SECTION 01311

CPM CONSTRUCTION SCHEDULE

1.01 GENERAL

A. See General Conditions Article 5.15: Submit to the Engineer a Temporary Construction Schedule and a CPM Schedule (along with updates) as described below:

B. Temporary Construction Schedule: Submit to the Engineer, within ten (10) days after date of the Notice to Proceed, a Temporary Construction Schedule covering the Contractor's activities over the first sixty (60) days of the Contract Time. The Temporary Construction Schedule shall schedule the progress within the calendar days set forth above for completion of the work.

C. CPM Schedule: Acceptable Critical Path Method (CPM) scheduling software includes SureTrak or Primavera. Provide a copy of the selected software to the Engineer. In accordance with General Conditions paragragh 5.16, submit an acceptable CPM Schedule to the Engineer within thirty (30) days after beginning Construction. Subsequent revisions to said schedule shall be submitted as set forth hereinafter. The requirement for the CPM schedule is included to assure adequate planning and execution of the work and to assist the Engineer in appraising the reasonableness of the proposed schedule and evaluating progress of the work. The CPM schedule submitted under this Specification shall utilize a critical path method (CPM) format, either the precedence or arrow diagramming method. Only one progress payment will be made prior to submission and acceptance of the CPM Schedule.

1. The CPM schedule system shall be submitted on paper and on floppy discs or CD-ROM and consist of diagrams and accompanying mathematical analyses. The diagrams shall show elements of the project in detail and an entire project summary. Diagrams shall show the order and interdependence of activities and sequence in which the work is to be accomplished as planned by the Contractor. The basic concept of a network analysis diagram shall be followed to show how the start of a given activity is dependent on the completion of preceding activities and its completion restricts the start of following activities. Detailed network activities shall include, in addition to construction activities, the submittal and approval of samples of material and Shop Drawings, the procurement of critical materials and equipment, fabrication of special material and equipment and their installation and testing. All activities of the Owner and the Engineer that affect progress and required contract dates for completion of all or parts of the work shall be shown. The selection and number of activities shall be subject to favorable review by the Engineer. Summary networks shall be time scaled. Durations shall be in working days and shall not exceed five workdays, except for submittal and delivery items. Where the duration of continuous work exceeds five workdays, work items in the Construction Schedule shall be subdivided by location, approximate stationing or other sub-element of the work.

   The graphic network diagram shall include for each activity, the description, activity number, the estimated duration in work days, and all activity relationship lines. The network diagram shall be drawn for the early start of all activities. If

the precedence technique is utilized, the schedule report shall include a calendar in work days, a network report sorted by early start and a logic table report sorted by preceding work item. If the arrow technique is utilized, the schedule report shall include a calendar in work days, a network report sorted by early start, a network report sorted by I-J numbers, and a network sorted by slack time and I-J numbers.

2. The critical path shall be shown on all reports and on the graphic network diagram. The activities which constitute the critical path shall be identified.
3. The mathematical analysis of the network diagram shall include a tabulation of each activity. The following information shall be furnished as a minimum for each activity:
    a. Preceding and following event numbers
    b. Activity description and number
    c. Estimated duration of activities
    d. Earliest start date (by calendar date)
    e. Earliest finish date (by calendar date)
    f. Actual start date (by calendar date)
    g. Actual finish date (by calendar date)
    h. Latest start date (by calendar date)
    i. Latest finish date (by calendar date)
    j. Slack or float
    k. Percentage of activity completed
4. The program shall be capable of accepting revised completion dates as modified by approved time adjustments and recomputations of all tabulation dates and float accordingly.
5. Submission and review of the system shall be as follows:
    a. Submit the complete network analysis system, consisting of the detailed network mathematical analysis and network diagrams, within thirty (30) calendar days after receipt of Notice to Proceed.
    b. Participate in a review and evaluation of the proposed network diagrams and analysis by the Engineer. Any revisions necessary as a result of this review shall be resubmitted for review by the Engineer within ten (10) calendar days. When completed, the favorably reviewed schedule shall then be the schedule to be used by the Contractor for planning, organizing and directing the work and for reporting progress. If the Contractor thereafter desires to make significant changes in his method of operating and scheduling, he shall notify the Engineer in writing stating the reasons for the change.
    c. Submit on paper and on floppy disc or CD-ROM at monthly intervals a report of the actual construction progress. Each monthly report shall cover a period of approximately thirty (30) days ending around the 20th of each month. The monthly reports shall be submitted within ten (10) calendar days of the end of the reporting period.
        1) If the project is proceeding on schedule, the monthly update report may consist of a marked-up copy of the graphical network diagram. This submittal shall clearly indicate the status of any minor shifts in sequence or schedule and the estimated completion date or percent complete of all activities currently in progress. The contract completion date shall also be indicated. Submit a narrative report relating to status of construction, the schedule, and factors which may affect the remainder of the schedule. The report shall show the

activities or portions of activities completed during the reporting period. The report shall state the percentage of the work actually completed and scheduled as of the report date and the progress along the critical path in terms of days ahead or behind the allowable dates.

