

## SECTION 01310 - PROGRESS SCHEDULE

((OPTION 1 - For use with projects with specified completion times of 120 calendar days or less, or projects with minor complexity or relatively few tasks; projects conducive to bar chart type scheduling.))

### 1.0 CONSTRUCTION SCHEDULE

The schedule shall be submitted within ten (10) days of Notice to Proceed and favorably reviewed by the Construction Manager before the first partial payment can be made.

The Contractor shall provide with its schedule a procedural outline of the system shutdowns and proposed tie-in procedures, which shall be subject to the favorable review of the Construction Manager and the City.

### 1.1 Base Schedule

The Contractor shall submit the schedule based on either the bar chart method or the Critical Path Method (CPM). The schedule shall indicate preceding activity relationships and/or restraints where applicable and a controlling path shall be indicated. The schedule shall be time scaled and shall be drafted to show a continuous flow from left to right. The construction schedule shall clearly show the sequence of construction operations and specifically list:

- a. The start and completion dates of all work items.
- b. The dates of submittals, procurement, delivery, installation and completion of each major equipment and material requirement.
- c. Progress milestone events or other significant stages of completion.
- d. The lead time required for testing, inspection and other procedures required prior to acceptance of the work.

Activities shall be no longer than fifteen (15) workdays, except for submittals and delivery items. If an activity takes longer, it shall be broken into appropriate segments of work for measurement of progress. This limitation may be waived, upon approval of the Construction Manager, for repetitious activities of longer durations for which progress can be easily monitored.

### 1.2 Reports

The following reports shall be submitted with the Base Schedule:

- a. Bar Chart: A bar chart which lists each activity description, early start and finish dates, and all preceding and succeeding activities. The chart shall indicate all critical activities. A chart with the above information shall be provided with each monthly update in lieu of the report specified in Paragraph 01310-4.1.1.a.
- b. CPM Schedule: A CPM network report sorted by I-J or activity number which lists each activity description, early start and finish dates, preceding and succeeding activities and restraints, including lead/lag durations. The report

shall show the critical path.

1. CPM network report sorted by total float.
2. CPM network report sorted by early start.

((OPTION 2 - For use with projects with completion times greater than 120 calendar days, or with complex projects; projects where a CPM schedule is preferred or required.))

## **1.0 CONSTRUCTION SCHEDULE**

The schedule shall be submitted within ten (10) days of Notice to Proceed and favorably reviewed by the Construction Manager before the first partial payment can be made.

The Contractor shall provide with its schedule a procedural outline of the system shutdowns and proposed tie-in procedures, which shall be subject to the favorable review of the Construction Manager and the City.

### **1.1 General**

The Progress Schedule for this Project will also be referred to as the CPM Schedule.

The Contractor shall designate, in writing, an authorized representative in its firm who will be responsible for the preparation, revising, and updating of the CPM Schedule. The Contractor's representative shall have direct project control and complete authority to act on behalf of the Contractor in fulfilling the construction scheduling requirements set forth herein, and such authority will not be interrupted throughout the duration of the Project. The requirements for the CPM Schedule are included to assure adequate planning and execution of the work and to assist the Construction Manager in appraising the reasonableness of the proposed schedule and evaluating progress of the work.

Within seven (7) days from award of the Contract, the Contractor shall submit to the Construction Manager demonstration of competence in the use of CPM Scheduling, including evidence of the use of CPM Scheduling on a project of similar value and complexity. In the event of the failure of the Contractor to satisfy the Construction Manager of its CPM Scheduling competence, the Contractor will be required to employ a qualified CPM consultant who regularly performs these services and who in the opinion of the Construction Manager possesses the qualifications required to perform CPM Scheduling for this Project.

Demonstration of competence in the use of CPM Scheduling shall be indicated by providing evidence to verify capability of using the critical path method (CPM) of construction by submitting: (1) Information regarding at least two construction projects, complete with description of the work, valued at least equal to the expected value of this Project, which were successfully controlled by the Contractor or its CPM consultant throughout their duration by means of CPM Scheduling and periodic systematic reviews of the CPM Schedules; (2) The Contractor's or its CPM Consultant's experience in the application of CPM Scheduling techniques for construction projects of similar size and complexity; (3) The Contractor's or its CPM consultant's library of computer programs for production of CPM Schedules; and (4) Information regarding the Contractor's or its CPM consultant's computer facilities (either by possession or contractual access).

