108-C-215 CRITICAL PATH METHOD SCHEDULE

(Revised 05-02-19)

The Standard Specifications are revised as follows:

SECTION 108, AFTER LINE 171, INSERT AS FOLLOWS:
108.04.1 Critical Path Method Schedule

(a) General Requirements
The Contractor shall provide a project schedule using the critical path method, CPM, in place of the bar graph type schedule required in accordance with 108.04. In addition to the submittals required herein, the CPM schedule shall be used to develop all schedules provided by the Contractor at scheduling meetings held in accordance with 108.04.

The CPM schedule shall show the various activities of work in sufficient detail to demonstrate a reasonable and workable plan to complete the work in the specified contract time.

The Contractor shall be responsible for ensuring that all work sequences are logical and that the schedule reflects a coordinated plan. The CPM schedule shall indicate the order and interdependence of activities and the sequence for accomplishing the work.

The CPM schedule shall include sufficient detail to allow the Engineer to readily identify the work and evaluate the progress of each activity. The CPM schedule shall include activities for all work to be performed by the Contractor and subcontractors. The schedule shall also include activities specific to the project to be performed by the Department, other units of government, regulatory agencies, utilities and any other parties necessary to complete the work. The schedule shall reflect the scope of work, construction phasing, maintenance of traffic requirements, environmental requirements, utility and railroad coordination, coordination with other contractors, and any other work included in the contract. The schedule shall include activities for working and shop drawing preparation, Contractor submittals, submittal review time by the Engineer, material procurement and fabrication, and the delivery of materials, plant, and equipment and other similar activities.

Failure by the Contractor to include any element of work or to accurately reflect the relationships among the work activities required for performance of the Contract does not excuse the Contractor from completing all required work within the specified time.

(b) Definitions
The following definitions shall be applied to the terms used in this specification and shall not be taken to modify in any way the definitions in 101.02 through 101.74.

Activity – A discrete, identifiable task or operation that takes time, has a definable start and stop date, furthers the work's progress, and can be used to plan, schedule, and monitor a project.

Activity Calendar – *A set of days assigned to a specific activity on which work for the activity may be scheduled.*

Activity Calendar Day – *A day on which work is scheduled to be performed on a specific activity.*

Activity Identification (ID) Number – *A unique, alphanumeric identification code assigned to a specific activity.*

Activity Network Diagram – *A graphic representation of a CPM schedule, including a timescale, which shows the relationships among activities.*

Bar Chart – *A graphic representation of a schedule without relationship lines displayed. A timescale appears along the horizontal axis.*

Baseline CPM Schedule – *An accepted CPM schedule showing the original plan to complete the entire project.*

Calendar ID – *An alphanumeric identification code assigned to an activity calendar.*

Closure Period – *The original or revised maximum duration specified in the contract for the closure of a road, ramp, bridge, or other facility.*

Constraint – *A restriction imposed on the start or finish dates of an activity that modifies or overrides the activity's logic relationships.*

Contract Completion Date – *The original date or revised date specified in the contract for completion of the project.*

Controlling Activity – *The first incomplete activity on the Critical Path.*

Critical Activity – *Any activity on the critical path.*

Critical Path – *The longest path of activities which determines the scheduled completion date of the project.*

Data Date – *The first day in a baseline CPM schedule or the first day for performance of the remaining work in a monthly update CPM schedule. For a final CPM schedule, it is the date that the last activity was completed.*

Delayed Start Date – *The original or revised date specified in the contract prior to which work on the project is prohibited.*

Final CPM Schedule – *The last CPM schedule containing actual start and finish dates for every activity.*

Free Float – *The amount of time an activity can be delayed and not delay a successor.*

Incentive/Disincentive, I/D, Date – *The original or revised date specified in the contract for completion of a specified portion of the project. Completion of the specified work prior to the I/D date may entitle the Contractor to additional compensation. Completion of the specified work after the I/D date may result in a credit to the Department.*

Intermediate Completion Date – *The original or revised date specified in the contract for completion of an interim milestone, phase or other portion of the project.*

