECT DEFINITIONS The following project specific properties within the schedule shall be defined:

CALENDAR- The standard calendar shall be 8-hour days, five days per week and shall account for holidays and non working days. Additional calendars shall be created and included as required for:

- Work week (5 or 6 day).
- Seasonal restrictions (asphalt, landscape, etc.).
- Concrete curing/calendar days.
- Shop drawing review (consistent with NYSDOT work calendar).
- Any project specifics as required by the Engineer.
- Expected and contemplated weather conditions shall be accounted for in the calendars.

All calendars created shall encompass and account for the total duration of the contract time period.

ACTIVITY CODE- As a minimum the following activity codes shall be established:

- **Responsibility** - The party responsible for each activity. Only one party can be responsible for an activity. Include Values for "NYSDOT", "Prime Contractor" and third parties to the contract as appropriate (utilities, etc).
- **Phase**- Phasing consistent with Contract plans where each activity is performed; Include Values for "None", and "Project Wide".
- **Stage** - Staging consistent Contract MPT stage where each activity is performed; Include Values for "None", and "Project Wide".
- **Location** - Location of activity work by Stationing, Ramp #, Structure #, etc.; Include Value for "None", and "Project Wide".
- **Type**- The type of work for each activity; Include a Value for "Administrative"
- **Added Work**- Work added to the Contract and incorporated into the schedule with the Engineers Approval; Include a Value for "None"
- **Time Related Clause**- A+B, I/D, Liquidated Damages, etc.; Include a Value for "None".
- **As Required by Project** - Any coding unique to or as required by the Engineer to facilitate the use and analysis of the Schedule. This coding shall be established in consultation with the Engineer at the Pre construction Scheduling Meeting.

RESOURCES - The Resource Dictionary shall be established as required by the Engineer. The Resource Dictionary shall be limited to Labor and Equipment. Labor may be represented by work crews. The composition of each crew must be detailed and included as an appendix to the Narrative Report. Sub Contractors shall be represented as a labor crew(s).

ITEM 637.3551--20 CPM SCHEDULING

c. ACTIVITIES DATA

ACTIVITY IDENTIFICATION - Each activity shall have a unique identifier. The identifier may be alpha-numeric, but at a minimum must be a unique number.

ACTIVITY DESCRIPTION - Each activity shall be unambiguously described. Descriptions such as "construct 30% of", are unacceptable. Activities shall be discrete to the extent necessary to accurately schedule the work.

ACTIVITY DURATION - Durations of individual work activities shall not exceed fifteen working days. The minimum activity duration increment is one full day. Durations of individual shop drawing review activities may exceed fifteen working days and shall be consistent with Contract Requirements. Exceptions to this will be reviewed by the Engineer on an activity-by-activity basis. If requested by the Engineer, production rates or other supporting information shall be supplied justifying the reasonableness of any given activity time duration. A Method Statement including the labor, equipment, production rates and any additional information, required to achieve a given activity shall be supplied when requested by the Engineer.

ACTIVITY RELATIONSHIPS - Activity relationships shall be finish-to-start with no lags unless directed otherwise by the Engineer. Contractor requests for exemptions will be made on a case by case basis. Each activity with the exception of the required "Project Award" and "Completion" activities shall have a predecessor and a successor activity relationship.

ACTIVITY START and FINISH DATES - The earliest start date, earliest finish date, latest start date, and latest finish date shall be calculated for each activity.

ACTIVITY TOTAL FLOAT - The total float shall be calculated for each activity. Total float is the full amount of time by which the start on an activity may be delayed without causing the project to last longer.

ACTIVITY CALENDARS- The appropriate calendar assignment shall be made to each activity.

ACTIVITY CODES - Coding shall be assigned to each activity from the defined activity dictionary. Each code shall have a value assigned in a given activity.

ACTIVITY CONSTRAINTS - The start or completion of any activity shall not be constrained. Exceptions to this must be approved by the Engineer. A "Must-Finish-By" Date for the overall project is a constraint and must be approved.

ACTIVITY RESOURCES- The schedule shall be "Resource" loaded as required by the Engineer. The resources required to accomplish each activity shall be assigned to that activity from the 'Resource Dictionary'.