### **1.2 Preliminary Progress Schedule**

- 1.2.1 Within ten (10) days after receipt of Notice to Proceed, the Contractor shall submit two (2) copies of a Preliminary Progress Schedule in the form of an arrow or precedence diagram covering the following project phases and activities:
- a. Procurement and Submittals, including shop drawings and fabrication and delivery of key and long lead time procurement activities.
    - 1. The Contractor's submittal information shall show intended submittal dates and shall be incorporated into the base project schedule.
    - 2. The delivery information shall include realistic delivery dates for the procurement activities.
  - b. The activities planned for the first 90 days in the execution of the Work.
  - c. The approach to scheduling the remaining activities or phases of the Work. The Work for each phase or activity shall be represented by at least one summary activity and the sum of the summary activities shall equal the Contract Time.
  - d. Approximate cost and duration for each summary activity representing the Contractor's best estimate for the work the summary activity represents.
- 1.2.2 The Preliminary Progress Schedule shall describe the activities to be accomplished and their dependency subject to all requirements under these Construction Schedule provisions, as appropriate. Work activities, other than procurement activities, shall be cost-loaded. The Preliminary Progress Schedule will be used temporarily to record and monitor the progress of the Work until the Base Schedule specified hereinafter, has been completely developed and approved. Recorded data on the Preliminary Progress Schedule shall be incorporated into the Base Schedule during the first schedule update.
- 1.2.3 The Construction Manager shall review the schedule and provide any comments, its favorable review of the schedule, or request a meeting to review the schedule with the Contractor within thirty (30) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the schedule with the Construction Manager. Any revisions necessary as a result of this review shall be resubmitted for review by the Construction Manager within ten (10) days.

### 1.3 Base Schedule

- 1.3.1 **Base Schedule Submittal** - The Contractor shall submit an acceptable Critical Path Method (CPM) Schedule to the Construction Manager within sixty (60) days after the receipt of the Notice to Proceed. Subsequent revisions to said schedule shall be submitted as set forth hereinafter.

The Construction Manager shall review the schedule and provide any comments, its favorable review of the schedule, or request a meeting to review the schedule with the Contractor within twenty (20) days of receipt of the schedule. If requested, the Contractor shall participate in a review and evaluation of the proposed network diagrams and analysis by the Construction Manager. Any revisions necessary as a result of this review shall be resubmitted for review by the Construction Manager within ten (10) 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 its method

of operating and scheduling, the Contractor shall notify the Construction Manager in writing stating the reasons for the change. Only one progress payment will be made prior to submission and acceptance of the CPM Schedule. Neither the Contractor nor the City shall own the "float".

To the extent that the favorably reviewed initial Construction Schedule, or revisions thereto, indicate anything not jointly agreed upon, it shall be deemed to be not favorably reviewed by the Construction Manager. 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.

- 1.3.2 **Schedule Type** - The CPM Schedule submitted under this Specification shall utilize a critical path method (CPM) format using either the precedence or arrow diagramming method. The schedule shall show completion of the project at the Contract completion date.

The schedule shall be computer generated utilizing either "**Primavera**" or a compatible scheduling program or the Contractor shall provide the Construction Manager with conversion software from the Contractor's scheduling program to the "**Primavera**" system. The Contractor shall provide a floppy disk for the initial base schedule and all monthly updates with the network diagram and mathematical analyses. 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. The CPM schedule system shall consist of diagrams and accompanying mathematical analyses network diagram.

- 1.3.3 **Network Diagram** - 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. Summary networks shall be time-scaled.

The graphic network diagram shall include for each activity, the description, activity number, the estimated duration in workdays, and all activity relationship lines. The network diagram shall be drawn for the early start of all activities. Minor activities with a cost less than \$10,000 may be included in other activities and not identified separately, except that the Construction Manager may require specific minor activities be identified in the network.