2) If, in the opinion of the Engineer, the project is behind schedule, the monthly report shall include a revised network diagram and/or mathematical analysis showing the Contractor's proposed revised schedule. An analysis of the effect that the delay has on progress along other paths shall also be included in the report. Also submit a narrative report with each updated analysis which shall include but not be limited to a description of current and anticipated problem areas, delaying factors and their impact, and an explanation of corrective actions taken or proposed.

3) Periodic reports shall be submitted in sufficient copies to cover Contractor needs plus three (3) copies to be retained by the Engineer.

6. Any omission of work from the detailed schedule, otherwise required for Contract compliance, will not excuse the Contractor from completing such work within any applicable completion date. The CPM schedule shall be generated by computer methods. If the submitted Construction Progress Schedule does not fully reflect the specified work, the CPM format requirements or time limitation for completion of the work as provided in these Specifications, it shall be returned to the Contractor by the Engineer for modification as necessary.

D. Schedule Review: Once each month, on a date mutually agreed upon, but no later than seven (7) working days after the monthly schedule progress report date, a jobsite meeting will be held to review the Construction Schedule and job progress. Also attend weekly meetings scheduled by the Engineer to review the progress of the work in the preceding week and in the subsequent work, coordinate the work with public agencies or other contractors as required, and allow the Engineer to plan his activities for testing, inspection, etc.

E. Schedule Revisions: The conditions under which the Engineer will require revisions of the Construction Schedule include the following:

1. When delay in completion of any work item or sequence of work items results in an estimated extension of project completion by either twenty (20) working days or by five percent (5%) of the remaining duration of time to complete the Contract, whichever is less.
2. When delays in submittals or deliveries make replanning or rescheduling of the work necessary.
3. When the schedule does not represent actual prosecution and progress of the work.
4. When any change to the sequence of activities, the completion date for major portions of the work, or when changes occur which affect the critical path.
5. When Contract modification necessitates schedule revision, the Contractor shall submit a schedule analysis of all change order work with his proposal.

F. Cash Flow Projection: A cash flow projection shall be submitted with the Construction Schedule. This cash flow projection shall be revised and resubmitted when revisions of the Construction Schedule will result in changes to the projected cash flow.

G. Proposed Change Orders: Proposed change orders submitted by the Contractor shall be accompanied by a statement of the time necessary for the work, together with a description of how this time will be incorporated into the current Construction Schedule. The Contractor shall not be entitled to a time extension for delays in activities on non-critical paths of the favorably reviewed schedule unless the duration of the excusable delay exceeds the total float of the activities being delayed. If the duration of an excusable delay does exceed the total float of the activities affected by the delay, the Contractor shall be entitled to an extension equal to the difference. Except as defined in the Contract Documents, the definitions of "non-critical activities" and "total float" shall be as provided in the Associated General Contractors of America book "CPM In Construction, A Manual For General Contractors."

H. Accelerated Work if Required to Meet Schedule: If the Contractor's performance falls behind schedule, the Contractor shall accelerate the work as required to get back on schedule at no additional cost to the Owner. Accelerated work shall include air or express delivery of materials and equipment, increasing the number of workers, working overtime, working Saturdays, Sundays, and holidays, and working additional shifts.

I. When, in the judgment of the Engineer, it is necessary to accelerate any part of the work ahead of schedule, the Contractor shall, when directed, concentrate his efforts on such part of the work, but maintain sufficient progress on all other areas of the Project required to maintain the schedule which meets the Contract Completion Date.

J. The Engineer shall be advised in advance by the Contractor when construction work will take place. If the Contractor fails to notify the Engineer in advance of the day or days when no construction work will be done, the Contractor will be charged the cost of inspection for that day or days and such changes may be deducted from any payment due the Contractor.

END OF SECTION