

SECTION 01310 CRITICAL PATH METHOD SCHEDULE AND COST/SCHEDULE INTEGRATION SYSTEM**1.0 General****1.1 Description**

The Work specified in this Section consists of developing and maintaining a Critical Path Method (CPM) cost/schedule integration system for this Contract. Where reference is made to Design, Engineering, or Design-Build items, the reference applies to Design-Build Contracts only. Planning, scheduling, management, and execution of Work in accordance with Contract Documents are the sole responsibility of Contractor.

A Related GENERAL PROVISIONS

1. GENERAL PROVISIONS Section, Differing Site Conditions.
2. GENERAL PROVISIONS Section, Limitations on Time Extensions.
3. GENERAL PROVISIONS Section, Liquidated Damages.
4. GENERAL PROVISIONS Section, Risk Allocation.
5. Section 01100, Summary of Work.
6. Section 01102, Design Management.
7. Section 01200, Contract Meetings.
8. Section 01300, Submittals.
9. Section 01460, Project Quality Program Requirements.
10. Section 01505, Mobilization.

B Generate a CPM schedule and cost/schedule integration system products using commercially available CPM scheduling software program containing direct file interchange capability with the software program used by the Authority. The Authority uses the Primavera software program, Primavera Project Planner. Provide same format for data used by Primavera batch processing system to exchange cost integrated scheduling system data.

C The Authority will provide the proposed network format for the dictionaries for activity codes, activity ID's, resources and cost accounts, as well as report formats. Certain activity codes define a minimum number of submittal, procurement, milestone and summary Work activities and are to be used to

- develop required scheduling submittals. Establish detailed activities, activity durations, cost and resource loading, and sequencing of Work in developing required schedule submittals. Maintain activity codes; resource accounts; cost accounts; activity ID codes; and report specifications, as provided in network format files, on Project schedule submittals. Do not change dictionary codes or report specifications provided in network format files without prior review and acceptance of the Authority.
- D For schedule network, integrated cost and cash flow submittals covered in this Section include an electronic version in a media format acceptable to the Authority.
- E For scheduling submittals produce Precedence Diagram Method (PDM) and time-scaled network diagram submittals on D-Size (22 inches by 34 inches) or E-Size (34 inch by 44 inch) medium suitable for reproduction. Print schedule submittal tabular reports on A-Size (8 1/2 inches by 11 inches) paper. For scheduling submittals, the Contractor shall include backup diskettes. The backup diskettes shall be made directly from the CPM scheduling software program and shall contain all files of the Project that can be restored by the Authority for its evaluation and analysis.
- F Contract milestones dates, Authority furnished goods, and Real Estate availability dates, as described in the Contract Documents, are unique zero duration activities containing corresponding dates and logic ties. Designate these activities as a "start no earlier than" or "finish no later than" milestone. Each milestone activity will constrain its dependent Work. Assume Notice To Proceed (NTP) is given at day zero for calculation of constraint dates for milestones.
- G Float is not for exclusive use or benefit of either the Authority or Contractor but is an expiring resource available to both parties on a nondiscriminatory basis. Float is used by either party, as needed to meet Contract milestones and Contract completion dates. Contract time extensions for Contract performance will be granted only to extent that delays or disruptions to affected Work paths exceed total float along those paths of current Contract Schedule (updated schedule) in effect at the time of delay or disruption. These delays or disruptions must also

cause end date of Work to exceed current Contract date or milestone date and be beyond control and without fault or negligence of Contractor or any subcontractor at any tier. If delays or disruptions impact an already negative float path, Contractor will not receive a time extension unless and until activity with highest negative float is driven even further negative.