- 1.3.4 **Mathematical Analysis** - 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 succeeding event numbers
- b. activity (or I-J) 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
- l. activity constraints
- m. cost value of each activity

If the precedence technique is utilized, the schedule report shall include a calendar in workdays, a network report sorted by early start, a network report sorted by total float, and a logic table report sorted by work item which indicates the complete preceding and succeeding logic ties. If the arrow technique is utilized, the schedule report shall include a calendar in workdays, a network report sorted by early start, a network report sorted by I-J numbers, and a network report sorted by float time and I-J numbers.

1.3.5 **Durations** - Durations shall be in calendar days and shall not exceed fifteen (15) workdays, except for submittal and delivery items. Where the duration of continuous work exceeds fifteen (15) workdays, work items in the Construction Schedule shall be subdivided by location, approximate stationing or other sub-element of the work.

1.3.6 **Network Activities** - Detailed network activities shall include:

- a. The submittal and approval of samples and equipment, fabrication of special material and equipment and their installation and testing.
- b. 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.
- c. System shutdown and tie-in dates must be identified and included on the schedule as milestones.
- d. The activity numbers shall be grouped by work area to provide logical summary activities.
- e. All activities of the City and the Construction Manager that affect progress and required contract dates for completion of all parts of the work. The selection and number of activities shall be subject to favorable review by the Construction Manager.
- f. All activities, other than procurement activities, shall be cost-loaded so that partial payments to the Contractor can be calculated on the basis of CPM reported work in place.

## 2.0 WEATHER CONDITIONS

Seasonal weather conditions shall be considered in the planning and scheduling of work influenced by high or low ambient temperatures or precipitation to ensure the completion of the Work within the Contract Time. No time extensions will be granted for the Contractor's failure to take into account such weather conditions for the location of the Work and for the period of time in which the Work is to be accomplished.

The expected loss of working days specified in the Supplementary Conditions, Paragraph 01010-5.0, **WEATHER DAYS**, shall be included in a separate identifiable critical activity labeled "Weather Days Allowance" to be included at the end of the project schedule. When weather days occur, and are approved as such by the Construction Manager, the Contractor shall either:

- a. Increase the duration of the current critical activity(ies) by the number of weather

days experienced, or

- b. Add a critical activity to the schedule to reflect the occurrence of the weather day(s).

The duration of the weather day allowance activity shall be reduced as weather days are experienced and included in the schedule. Any remaining weather days in the weather day allowance activity at the completion of the project shall be considered as float and shall not be for the exclusive use or benefit of either the City or Contractor.

### 3.0 UPDATES

#### 3.1 Submittal Period

The Contractor shall submit 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 30th of each month, or on another mutually agreed upon date each month. The monthly reports shall be submitted within ten (10) days of the end of the reporting period.

##### 3.1.1 **All Monthly Updates** - All monthly updates shall include as a minimum:

- a. Tabulation reports for the following sorts:
  1. I-J [or Activity] Numbers
  2. Total Float
  3. Early Start
  4. Logic report of proceeding and succeeding activities with all restraints indicated (precedence schedules only)
- b. Narrative Report - 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, the remaining duration, and the progress along the critical path in terms of days ahead or behind the allowable dates as of the report date. Any changes made by the Contractor to the schedule, including I-J (or Activity) numbers and activity descriptions, shall be listed.

##### 3.1.2 **On-Schedule Updates** - 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. The Contractor shall submit a narrative report relating to status of construction, the schedule, and factors which may affect the remainder of the schedule.

##### 3.1.3 **Delayed Schedule Updates** - If, in the opinion of the Construction Manager, 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. The schedule shall be revised under the conditions defined in Paragraph 01310-3.3, **Schedule Revisions**. An analysis of the effect that the delay has on progress along other paths shall also be included in the report. The Contractor shall 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.

### **3.2 Schedule Review**

Once each month, on a date mutually agreed upon, but no later than seven (7) working days after the submittal of the monthly update specified herein, a jobsite meeting will be held to review the Construction Schedule, job progress and the monthly update, or the Construction Manager will provide written comments on the monthly update.

### **3.3 Schedule Revisions**

The conditions under which the Construction Manager will require revisions of the Construction Schedule include the following:

- a. 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.
- b. When delays in submittals or deliveries make replanning or rescheduling of the work necessary.
- c. When the schedule does not represent actual prosecution and progress of the work.
- d. When any change to the sequence of activities, the completion date for major portions of the work, or changes occur which affect the critical path.
- e. When Contract modification necessitates schedule revision.