Milestone – *An activity with no duration that is typically used to represent the beginning or end of the project or an interim phase. Includes, but is not limited to, intermediate completion dates and the contract completion date.*

Monthly Update CPM Schedule – *A CPM schedule produced by incorporating the project's actual progress into the baseline CPM schedule.*

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 or only successor relationship is a start-to-start.*

Original Duration – *The estimated time, expressed in activity calendar days, required to perform an activity.*

Predecessor – *An activity that is defined by schedule logic to precede another activity. A predecessor may control the start or finish date of its successor.*

Relationship – *The interdependence among activities. Relationships link an activity to predecessors and successors.*

Remaining Duration – *The estimated time, expressed in activity calendar days, required to complete an activity.*

Schedule – *Activities organized by relationships to depict the plan for execution of a project.*

Scheduled Completion Date – *The completion date forecast by the CPM schedule. The schedule may also forecast intermediate completion dates or durations for milestones, phases, or other portions of the project.*

Successor – *An activity that is defined by schedule logic to succeed another activity. The start or finish date of a successor may be controlled by its predecessor.*

Total Float – *The amount of time an activity can be delayed and not delay the contract completion date.*

(c) Required CPM Schedule Submissions

1. Baseline CPM Schedule

The baseline CPM schedule submittal shall consist of a CPM schedule in accordance with 108.04.1(d) and a narrative report in accordance with 108.04.1(e). The baseline CPM schedule data date shall be the date of the notice to proceed and the CPM shall not include any actual start or actual finish dates for any activity. The baseline CPM schedule submittal shall be made no later than the date of the preconstruction conference.

If the Contractor fails to submit the baseline CPM schedule by the date of the preconstruction conference, the Department will withhold progress estimates until the baseline CPM schedule is submitted.

2. Monthly Update CPM Schedule

The monthly update CPM schedule submittal shall consist of a CPM schedule in accordance with 108.04.1(d) and a narrative report in accordance with 108.04.1(e). The first monthly update CPM schedule shall be submitted by the 7th of the month following acceptance of the baseline CPM schedule. Each succeeding monthly update CPM schedule shall be submitted by the 7th of each succeeding month. The CPM schedule data date shall be the last date of the month prior to submittal. The CPM shall not include any actual start or actual finish dates later than the data date for any activity.

If the 7th day of an individual month is a Saturday, Sunday, or a holiday on which work has been suspended, the monthly update CPM schedule shall be submitted by the first business day following the 7th.

If the Contractor fails to submit a monthly update CPM schedule by the required date, the Department will withhold progress estimates until the monthly update CPM schedule submittal is made.

3. Final CPM Schedule

The final CPM schedule shall consist of a CPM schedule in accordance with 108.04.1(d). The final CPM schedule shall be submitted no later than 30 calendar days after final acceptance. The final CPM schedule shall depict the actual start and finish dates for each activity. The data date of the final CPM schedule shall be the date of final acceptance. If the Contractor fails to submit the final CPM schedule by the required date, the Department will withhold progress estimates until the final CPM schedule is submitted.

4. Acceptance of Schedules

The Engineer will provide written notice within 14 calendar days of receipt of a baseline, monthly update, or final CPM schedule that the schedule is either accepted or rejected. If the notice indicates that a schedule is rejected, the contractual basis for

rejection will be identified. If the Engineer does not respond in writing to the submittal of a schedule within the allotted time, the schedule shall be considered to be accepted.

The Engineer's written notice of acceptance or rejection may include questions, comments, or request additional information. The next CPM schedule submittal's narrative report shall address all questions, comments, or additional information requested by the Engineer.

Rejected baseline CPM schedules shall be resubmitted until accepted by the Engineer. If acceptance of a baseline CPM schedule is not obtained within 45 calendar days of the date of the preconstruction conference, the Department will withhold progress estimates until the baseline CPM schedule is accepted.

