MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CRITICAL PATH METHOD SCHEDULE

a. Description. A critical path method (CPM) schedule as noted herein must be submitted and approved prior to starting construction activities. Prepare the CPM schedule using Primavera Project Management software. Approval of the CPM schedule does not modify the contract or give authorization to deviate from contract requirements. Delays related to the approval of the schedule will not be considered for an extension of time. The Engineer may withhold all or part of contract payments for failure to develop an approved CPM schedule within 60 days of contract award or for failure to update the schedule as required.

b. Staff Qualifications. Employ experienced scheduling personnel qualified to use Primavera Project Management software. Designate to the Engineer a Project Scheduler responsible for administering the project schedule. Discuss project specific schedule expectations with the Engineer and the Department's Scheduling Specialist prior to the initial schedule submittal.

c. Schedule Submittal Requirements.

1. Submit CPM Schedules in accordance with Table 1: Submittal Timeline.

Table 1: Submittal Timeline

Schedule Type	Submittal Deadline	MDOT Review	Resubmission Period
Interim Baseline	7 days after award	7 days	7 days
Baseline	21 days after award	14 days	7 days
Revised Baseline	10 days after requirement or request	10 days	7 days
Update	3 days after Data Date	7 days	7 days
Final As-Built	14 days after CPM activities complete	14 days	14 days

A. If the submittal is received after noon, or on a Saturday, Sunday, or Department holiday, the specified time for review or resubmission will begin on the next business day.

B. The submittal will be considered approved if the Contractor meets the submittal deadline and the Engineer does not respond within the MDOT review timeline. Failure to meet the submittal deadline waives the Engineer's obligation to meet the MDOT review timeline.

C. Depending on which portions of the schedule are not in compliance, it may not be possible to perform a complete review of the schedule. If necessary, the Engineer will facilitate a meeting to resolve issues with the Contractor's Project Scheduler within 5 days of the Engineer's response. Correct and resubmit rejected schedule submittals in accordance with Table 1. For schedules that are "approved as noted," make the necessary

revisions on the subsequent schedule submittal. The subsequent schedule submittal will be rejected without full review unless the comments from the previous schedule submittal are addressed.

2. CPM Schedule submittals must use the filename convention outlined in Table 2 and contain the following:

A. Primavera XER electronic file that can be directly imported into the Department's version of Primavera without loss or modification of data or need for conversion.

B. Gantt chart in portable document format (PDF) format. The Gantt chart must contain all activities grouped by work breakdown structure (WBS) and sorted by Start date, with the longest path indicated in red. The Gantt chart title block must contain Data Date, Run Date, Contract ID, Project Name/Description, Contractor's Name, and Submission Date. Gantt chart must display columns for Activity ID, Activity Name, Original Duration, Start, Early Start, Finish, Late Finish, Total Float, Responsibility, Calendar, and Longest Path. In addition, Update schedules must also display columns for Activity % Complete, At Completion Duration, and Actual Duration.

C. Scheduling/Leveling Report (Log) generated for the current schedule submittal.

D. Written narrative as specified herein.

Table 2: CPM Schedule Submittal Filename Convention

Schedule Type	Filename Convention
Interim Baseline	CPM_[Contract ID]_DD[Data Date]_IS
Baseline	CPM_[Contract ID]_DD[Data Date]_1BS
Revised Baseline	CPM_[Contract ID]_DD[Data Date]_[Baseline Number]BS
Update	CPM_[Contract ID]_DD[Data Date]_[Update Number]SU
Final As-Built	CPM_[Contract ID]_DD[Data Date]_ABS
For example, "CPM_87063-356733_DD2019-01-12_1SU_R2"	
For resubmittals, include the suffix "_R" followed by corresponding resubmittal number (i.e. R1)	
Include "Log" or "Narrative" at the end of the filename for each respective submittal file.	

d. General Schedule Requirements.

1. Provide a CPM schedule that shows the activities of work in sufficient detail to demonstrate a reasonable work plan to complete the project by the contract dates. Show the order and interdependence of activities so the Engineer can identify the work and measure the progress of each activity.

2. The CPM schedule must reflect the scope of work, the special provision for maintaining traffic, interim completion dates, the completion date, and other project milestones established in the contract. Include activities for subcontractors, suppliers, vendors, the Department, permitting agencies, utility submittals, working drawings, shop drawing preparation, submittal review and approval, material fabrication, delivery of materials, plant, and equipment, and other contract related activities. Failure to include an element of work required for performance of the contract will not excuse the Contractor from completing work by the contract completion dates.

3. If the project scope, contractual milestones or work season restrictions prevent a logically defined critical path, it may be necessary to develop project calendars representing non-work periods or to have multiple schedules. This necessity may be driven by, but not limited to: complex project scope, multiple work seasons, or project scope extraneous to, and extending beyond, the contractual completion dates.