ITEM 637.3551--20 CPM SCHEDULING

d. REQUIRED ACTIVITIES

The following activities shall be incorporated into the Schedule:

<u>Activity ID</u>	<u>Activity Description</u>	<u>Activity Type</u>	<u>Logic Relationship</u>
000010	Contract Award	Start Milestone	No Predecessors to this First Schedule Activity
999999	Completion	Finish Milestone	No Successors to this Last Schedule Activity

e. DATA DATE

The Data Date and Project Start Date in the Initial Baseline Schedule shall be the AWARD DATE.

The Data Date for each Monthly Update shall be the last work day of the month.

2. REVIEW OF THE INITIAL BASELINE CPM CONSTRUCTION SCHEDULE

The Contractor shall submit to the Engineer the following items to facilitate review of the Initial Baseline CPM Construction Schedule:

- Narrative- A statement explaining the general sequence of work in the Contractor's schedule, a detailed definition of the work on the Critical Path, a statement regarding the meeting of any Time Restrictive Clause dates and bonus dates, and the explanation of any other ambiguities in the schedule.

The following Activity Sorts generated from the software shall be provided:

- Critical Path Activity Sort - The activities that comprise the projects Critical Path. The list shall start with the first activity in the path and then ascend by Early Start date to the final activity in the path.
- Time Related Activity Sort - For contracts that contain Interim Time Frames (A+B, I/D, etc.), the activities necessary to complete the work within each specific Time Frame provision in the contract, shall be listed. The list shall start with the first milestone activity and then ascend by Early Start date to the final milestone activity in the network comprising each Time Frame period. Include a Critical Path activity sort for each specific Time Frame in the contract.
- Constraint Activity Sort - Listing of Constrained Activities and type of constraint.
- Listing of Calendars and Activity Coding incorporated in the Schedule

Electronic copies of the Initial CPM Construction Schedule shall be provided.

The Engineer will review the Initial Baseline CPM Construction Schedule and forward any comments, revisions, or requests to the Contractor. Within fifteen (15) calendar days of the Engineer's reply, the Contractor shall make adjustment to the Initial Baseline CPM Construction Schedule in accordance with the Engineer's comments and resubmit copies for review consistent with the above directives.

Upon final revisions, the Contractor shall submit electronic file copies of the Initial Baseline CPM Construction Schedule to the Engineer. A sort of activities scheduled to start (ES) & finish (EF) in the

ITEM 637.3551--20 CPM SCHEDULING

next update period shall be included. The Logic Diagram (PERT chart) shall be submitted on 279 mm x 425 mm size sheets. The final submission shall be submitted for approval within one week of the Contractor's receipt of the final comments by the Engineer.

Approval of the Initial Baseline CPM Construction Schedule by the Engineer shall not be construed to imply approval of any particular method or sequence of construction or to relieve the Contractor of providing sufficient materials, equipment, and labor to guarantee completion of the project in accordance with the contract proposal, plans, and specifications. Approval shall not be construed to modify or amend the completion date. Completion dates can only be modified or amended by standard contractual means.

Failure to include in the Initial Baseline CPM Construction Schedule any element of work required for the performance of the contract shall not excuse the Contractor from completing all work required within the completion date(s) specified in the contract.

C. SCHEDULE UPDATES

1. MONTHLY PROGRESS UPDATES

The Contractor shall update the schedule monthly. The schedule shall be updated to include all work and progress up to and including the last working day of the month. This will establish the "Data Date". The Monthly update shall detail progress based on actual dates of activities started and completed, the percent of work completed to date on each activity started but not yet completed and the status of procurement of critical materials. The updated schedule data shall be submitted in an electronic file format acceptable to the Engineer.

A Narrative Report is required for each update and shall provide the following information:

- Contractors transmittal letter to the EIC stating the update period and schedule "Data Date".
- Work started, completed and ongoing during the update period by activity with "Actual Dates".
- Description of current Critical Path and any change from previous Critical Path.
- Any activities added or deleted and any proposed changes in Activity Logic (Engineers approval is required).
- Current Delays or Advancements
 - o Delayed or Advanced Activities.
 - o Proposed corrective action and schedule adjustments to address the Delay.
 - o Impact of Delay or Advancement on other activities(duration, ES,EF,LS,LF), milestone and completion dates.
 - o Impact of Delay or Advancement on the Critical Path.
- Outstanding Items that effect the schedule and status thereof (including but not limited to)
 - o Permits.
 - o Shop Drawings.
 - o Orders-on-contract.
 - o Reviews of submittals.
 - o Approvals.
 - o Fabrication and Delivery.