A rejected monthly update CPM schedule which immediately follows an accepted baseline or monthly update CPM schedule will not require resubmittal. Monthly update CPM schedules that are rejected for a second consecutive month shall be resubmitted within 14 days of the date of the rejection notification. Subsequent rejections will require additional submittals until acceptance. If the Contractor fails to submit a monthly update CPM schedule requiring resubmittal by the required date, the Department will withhold progress estimates until the monthly update CPM schedule is submitted.

Rejected final CPM schedules shall be resubmitted until accepted by the Engineer. Resubmittal of a final CPM schedule shall be made within 14 calendar days of receipt of rejection notification. If the Contractor fails to resubmit a rejected final CPM schedule by the required date, the Department will withhold progress estimates until the final CPM schedule is submitted.

The Engineer's review of a submitted schedule will be for compliance with the specifications. Acceptance by the Engineer does not relieve the Contractor of responsibility for the accuracy or feasibility of the schedule. Acceptance of a schedule does not constitute a modification of the contract or endorsement or validation of the Contractor's logic, activity durations, or assumptions in creating the schedule. Acceptance of a schedule does not guarantee that the project can be performed or completed as scheduled. Omissions and errors in a CPM schedule shall be corrected in the next CPM schedule submittal and will not entitle the Contractor to a contract adjustment.

5. Float and Scheduled Completion

Total float belongs to the project and shall be a shared commodity between the Contractor and the Department. Float is not for the exclusive use or benefit of either party. Either party has full use of float until is it depleted.

Float generated during the course of the project due to the efficiencies of either party shall be considered to be part of total float.

Float generated during the course of the project due to favorable weather within a calendar month, where the number of days of inclement weather is less than the normal inclement weather days for the month, shall be considered to be part of total float.

Negative float generated during the course of the project due to factors within the control of the Contractor will not be a basis for requesting time extensions. Time extension requests shall be developed in accordance with 108.04.1(f).

A CPM schedule may indicate a scheduled completion date in advance of the contract completion date or scheduled completion of work associated with an intermediate completion date, I/D date, or closure period prior to the corresponding contract date or period. However, the Department shall not be liable in any way for the Contractor's failure to complete the project prior to the contract completion date or complete work associated with any intermediate contract date or period prior to the original or revised date or period. Any costs incurred by the Contractor as a result of such a failure shall be the responsibility of the Contractor. The Contractor will not be entitled to claim or recover any such cost from the Department.

An accepted schedule that indicates a scheduled completion date in advance of the contract completion date will be considered to have total float equal to the time between the scheduled completion date and the contract completion date.

(d) CPM Schedule Technical Requirements
The CPM schedule shall be generated using software completely compatible with Primavera Contractor 5.0 by Primavera Systems Inc., Bala Cynwyd, PA.

Each CPM schedule submittal shall include the following:

1. A letter of transmittal identifying the schedule submittal and contents.

2. A narrative report in accordance with 108.04.1(e). No narrative report is required for the final CPM schedule.

3. An electronic file of the schedule in Primavera .XER format that is completely compatible with and may be directly imported into Primavera Contractor 5.0 without any loss or modification of data or need for any conversion or other software. Any electronic schedule file submitted by the Contractor that is not completely compatible with the Department's Primavera Contractor 5.0 software will be rejected.

4. A copy of the critical path gantt chart, including lines representing relationships between activities, measuring 11" x 17" or larger. This item is not required for a final CPM schedule.

The CPM schedule shall meet the following requirements:

1. The first activity on a schedule shall be a milestone for the notice to proceed. The last activity on a schedule shall be a milestone for the contract completion date and shall reflect the date of notice of presumptive completion of the entire contract in accordance with

105.15(b). The schedule shall not include activities related to the final inspection, performance of punchlist work, or removal of construction signs.