4. Work Breakdown Structure (WBS). Divide the work elements to be performed on the project into manageable parts corresponding to key deliverables, stages, and/or milestones. A separate WBS must be developed for deleted activities, contract modifications, or other impacts as applicable.

5. Project Activities.

A. Activity Type. Resource Dependent is not an approved activity type, unless the schedule is resource loaded.

B. Activity % Complete Type. Set Level of Effort activity percent complete type to "duration". Set all other activity percent complete types to "physical".

C. Activity Identification (ID). The assigned unique Activity ID must be used for the duration of the project. Once approved, do not delete activities from the schedule.

D. Activity Name. Each activity must have a narrative description consisting of a verb or work function (i.e.; form, pour, excavate), an object (i.e.; slab, footing, underdrain), and a location (i.e.; Structure X, Roadway X, Station X+XX).

E. Activity Original Duration. Task dependent construction activities must be assigned an original duration in whole days ranging from 3 to 20 days. Summary level activities included in an Interim Baseline may have durations over 20 days. Schedule durations are to be contiguous. Do not change original activity durations unless justified with a Revised Baseline schedule and an approved explanation in the narrative.

F. Activity Relationships. Open logic activities are not allowed. All task dependent activities, except the first activity, must have an activity logically tied to its start. All task dependent activities, except the final activity, must have an activity logically tied to its finish. Negative lags are prohibited.

G. Activity Codes. At a minimum, assign an activity code for Responsibility to each activity to identify the responsible party (i.e. contractor, supplier, the Department, utilities). Indicate Department activities by using "MDOT". If requested, use additional project level activity codes to provide a means to view, group, or summarize activities.

6. Project Milestones. Provide milestones in the schedule, including start of the project, the completion of the project, interim contractual dates and additional activities necessary to communicate the planned progress of work. Project milestones must have zero duration and an Activity Type of Start Milestone or Finish Milestone.

7. Constraints. Use only "Finish on or Before" or "Start on or After" constraint types. Use constraints only for contractual dates and timeframes. Use project level calendars representing contractual dates if the use of constraints prevents a continuous critical path from project start to project completion.

8. Calendars. Assign activities a project level calendar. Incorporate non-work periods such as holidays, weekends, seasonal restrictions, or weather contingency (i.e. temperature and/or precipitation) and other non-work days identified in the contract. Activity calendars for non-field work activities, including submittals, reviews, procurement, fabrication, cure times, and utility relocations performed by others, must not show non-work days unless otherwise specified in the contract. Define the "work hour/day" in calendars to match the Primavera Admin Preference "Hours per Time Period". For example, if the Hours per Time Period is defined as 8 hours/day, the "work hour/day" for the calendar is defined as 8 hours. Activity calendars must have the same shift times.

9. Schedule Calculation Options. Ignore relationships to and from other projects. Do not make open-ended activities critical. Calculate the schedule using Retained Logic. Ensure critical activities are defined using the "Longest Path" criteria. Compute total float as finish float.

10. Float. Float available in the schedule, or generated due to efficiencies of either party, is a shared resource available to either the Department or the Contractor. Use of float suppression techniques, such as; preferential sequencing (arranging critical path through activities more susceptible to Department caused delay), lag logic restraints, artificial activity times, or imposing unapproved constraint dates, will be cause for rejection of the schedule. A Baseline Schedule will be rejected if submitted with negative float. Revised Baseline schedules and schedule updates submitted with negative float can be cause for rejection. Negative float will not be a basis for requesting time extensions.

e. Baseline Schedules.

1. Interim Baseline Schedule. An Interim Baseline schedule must be submitted and approved prior to starting construction activities. The Interim Baseline schedule must detail the work activities in the first 90 days of the project and show summary level activities required to complete the remainder of the project. Until the Baseline schedule is approved, submit monthly updates to the Interim Baseline schedule to show the actual progress of work completed to date.

2. Baseline Schedule. The Baseline schedule must incorporate the approved Interim Baseline schedule and actual progress to date, if applicable. The Baseline schedule will be the fixed CPM schedule by which project performance and progress is measured.

3. Revised Baseline Schedule. When directed by the Engineer or as applicable, submit a Revised Baseline schedule that details the revised plan for completing the remaining contract work. A Revised Baseline schedule will be required when:

A. A contract revision or change significantly impacts the schedule.

B. The Contractor plans to substantially alter future work sequences or operations.

C. There are significant discrepancies between the latest approved schedule and actual work operations and/or progress.

D. An update schedule shows considerable negative float and/or it is apparent that the work may not be completed within contract time.

4.   Baseline Narrative Requirements. Follow the outline detailed below:

A.   Milestone Dates – List major milestones with their scheduled and contractual dates as applicable, including the contract completion date, contract interim milestones, major traffic switches, start/finish milestones for each stage of work, and closure periods.

B. Work Sequence – Explain the sequence of work to complete the project, including where the work will begin and how the work will progress through the project.