The Contractor shall not make any changes to the critical path without the Construction Manager's written consent.

## **4.0 TIME IMPACT ANALYSES**

### **4.1 Requirement**

When change orders impacting project duration are initiated, delays are experienced, or the Contractor desires to revise the schedule logic, the Contractor shall submit to the Construction Manager a written Time Impact Analysis illustrating the influence of each change, delay, or Contractor request on the current contract schedule completion date.

| ((OPTION 1 - Use with Schedule Option 1))

#### **4.1.1 Construction Schedule Analysis -**

- a. Each Time Impact Analysis shall include an analysis demonstrating how the Contractor proposes to incorporate the change order, delay, or Contractor request into the Schedule.
- b. The analysis shall demonstrate the time impact based on the date of occurrence of the change, delay or revision; the status of construction at that point in time; and the impact of all affected activities.

| ((OPTION 2 - Use with Schedule Option 2))

4.1.1 **Construction Schedule Analysis -**

- a. Each Time Impact Analysis shall include a fragmentary network analysis demonstrating how the Contractor proposes to incorporate the change order, delay, or Contractor request into the Schedule.
- b. The analysis shall demonstrate the time impact based on the date of occurrence of the change, delay or revision; the status of construction at that point in time; and the event time computation of all affected activities.
- c. The event times used in the analysis shall be those included in the latest updated copy of the Construction Schedule or as adjusted by mutual agreement between the Construction Manager and Contractor.

**4.2 Delays**

Activity time delays will not automatically mean that an extension of Contract Time is warranted or due the Contractor.

- a. It is possible that a strike or contract modification will not affect existing critical activities or cause noncritical activities to become critical, i.e., a strike or modification may result in only absorbing a part of the available total float that may exist within an activity chain of the network, thereby not causing any effect on the Contract completion date or time.
- b. The Contractor acknowledges and agrees that mitigation for delays due to changes, differing site conditions, and other causes will require revision of preferential sequences of the Work before proposing an updated schedule which supports a delay to the Project as a whole. When a delay to the Project as a whole can be avoided by revising preferential sequencing, and the Contractor chooses not to implement the revisions, the Contractor will be entitled to a time extension but is not entitled to compensation for indirect overhead.
- c. Float or slack shall not be for the exclusive use or benefit of the City or the Contractor. Extensions of time for performance will be granted only to the extent that the equitable time adjustments for the activity or activities affected exceeds the total float along the activity chain involved at the time the change was ordered or the delay occurred.
- d. The definitions of "noncritical activities" and "total float" shall be as provided in the Associated General Contractors of America book "CPM in Construction, A Manual for General Contractors."

**4.3 Submittal**

Time Impact Analyses shall be submitted in quadruplicate and within fifteen (15) days after a delay occurs or with the Contractor's cost proposal in response to a notice of change from the Construction Manager. In cases where the Contractor does not submit a Time Impact Analysis for a specific change order, delay, or Contractor request within the specified period of time, then it is mutually agreed that the particular change order, delay, or Contractor request has no time impact on the Contract completion date and no time extension is required.

- a. Approval or rejection of Time Impact Analyses by the Construction Manager and the City will be made within fifteen (15) days after receipt of the Time Impact Analysis unless subsequent meetings and negotiations are necessary.
- b. Upon mutual agreement by both parties, schedule revisions illustrating the influence of change orders, delays, and/or Contractor requests will be incorporated into the next schedule update.

## **5.0 WEEKLY ACTIVITIES PLAN**

On the last working day of every week the Contractor shall submit to the Construction Manager the Contractor's Plan of Activities for the following three weeks. The Plan of Activities shall describe the activity and location of the activity and include the activity's I-J or Activity number as provided in the Construction Schedule.

## **6.0 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.

## **7.0 WORKHOUR PROJECTION**

A workhour projection shall be submitted with the Construction Schedule. The projection shall list projected workhours for each intended trade. This applies to the Contractor and the Subcontractors as listed in the bid. The projection shall include workhours for project management, superintendence and administration. The workhour projection shall be revised and resubmitted when revisions to the Construction Schedule will result in changes to the projected manpower.

**\*\*\*\* END OF SECTION \*\*\*\***