- H Use of float suppression techniques such as preferential sequencing or logic, special lead/lag logic restraints, and extended activity times or durations should be submitted with written justification to obtain the Authority's acceptance. Use of float time disclosed or implied by use of alternate float suppression techniques shall be shared to proportionate benefit of the Authority and Contractor. Use of any network technique solely for purpose of suppressing float will be cause for rejection of schedule submittal.
- I Planning units - The standard time unit applied to the cost/schedule integration system is defined as Days.
- J Schedule network - Use Retained Logic CPM Precedence Diagram Method of scheduling.
- K Analyze in detail, activities included in Contract Schedule to determine activity time durations in units of project Working Days. Base durations on engineering and design resources, drawing production rates, submittal review periods, procurement lead time and duration, manufacturing times, labor (crafts), equipment, and materials required to perform each activity on a normal Workday basis. No on-site activity shall have a duration over 20 Working Days except non-construction activities such as submittals, submittal reviews, procurement and delivery of materials or equipment, and concrete curing. All design and on-site construction activities will be shown in their resource-loaded state to reflect cost, manpower, materials and equipment, except those activities specifically identified under this section. Durations shall be the result of definitive manpower and resource planning by the Contractor to perform Work in consideration of contractually defined on-site Work conditions. Show manpower to be assigned by craft definition for each task - by item designation, for each design, engineering, procurement, manufacturing, shipping, installation, testing, systems integration,

contractor supplied training and construction activity for the network on a tabular listing, and include in information furnished in accordance with paragraphs 2.6 and 2.7. Show crafts necessary to execute an activity.

- L. In preparing the submittal schedule, the Contractor shall consider the nature and complexity of each submittal and allow ample time for review, revisions or corrections. If the submittal schedule is found to place an extraordinary labor demand on the technical reviewing staff of the Authority or any jurisdictional agency, the submittal schedule shall be revised to prioritize the criticality of submittals.

2.0 Products

2.1 Submittals

Submit one original and four copies of Schedule unless specified otherwise. Provide submittals specified in this Section to the Authority for review and acceptance. See Table 1 for a summary of the submittal frequency.

- A. Early Work 120 Days CPM Schedules
 1. Submit to the Authority within 14 days after Notice of Award, an early work CPM Schedule containing the first 120 day submittals, permits, equipment procurement and summary design and construction activities. The schedule shall contain Contractor's detailed activities for first 120 days following NTP. Update the accepted early work schedule monthly, as specified, and submit until specified Contractor's Baseline CPM Contract Schedule is fully developed and accepted by the Authority. Include summary bars that reflect the balance of the Work to be performed for all Contract milestones.
 2. Submit computer generated back-up copy of the Early Work CPM Schedule files, computer generated tabular reports and time scaled network diagrams. Submit a written narrative for the Early Work Schedule.
 3. Submit partial Schedule of Values for Design and Construction within 14 days after Notice of Award. Identify value of Work planned for first 120 days following NTP. Allocate Schedule of Values to activities scheduled to be performed in first 120 days after NTP.
- B. Baseline CPM Contract Schedule

1. Submit breakdown of Contract price into individual resource accounts and into individual activities detailed by Contractor in Baseline CPM Contract Schedule, within 45 days after NTP.
2. Submit cost and resource (manpower, material and equipment) loaded Baseline CPM Contract Schedule, containing detailed activities and intended sequencing of Work included in Contract, within 45 days after NTP. Cumulative amount of cost loaded Work activities shall equal total Contract price. Resource-load detailed activities with manpower, equipment and Contract material unit quantities. Cumulative amount of material unit quantities shall equal total Contract Price. Resource load detailed activities with manpower, equipment, material unit quantities indicated in Schedule Of Values.
3. Include time-scaled network diagrams, based on Working Days, as well as computer generated reports. Construct to show the order in which the contractor proposes to carry out the Work, including restrictions of access, availability of Work areas, and use of manpower, materials and equipment. Also include any schedule activities affected by any specified access milestones and other contracts. Include the activities of subcontractors, equipment vendors, and suppliers. Provide the Authority with a copy of the schedule and written confirmation of concurrence that major (5 percent or more of the Contract amount) subcontractors and suppliers agree with their schedule activities including the Baseline CPM Contract Schedule and any revisions or updates.
4. Provide the Authority with a means to monitor and follow progress of all phases of Work. The schedule detail required shall include activities to the satisfaction of the Authority, including but not limited to, the following:
 - a. Master list of submittals and all other requirements as referenced in Section 01300 Submittals;
 - b. Contract milestones;
 - c. Purchases, manufacture, tests, delivery, and installation activities for major materials and equipment, and a separate list of major material items