2. *All intermediate completion dates or I/D dates shall be shown in the schedule as milestones.*

3. *Baseline CPM schedules shall indicate that milestones associated with the contract completion date, all intermediate completion dates, all I/D dates, and all closure periods meet contract requirements.*

4. *Monthly update CPM schedules shall indicate that milestones associated with the contract completion date, all intermediate completion dates, all I/D dates, and all closure periods meet contract requirements unless the narrative report indicates that there is an unresolved delay situation which is beyond the control of the Contractor.*

5. *Codes for phase, location and responsibility shall be assigned for each activity. Additional activity codes may be used if approved by the Engineer.*

6. *Activities associated with work performed on a closed facility during a closure period shall be assigned a distinct activity phase code to allow a comparison of the scheduled closure period to the contract closure period.*

7. *Each activity shall have a unique description and activity identification number which shall not be modified or re-assigned after acceptance of the baseline CPM schedule.*

8. *Each activity description shall generally describe the work type and location and shall be associated with only one operation.*

9. *Each construction related activity shall have an original duration not to exceed 20 activity calendar days unless approved by the Engineer. It is permissible for activities related to fabrication, utility relocation, permit acquisition, and other non-construction activities to have longer original durations.*

10. *Activities for submittal reviews by the Department shall allow reasonable durations, but in no case less than 14 calendar days unless otherwise specified or approved by the Engineer.*

11. *Each activity, except the first activity, shall have at least one predecessor.*

12. *Each activity, except the last activity, shall have at least one successor.*

13. *No start-to-finish activity relationships shall be used. Activity finish-to-start relationships shall include no lags. Finish-to-finish or start-to-start activity relationships may use lags that include fewer days than the original duration of the predecessor activity.*

14. *The use of lags with a negative value shall not be used for any activity relationship type.*

15. *All activities shall have their start and finish tied to the logic of the schedule.*

16. *Activities shall not be constrained unless noted herein or approved by the Engineer. The contract completion date, intermediate completion dates, and I/D dates shall be constrained using a finish on or before constraint. Delayed start dates shall be constrained using a start on or after constraint.*

17. *Each activity shall be assigned to an activity calendar. A CPM schedule may utilize more than one activity calendar, but only one activity calendar shall be assigned to each activity. All activity calendars shall be project calendars as classified by Primavera.*

18. *Activity calendars associated with construction activities shall include a minimum number of non-work days for the months of April through November, inclusive, equal to the number of above normal inclement weather days shown in 101.02. However, the number of non-work days included in calendars associated with bridge, traffic, and road construction activities shall be equal to or greater than the tabulated value related to B, T, or R contracts respectively, regardless of the type of contract involved.*

19. *Activity calendars for non-work activities, including but not limited to submittals, reviews, procurement, fabrication, cure times, and utility relocations performed by others shall not show any non-work days.*

20. *Seasonal weather conditions and Contractor scheduled shut down periods shall be considered and included in the activity calendars for all work scheduled from December 1 through March 31.*

21. *CPM schedule calculations shall be performed using the following settings: retained logic; contiguous activity durations for individual activities; critical path based on longest path; and total float based on activity finish dates.*

(e) Narrative Reports

The Contractor shall submit a narrative report with each baseline CPM and monthly update CPM schedule submittal to describe and elaborate on the work identified in the CPM schedule. Conflicting information between the narrative report and associated CPM schedule will be cause for rejection of a baseline or monthly update CPM schedule.

Information included in narrative reports will not be considered to meet the requirements for contractual notice of a changed condition in accordance with 105.16 or requests for additional contract time in accordance with 108.04.1(f). Separate correspondence meeting the applicable requirements shall be submitted by the Contractor to serve as notice of a changed condition or a request for additional contract time.

For the baseline CPM schedule submittal, the narrative report shall include the following:

1. An explanation of the overall plan to complete the project, including where the work will begin and how the work and crews will progress through the project.

2. Statements comparing the scheduled completion date or duration to the contract completion date, all intermediate completion dates, all I/D dates, and all closure periods.

3. An explanation of the planned work schedule, including the planned number of workdays per week, planned number of shifts per day, whether night shifts are planned, number of hours planned per shift, holidays planned to be observed, extent of work planned for the winter months, and how the schedule calendars accommodate the required number of adverse weather days for each month. If multiple crews are planned, the above information shall be provided for each crew.

4. Description of the work to be completed each construction season and during each winter for multi-year projects.

5. A detailed description of any unresolved actual or anticipated problems or issues. If a contractual notice of a changed condition or a claim in accordance with 105.16 has been submitted and the Department response is pending, the description shall indicate dates associated with each Contractor submittal.