ITEM 637.3551--20 CPM SCHEDULING

- Scheduled Completion Date Status
 - o Contract Completion.
 - o Interim Time Frame (A+B, I/D, etc.).

The following Activity Sorts generated from the Software shall be provided:

- Current Critical Path Activity Sort.
- Near Critical Activities Sort, TF < 5 days.
- Sort of Activities scheduled to start (ES) & finish (EF) in the next Monthly update period.

The Monthly Progress Updates shall be submitted to the Engineer within three (3) calendar days of the "Data Date". The Engineer shall prepare a written response within seven (7) calendar days of receipt of the Monthly Update approving, approving with comments, or returning for resubmission. If the Contractor fails to comply with the Monthly Progress Update submission requirements the Engineer may invoke Article 8 of the contract and withhold contract payments.

D. TOTAL FLOAT OWNERSHIP

Total Float belongs to the contract and shall not be considered as available for the exclusive use of or benefit of either the State or the Contractor. Total Float is the number of days an activity may be delayed without extending the completion of either the project or an interim milestone. Float is available on a first-come, first-served basis to all identified "Responsible" parties in the schedule.

E. FLOAT MANIPULATION NOT PERMITTED

The Schedule shall not sequester float through such strategies as calendar manipulation, resource/labor manipulation or the extension of activity durations to fill up available float time. The Initial Baseline CPM Construction Schedule shall not attribute negative float to any activity.

F. CHANGES TO THE SCHEDULE

The Initial Baseline CPM Construction Schedule shall accurately reflect the manner in which the Contractor intends to proceed with the project. Changes to the schedule (the addition or deletion of activities, logic changes, and duration changes) shall be submitted in writing to the Engineer for approval and inclusion in the next Monthly Progress Update. The approved or approved with comments Monthly Progress Update shall be considered the updated Baseline from which future progress is measured. The process of comparing the Schedule Update to Baseline (previous Update) shall be followed throughout the contract. Revision to any contract milestones, or contractually mandated schedule provisions will not be permitted without written authorization from the Engineer.

G. CRITICAL ACTIVITIES AND BASIS FOR TIME ADJUSTMENTS

The measure for Time Adjustments in the schedule shall be based on the criticality of the delay or advancement. Criticality is defined as the presence of the delayed or advanced activity on the projects Critical Path. The Critical Path is defined to be the longest continuous chain of activities through the schedule network that establishes the minimum overall duration in the absence of constraints in the program software.

ITEM 637.3551--20 CPM SCHEDULING

H. CHANGES TO THE CONTRACT

In the event a notice of a change to the contract is received the Contractor shall notify the Engineer in writing within 10 (ten) calendar days of the effect of such change to the schedule. Change to the contract includes, but is not limited to, extra work, Orders on Contract's, suspensions, changed condition, Value Engineering Change Proposal, etc. The effect of the change to the contract on the projects Critical Path shall be stated. Any proposed revisions to the Schedule to incorporate the change to the contract shall be stated. No changes shall be made to the Schedule without the written approval of the Engineer. The approved changes shall be incorporated in the next Monthly Progress Update.

I. SCHEDULE ANALYSIS METHOD

Events, actions, and progress that cause delays or gains to the Project 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 this Specification shall be the period covered in each Monthly update to the schedule.

METHOD OF MEASUREMENT.

The Critical Path Method Scheduling System will be measured for payment on a Lump Sum Basis.

BASIS OF PAYMENT

The lump sum price bid for the Critical Path Method Scheduling system shall include the cost of preparation and submission of the Initial Baseline Schedule and the preparation and submission of the monthly updates and the licensed copy of the latest available version of SureTrak Project Manager.

Payment will be made as follows:

- | | | |
|----|--|-----|
| A. | Upon completion of the Pre-Construction Schedule Meeting | 10% |
| B. | Upon acceptance of the Initial Baseline Construction Schedule | 30% |
| C. | The balance will be paid in equal monthly payments distributed over the contract. These payments will be contingent on the submission of acceptable monthly updates. | 60% |