- of equipment for which the Contractor intends to seek payment before installation;
- d. Deliveries of Authority furnished goods and/or materials in accordance with dates or schedule windows of such times set forth in the Contract or furnished by the Authority;
 - e. Preparation, submittal and acceptance of shop and/or Working drawings and material samples showing a 30-day minimum time specified for the Authority and Third Party reviews of normal or routine submittals, so identified in the Specifications, and the same time frame shall be allowed for at least one resubmittal or submittals so identified in the Contract Documents;
 - f. Approvals and permits required by regulatory agencies or other third parties;
 - g. Schedules for subcontract Work; including engineering and design services;
 - h. Assignment of responsibility for performing specific activities; including engineering, design, and procurement management services;
 - i. Access and availability to Work areas;
 - j. Identification of interfaces and dependencies with preceding, concurrent and follow-on Construction or Contractors and utilities;
 - k. Resource loading for cost, manpower, material, and equipment;
 - l. Actual tests, submission of test reports, and acceptance of test results;
 - m. Start up, testing, training, and assistance required under the Contract;
 - n. Planning for phased or total takeover by the Authority;
 - o. Punchlist and final cleanup;
 - p. Identification of manpower, material, or equipment restrictions, as well as any activity requiring unusual shift Work, such as two shifts, six day weeks, specified overtime, or Work at times other than a Standard Work Day; and
 - q. Any cost, resource roll-up, schedule summary organization, WBS or activity code designation requested by Authority.

- C. Current CPM Contract Schedule Updates
1. Initially, upon acceptance of the Baseline CPM Contract Schedule, establish the Current CPM Contract Schedule from the Baseline CPM Contract Schedule. Thereafter, update the Current Contract Schedule monthly with Data Date designated by the Authority. Submit updated Current Schedule as required in Table 1. Use updated Current Contract Schedule for subsequent planning, scheduling, managing, monthly progress payments, statusing of the master list of submittals and execution of Work to be accomplished.
 2. Participate with the Authority in periodic meetings, at least monthly, on dates directed by the Authority and seven days prior to monthly status Data Date for purposes of reviewing changes to schedule logic and Project status. At meeting held seven days prior to Data Date, provide preliminary updated Current CPM Contract Schedule that forecasts Project status on the Data Date and contains actual start and actual finish dates for activities in progress or completed, remaining durations of activities in progress, percent complete, earned value of cost-loaded activities, logic changes, new or deleted activities, and new Authority-Directed Changes.
 - a. Provide 30, 60, and 90 calendar day critical path look-ahead updates during each monthly status meeting. Identify all activities entering or falling off the critical path in the look-ahead periods, and indicate the cause or causes of changes to the critical path.
 - b. Provide report indicating variations between planned and actual sequences of completing any element of the work.
 3. Submit a stand alone portion of the network (fragnet), if current progress reflects negative float of minus 10 days or more for a milestone activity, as indicated by most recent Current CPM Contract Schedule, allowed by Contract Special Provisions as amended by approved Change Orders. Show activities affected, date delay or disruption occurred or how productivity rates were impacted, and unmitigated impacts to schedule caused by delay or disruption. Submit similar fragnet showing Contractor's plan to mitigate delay or disruption and subsequent impacts to schedule at the Authority's request.