C. Resources – Describe the general resources to be applied to the major disciplines of work on the project. This includes the number of crews, types of crews, and key pieces of equipment such as cranes or pavers.

D.   Work Schedule – Detail the planned work schedule, including the number of workdays per week, work hours, night or weekend work, and non-work periods. If using multiple crews on differing schedules, provide the information for each crew.

E. Weather – Explain how the schedule accommodates adverse weather days. Describe how weather impacts will be addressed including changes to the work schedule or make-up work days. Describe planned work and explain weather considerations for winter months and seasonal suspension.

F. Critical Path – Briefly describe the critical path of the project. Highlight other critical paths that may exist due to interim contractual dates.

G. Delays – Describe actual or anticipated delays, including identification of the type, the cause, and responsibility. Identify delayed critical activities, activities that may become critical, and note the impact of the delay on project milestones. Detail actions required to mitigate delays or provide a recovery plan to complete within contract time.

H. Third Party Interfaces – State the status of required permits, utility coordination or other third-party interfaces.

I.   Lags - Explain the use of lags summarized by each sequence of work.

J. Additional Information – Describe other assumptions, contingency or risk incorporated into the schedule that may help the Engineer understand the overall project schedule. Include planned production rates for key work items or as requested by the Engineer.

f.   Update Schedules. Submit Update schedules every month with consistent Data Dates determined at the time of Baseline schedule acceptance. The Engineer can request an update at any time if circumstances become known that make the latest approved schedule an ineffective tool to track progress.

1. Update Schedule Narrative Requirements. Follow the outline detailed below:

A. Milestone Dates – List major milestones with their current scheduled completion dates and compare against the completion dates from the latest approved schedule.

B. Work Sequence – Describe the work performed since the latest approved schedule. Note changes to correct out-of-sequence (OOS) work or changes to sequencing.

C. Resources – Describe changes in resources.

D. Work Schedule – Describe changes to work schedule (i.e. days, hours, shifts).

E. Weather – List adverse weather dates and the total number of days lost each month due to adverse weather or conditions resulting from adverse weather. Identify the activities affected and impacts to the critical path.

F. Critical Path – Describe changes to the critical path.

G. Delays – Describe actual or anticipated delays, including identification of the type, the cause, and responsibility. Identify delayed critical activities, activities that may become critical, and note the impact of the delay on project milestones. Detail actions required to mitigate delays or provide a recovery plan to complete within the contract time.

H. Third Party Interfaces – State the status of required permits, utility coordination or other third-party interfaces.

I. Activity Changes – List activities that have been added or removed from the schedule. List changes in activity relationships, predecessors, or successors. List all other changes to activities. Provide an explanation or reasoning for all activity changes, except for status or progress updates.

J. Additional Information – Describe any changes to other assumptions, contingency or risk incorporated into the schedule that may help the Engineer understand the overall project schedule moving forward.

g. **Time Extensions.** Time extensions will not be considered without an approved current schedule. Unless the Engineer approves otherwise, requests for time extensions will only be considered if the analysis detailed herein is provided. The Standard Specifications for Construction provide the excusable delays that the Engineer may grant time extensions for, and the analysis herein will help quantify and determine the appropriate time extension due, if any.

1. Use a Time Impact Analysis (TIA), for evaluating the potential or most likely results of unplanned or extra work (prospective). In general terms, complete the following steps:

A. Model the impact with a schedule fragnet.

B. Select the approved current schedule to impact (unimpacted schedule).

C. Insert the fragnet and calculate the schedule (impacted schedule).

D. Compare the finish dates of the unimpacted and the impacted schedules in order to determine the duration of the impact. The time extension due, if any, will be based on this duration.

2. Use a retrospective/contemporaneous analysis (commonly known as a Windows Analysis) when evaluating delays that are currently occurring or have already occurred. In general terms, complete the following steps:

A. Identify the approved schedule prior to the start of the delay being evaluated.

B. Identify the approved schedule following the conclusion of the delay and, if applicable, each approved Update schedule in effect during the delay.

C. Identify and track the critical path each day from immediately before the start of the delay to immediately following the delay.

D. Determine whether the delay affected the critical path. If the delay did not fall on the critical path, then no project delay occurred, and no time extension is due. If the delay falls on the critical path, then determine the number of days the critical path is delayed. The time extension due, if any, will be based on this delay.

h. Final As-Built Schedule. Submit a final updated as-built schedule within 14 days after completion of all activities on the CPM schedule. All activities must have an actual start date and an actual finish date that are accurate and the physical % set to 100.

i. Measurement and Payment. The completed work, as described, will be measured and paid for at the contract price using the following pay item:

Pay Item   **Pay Unit**

Critical Path Method Schedule .... Dollar

A budgeted amount of $15,000 has been established for payment of the work detailed herein. **Critical Path Method Schedule** will be paid upon baseline schedule approval. No extra compensation will be paid for scheduling costs associated with updates, revisions, or delays to the project.