6. A description of any unresolved actual or anticipated delays, including identification of the type of delay, the cause of the delay, responsibility for the delay, identification of all delayed critical activities, the effect of the delay on other activities and project milestones and identification of actions required to mitigate the delay. If the Contractor has submitted a request for additional contract time

in accordance with 108.04.1(f) and the Department response is pending, the description shall indicate the date of the Contractor submittal.

7. *A detailed description of the critical path.*

8. *An explanation of the use of any constraints, including the reason and purpose for each constraint.*

9. *A statement describing the status of any required permits.*

10. *A statement describing the reason for the use of each lag.*

11. *A list of all proposed exceptions to this specification included in the schedule that require approval by the Engineer along with an explanation of why the exception is appropriate.*

For each monthly update CPM schedule submittal, the narrative report shall include the following:

1. *A statement comparing the scheduled completion date to the contract completion date and any change in the scheduled completion date from the previous accepted submittal.*

2. *An explanation if the scheduled completion date is projected to occur after the contract completion date.*

3. *A statement comparing the scheduled completion of work associated with each intermediate completion date, I/D date, or closure period in the contract as well as any changes in these scheduled dates or closure periods from the previous accepted submittal.*

4. *An explanation if work associated with any contract milestone date or closure period is projected to occur after the dates or projected to require a longer duration than set out in the contract.*

5. *A list of activities that have been added or deleted from the schedule since the last accepted submittal and an explanation for the addition or deletion.*

6. *A list of all changes in activity relationships, predecessors, or successors since the last accepted submittal and an explanation for each change.*

7. *A list of activities with original durations that have been changed since the last accepted submittal along with an explanation regarding how the change is planned to be accomplished.*

8.   *A description of the work performed since the last accepted submittal.*

9.   *A description of and explanation for any changes between the work performed since the last accepted submittal and the work planned at the time that submittal was made.*

10. *A detailed description of any unresolved problems that are anticipated or that have been encountered. If a contractual notice of a changed condition or a claim in accordance with 105.16 has been submitted and the Department response is pending, the description shall indicate the date of the notice or claim submittal.*

11. *A statement that identifies any unresolved actual and anticipated delays. The statement should include identification of the delayed activity, the party apparently responsible for the delay, the type of delay, the cause of the delay, the effect of the delay on other activities and project milestones and identification of actions required to mitigate the delay. If the Contractor has submitted a request for additional contract time in accordance with 108.04.1(f) and the Department response is pending, the statement shall indicate the date of the Contractor request.*

12. *A detailed description of the critical path.*

13. *A list of activities which have become critical since the last accepted submittal.*

(f) Extension of Contract Time

If the Contractor believes work on the contract has been delayed for reasons beyond its control, a written request for extension of contract time may be submitted in accordance with 108.08. The Contractor's request for extension of time shall be submitted in conjunction with the first monthly update CPM schedule submittal that is made after the delay mitigation work is complete. A monthly update CPM schedule which accompanies a time extension request shall utilize a data date which is the date that the delay mitigation work is complete.

The determination of contract time extension will be based solely on the Engineer's comparison of the monthly update CPM schedule submittal associated with the time extension request and the last accepted schedule prior to the beginning of the delay event.

Delays or suspensions of work due to the Contractor's failure to comply with the specifications will not be cause for additional compensation or extension of contract time.

(g) Method of Measurement

Baseline, monthly update, and final CPM schedules will not be measured for payment.

(h) Basis of Payment

Baseline, monthly update, and final CPM schedules will be paid for at the contract unit price for lump sum for CPM Schedule. Payment for CPM Schedule will be made on the 1st estimate after acceptance of the baseline CPM schedule.

Payment will be made under:

Pay Item   **Pay Unit Symbol**

CPM Schedule .... LS

All costs necessary to provide baseline, monthly update, and final CPM schedules, as well as all schedules provided at scheduling meetings shall be included in the cost of the pay item for CPM Schedule.