- Provide written narrative describing circumstances that caused delay or disruption and methodology used to determine extent of delay or disruption. Submission of such fragnets does not constitute Authority acceptance to proceed with the Contractor's plan. Potential remedial actions may include:
- a. Increase design or construction manpower in such quantities and crafts as necessary to eliminate the backlog or Work.
 - b. Increase the number of Working hours per shift, shifts per Working day, Working days per week, the amount of design or construction equipment, or combination of the foregoing to eliminate the backlog or Work.
 - c. Reschedule the Work in conformance with the Specification requirements.
4. Before implementing any of the above remedial actions, notify and obtain acceptance from the Authority. If such remedial actions are accepted by the Authority, the Contractor shall incorporate the revisions into the next update of the Current CPM Contract Schedule.
 5. Addition of equipment or design/construction forces, increasing Work hours or other method, manner, or procedure to return to contractually required completion date will not be considered justification for a Change Order, nor be treated as acceleration where the need for a recovery schedule has been caused by the Contractor and/or its Subcontractors or Suppliers, at any tier.
 6. The Contractor may request a time extension due to Authority-Directed Changes or any other cause of delay, and shall therefore submit to the Authority, a written Time Impact Analysis illustrating the influence of each change or delay on the latest accepted current CPM Contract Schedule. Include in each Time Impact Analysis a fragnet demonstrating how the Contractor proposes to incorporate the Authority-Directed Change or delay into the accepted current CPM Contract Schedule. The fragnet shall contain a sequence of new and/or activity revisions that are proposed to be added to the Current CPM Contract Schedule in effect at the time change or delay is encountered to demonstrate influence of delay and method for incorporating the delay and its impact into the schedule as they are encountered.

- a. Each Time Impact Analysis shall demonstrate estimated time impact based on events of delay, date of the Change Order, Potential Change Order (“PCO”) or unilateral Change Order given to the Contractor, status of design or construction at that point in time, and event time computation of activities affected by change or delay. Event times used in analysis shall be those included in the latest accepted Current CPM Contract Schedule, in effect at time change or delay was encountered.
- b. Submit each Time Impact Analysis in triplicate, within ten days after a delay occurs. If the Contractor does not submit a Time Impact Analysis for a specific Change Order or delay within specified period of time, the Contractor will be deemed to have irrevocably waived rights to additional time and cost.
- c. Because float time within Current CPM Contract Schedule is jointly owned, it is acknowledged and agreed by the Contractor that the Authority caused delays on the project may be offset by Authority caused time savings (including, but not limited to: critical path submittals returned in less time than allowed for in the Contract, acceptance of substitution requests which result in a savings of time along the critical path for the Contractor, etc.). In such an event, the Contractor will not be entitled to receive an extension of time or delay damages until Authority caused time savings are exceeded and Contract completion date also exceeded.
- d. The Authority will accept or reject each Time Impact Analysis. Upon acceptance, a copy of a Time Impact Analysis signed by the Authority will be returned to the Contractor for incorporation into the schedule.
- e. Upon mutual agreement by both parties, incorporate fragnets illustrating the influence of Change Orders and delays into the Current CPM Contract Schedule during first update after agreement is reached.
- f. In the event the Contractor does not agree with the decision of the Authority regarding impact of a change or delay, it will be resolved in accordance with GENERAL PROVISIONS Section 20.0 entitled Disputes Resolution.

- D. As-Built Schedule - Submit As-Built Schedule covering Work performed under the Contract within 30 days after Substantial Completion. As -Built Schedule – shall be certified by planner/scheduler and Contractor's project manager as being the manner in which the Contract was executed. Submittal and acceptance of the Schedule will be a condition precedent to reduction/release of retainage at end of Contract.
- E. Schedule Reviews – The Authority will review and respond to scheduling submittals within 14 days after submittal. Submit a revised schedule within seven days after receipt of the Authority's response if the Authority requires changes or additional information.
- F. Scheduler - Employ a full-time Planning/Scheduler(s) with CPM scheduling knowledge and a minimum of 15-years of experience using automated scheduling systems involving 3 or more projects of similar scope, time, and cost. Maintain a sufficient number of appropriately trained and experienced Planner/Scheduler(s) to prepare, update, and analyze the schedule as required herein. Cooperate with the Authority and monitor and maintain Contractor's detailed cost/schedule integration system. - Within 10 days of Contract Notice of Award, submit to the Authority, resumes for Planning/Scheduler(s) with professional references, and an organization chart showing the name and number of scheduling staff to be employed. The Authority has the right to refuse to accept planner/scheduler(s) based upon lack of experience of similar Work as required in this Specification, or demonstrated inability to perform during the assignment to the project. If the Authority refuses to accept planner/scheduler proposed by the Contractor, provide another planner/scheduler meeting experience requirements listed above.
- G. Early Completion Schedule – Contractor agrees that in the event a proposed early completion schedule (or any subsequent update) which is found to be acceptable by the Authority, indicating a duration which is less than time allowed by Contract for completion of Work or of interim milestone, Contract completion time shall only be shortened by a Change Order to equal Contractor's proposed Baseline CPM Contract Schedule duration.

- H. Three Week Rolling Bar Chart Schedule - Once a week, on a day mutually agreed to by the Authority and the Contractor, a meeting will be held to assess the progress achieved by the Contractor during previous Work week. Submit a manpower/construction report and progress schedule listing activities completed and in progress for the previous week and the activities scheduled for the succeeding two weeks based on the Current CPM Contract Schedule. The Three Week Rolling Bar Chart Schedule shall be provided from the Current CPM Contract Schedule and include all activities scheduled including: activity ID, description, early start and early finish, total float, manpower requirement, original duration, remaining duration, percent complete, performance of the activity, and pertinent remarks as to activity status. The schedule and manpower shall be submitted to the Authority before the weekly meeting for review. Submit copies of schedule on 11 inch by 17 inch paper.
- I. Pay Estimate - As back up for the invoices, prepare schedule of activities for all Design and Construction Work to be done and show status of completion. Payment will be made off the resource and cost loaded schedule as activities are completed. Progress for payment shall be derived from the progress for Current CPM Contract Schedule Update. (See Article 2.1.C.) Pay Estimate shall include activity I.D. number, description, total cost, percent complete and current period earned payment amount and early start and early finish dates.

2.2 Partial Schedule of Values

For the first four progress payments following NTP - Computer generated tabular reports in a format provided by the Authority.

2.3 Contract Price Breakdown for Resource Accounts

Computer generated tabular reports in a format provided by the Authority.

2.4 Contract Unit Quantities Breakdown

Computer generated tabular reports in a format provided by the Authority.

2.5 Cost and Resource Loaded Baseline Contract Schedule

- A. One computer generated backup copy of Baseline CPM Contract Schedule files.
- B. Computer generated tabular reports in a format provided by the Authority.

- C. Computer generated bar chart and time-scaled network diagrams in a format provided by the Authority.
- D. Written narrative for Cost and Resource Loaded Baseline CPM Contract Schedule.

2.6 Manpower, Cash Flow, and Progress Curves

- A. Manpower - Submit with the Baseline CPM Contract Schedule a histogram depicting total project craft manpower, craft manpower for its own forces and for each of its Subcontractors for each month. Base histogram upon the number of shifts and crew sizes by engineering discipline or craft in Baseline CPM Contract Schedule. Update monthly and submit with current CPM Contract Schedule. Show actual manpower for each month during Design and Construction period to date and required manpower for both base scope and Change Order Work each month necessary to complete remaining activities, including Change Order Work, to ensure timely project completion.
- B. Cash Flow
 - 1. Submit with the initial Baseline CPM Contract Schedule a Cash Flow Curve of expected progress payments over the Performance Period. Plot curve using costs assigned to activities on the Baseline CPM Contract Schedule.
 - 2. Update the curve with actual information from the approved progress payments and forecasted progress payments and submit to the Authority. The total approved progress payments and forecasted progress payments must equal Contract amount including Change Order. Derive updated curve from the current CPM Contract Schedule.
- C. Progress Curves - Submit Scheduled Progress Curves with Baseline CPM Contract Schedule. Show with the curves the cumulative scheduled percent complete of each phase, time-scaled in calendar days from NTP to baseline schedule completion date for each phase. The curves shall be derived from the Cash Flow Curve. Update progress curves monthly showing actual progress, submit to the Authority with each monthly update of the Current CPM Contract Schedule. Include scheduled, actual and forecasted progress, plotted as a time-

scaled curve from 0 to 100 percent. Derive scheduled, actual, and forecasted progress from Cash Flow Curve.

2.7 Construction Equipment

Submit with Baseline CPM Contract Schedule a tabular report listing each major piece of construction equipment and each major piece of construction equipment for each of its Subcontractors for each month. Separately describe, identify and number each major piece of the Contractor's and the subcontractor's equipment in the report. Base tabular report upon number of shifts and crew sizes by craft in the Baseline CPM Contract Schedule. Update monthly in the Current CPM Contract Schedule. Show in update the actual construction equipment for each month during construction period to date, and the required construction equipment for each month necessary to complete remaining activities, including Change Order Work, on the early finish date.

2.8 Monthly Updated Current CPM Contract Schedule

- A. One computer generated backup copy of Monthly Updated Current CPM Contract Schedule file.
- B. Computer generated tabular reports in a format provided by the Authority
- C. Computer generated bar chart and time-scaled network diagrams in a format provided by the Authority.
- D. Written narrative for updated Current CPM Contract Schedule.

2.9 Fragnets

- A. One computer generated backup copy of Fragnet files.
- B. Computer generated tabular reports in a format provided by the Authority.
- C. Computer generated network diagrams in a format provided by the Authority.
- D. Written narrative of fragnet assumptions.

2.10 Contract Time-Scaled Network Diagrams

Submit computer generated time-scaled network diagram entitled "Current Time-Scaled Network Diagram" with submittal of items referenced below. Submit four copies produced on D-Size (22 inch by 34 inch) or E-Size (34 inch by 44 inch) paper.

- A. Submit with initial Early Work Schedule submittal.
- B. Submit with cost/resource-loaded Baseline CPM Contract Schedule submittal.
- C. Submit every month with Updated Current CPM Contract Schedule.

2.11 Written Narrative Reports

Include a “stand-alone” narrative of sufficient detail to explain basis of Contractor’s submittal with each schedule submittal.

- A. Early Work and Baseline CPM Contract Schedule Submittals - Explain determination of activity durations and describe Contractor’s approach for meeting required interim and final completion milestone dates, as specified in the Contract. Include as a minimum: basis and assumptions used in preparing submittal, including crew sizes, equipment requirements, and anticipated delivery dates; restraints; critical path activities; production rates; activities requiring overtime or additional shifts; activities that contain time contingencies for impacts to be expected from normal rainfall; holidays and other non-Work days; potential problem areas; permits; coordination required with the Authority, railroads, utilities and other parties; and long lead delivery items requiring more than 30 days from order to delivery. Identify Work items that may be expedited by use of overtime or additional shifts. Identify and explain sequencing and other constraints such as manpower, material, and equipment. Include listing of holidays and special non-Work days.
- B. Current CPM Contract Schedule Submittals - State in narrative, Work actually completed and reflect progress along critical path in terms of days ahead of or behind Contract dates. Specific requirements of narrative are as follows:
 1. If updated Current CPM Contract Schedule indicates an actual or potential delay to Contract completion date or interim milestone dates as specified under GENERAL PROVISIONS or modified by Change Order, identify causes of delays, disruptions and interruptions and provide explanation of Work affected and proposed corrective action to meet milestone dates involved or to mitigate potential delays or disruptions. Document and log in a matrix format activities with nonmitigated negative float until the negative float is mitigated. Identify deviations from previous month’s critical path. The matrix will include applicable activity number, description, planned start and finish dates, current start and finish dates, and float quantity.
 2. Discuss added Change Order Work items.

3.0 Execution

3.1 Early Work CPM Schedule

- A. Show activities that will or may affect milestone completion dates including planning, mobilization, engineering, design, permits and approvals, submittals, procurement, fabrication, and construction during first 120 days after NTP. Include activities and milestones that will or may affect or be affected by activities of the Authority, utilities, and other third parties. Network format files, in a format provided by the Authority, shall present a framework for preparation of early Work and Baseline Schedules.
- B. Describe Contractor's approach to mobilization, procurement, design and construction during first 120 days, including crew sizes, equipment and material delivery, site access, submittals and permits.

3.2 Four Month Schedule of Values

- A. Allocate applicable Contract costs to related resource account categories in a format provided by the Authority, and to Contractor's detailed activities, included in early Work CPM Schedule, to be completed or partially completed during four month period following NTP.
- B. Submit computer tabular report containing following data per activity: activity I.D., activity description, cost and resource account number; cost and resource account description; cost and resource account budget; total Contract material quantities and unit costs; cumulative quantities and cost to date; material quantities and cost this period; and estimated material quantities and cost at completion.

3.3 Contract Price Breakdown, Unit Quantity Breakdown

Provide a tabular report showing following data per cost and resource account: cost and resource account number; cost and resource account description; cost and resource account budget.

3.4 Baseline CPM Contract Schedule–Detailed Cost and Resource Loaded Network

- A. Provide Contractor's detailed activities and sequencing for Work included in the Contract. Assign unique activity identification for each detailed activity.
- B. Cost sums and unit quantity sums of cost and resource loaded activities shall equal Contract award amounts plus approved Change Order amounts. Assign

General Requirement costs not specifically assigned to Work activities to hammock activity representing entire Contract duration. Budget per cost account shall equal approved Contract award amounts plus approved Change Order amounts. Include cost account number and related resource account numbers, in a format provided by the Authority, in cost and resource loaded activities. Enter dollar amounts used for cash-flow calculations into scheduling software financial window. Approved activity budget dollar value shall equal forecast dollar value.

- C. Indicate Contractor's best estimate for original durations, early dates, late dates, logic ties, constraint dates, and total float. Schedule activities in the sequence which Contractor intends to perform Work.
- D. Include activities for installation and testing of Authority and Contractor furnished mechanical and electrical equipment required to support follow-on contractors. Include as a minimum: Elevators; Escalators; Air Handling Units; Sump Pumps; Supply Fans; Air Filters; Exhaust Fans; Motor Operated Dampers; Fire and Smoke Dampers; Sound Attenuators; and CIC Panels. Identify equipment by sort code that would allocate locations by survey station points and by associated finish Work.
- E. Cost and resource (manpower and equipment) load activities for installation and testing of materials and equipment.
- F. Include following activity sequence for major material and equipment procurement: Submittal Preparation; Review for Acceptance; and Fabricate/Deliver. Divide procurement items that may contain multiple submittals occurring at different time intervals into separate sequences that can be tracked on an individual basis. Include a minimum original duration of 20 Working days in Review-for-Acceptance activities. Include a minimum duration of 20 Working days for re-review. Re-submittal activities shall contain submittal preparation activities for other material and equipment procurement (non-major) to Schedule. A format provided by the Authority shall contain activity codes and values for submittal and procurement activities that are to be used in the Contract. Submit for Authority's review

and acceptance, a listing of proposed activity codes, code values and titles using examples given as a guide for Project.

- G. Baseline CPM Contract Schedule activity requirements are as follows:
1. Activity descriptions - Briefly convey scope and location of Work indicated.
 2. Activities - Discrete items of Work accomplished under Contract that provide measurable and recognizable parts of Work.
 3. Include as Contract deliverables, submittal and approval of permit applications and variances, design milestone deliverables and approvals, samples of materials, Shop Drawings, Working Drawings, Inspection and Test Plans, Safety and Security Plans, and Site Traffic Control Plans. Include activities of the Authority that may affect progress as well as those of affected utility companies and other similarly involved third parties. Include activities in the Baseline CPM Contract Schedule as stipulated in General Requirements.
 4. Work activities - Show duration in Workdays, costs, and unit quantities for material manpower and equipment where applicable.
 5. Work activities - Durations of 20 Working days or less except for nonconstruction activities such as procurement of materials, or fabrication of equipment. Should a Work activity require more than 20 Working days, subdivide Work activity to define appropriate Work items.
 6. Critical path is defined as the sequence(s) of Activities with the least amount of float.
 7. Failure to include any element of Work required for performance of the Contract in Baseline CPM Contract Schedule will not excuse Contractor from completing Work required to achieve milestone completion, notwithstanding acceptance of Baseline CPM Contract Schedule submittals. Activities that are susceptible to weather delays caused by rain shall contain time contingencies for those potential delays. The time contingencies shall be described in the appropriate activity log windows of scheduling software. In scheduling the Work, Contractor shall plan for

normal rainfall as listed in the General Provision Section 14.4, entitled Weather Delays Caused By Rain.

3.5 CPM Contract Schedule Changes

When commencing new Work associated with a Change Order, incorporate Work into the Current CPM Contract Schedule submittal as new activities after discussion with the Authority concerning how change will be placed into the updated current CPM Contract Schedule. After an official Change Order has been issued for Work, add it to the schedule. Change Orders added to the schedule are resource-loaded with material unit quantities and corresponding cost account, resources account codes, activity description, and costs. The activity ID identifies the number of the change. Time extensions may not be incorporated into schedule for changes or delays without an approved Change Order. Zero duration activities may be added until time extensions are executed.

3.6 Fragnets

- A. Submit revised Current CPM Contract Schedule within 14 days of request, if Contractor falls behind in prosecution of Work, as indicated by negative critical path, or submittal of Current CPM Contract Schedule no longer appears to represent actual prosecution of Work.
- B. Properly connect to, and constrain by, previously existing predecessor and successor activities, as applicable, activities of revised portion(s) of schedule. Band impacted activities in separate networks (fragnets), indicating specific delay or impact issue and submit to the Authority for review. Combine approved fragnets into Current CPM Contract Schedule.
- C. Time extensions will be granted only to the extent that equitable time adjustments for activity or activities affected exceed total or remaining float along critical path of activities at time of actual delay, or at time a Change Order was issued. Float or slack time is not for the exclusive use or benefit of the Contractor but is an expiring resource available to all parties as needed to meet Contract milestones and Contract completion date. Time Extensions will not be granted nor delay damages paid until a delay occurs:
 1. Which is beyond the control and without the fault or negligence of the Contractor and its Subcontractors or Suppliers, at any tier; and

2. Which extends actual performance of Work beyond applicable current Contract completion date and most recent date predicted for completion of project on approved schedule update, current as of the time of the delay or as of time of issuance of a Change Order.

3.7 Variance Reports

Submit a monthly comparison of consecutive updated Current CPM Contract Schedules and report noncritical (more than 15 days of total float) activities that have been delayed 20 or more Working days, and critical (15 days or less total float) activities that have incurred any delay. Include:

- A. Activity I.D. number code and description
- B. Previous scheduled early start/finish dates.
- C. Current scheduled early start/finish dates.
- D. Working days remaining to complete the activity.
- E. Percentage complete of the activity.
- F. Remaining total float of each activity.
- G. Reason for the delay and mitigation measures to be implemented, in the narrative.

3.8 As-Built Schedule

Submit within 30 days after Substantial Completion. As a condition precedent to release of retention by the Authority, identify last update to Current CPM Contract Schedule submitted as "As-Built Schedule." Reflect exact manner in which the project was actually designed and constructed, including start and completion dates, activities, sequences, and logic. Contractor's Project Manager and Design/Construction scheduler shall certify that it is a true reflection of the way the project was actually constructed.

4.0 Measurement and Payment

4.1 Physical Progress Measurement

- A. This Section is intended to inform Contractor how the Authority will calculate "Physical progress". Physical progress will be measured as sum of earned dollar values of activities identified as representing physical construction divided by "Physical Progress Budget." The Activities and physical progress budget will be developed jointly between the Contractor and the Authority. Physical progress budget is defined as summed dollar values of cost loaded

activities identified as representing physical construction in approved cost and resource loaded Baseline CPM Contract Schedule. Determine percent complete for cost-loaded activities as follows: For design activities the Contractor will prepare and the Authority will accept a schedule of values for said Work. For activities loaded with Contract unit quantities, calculate percent complete by dividing units of Work in place by total units of Work forecast. For activities loaded with lump sum costs, calculate percent complete by estimating percent of Work in place. Only activities representing physical progress (Work in place) will be included in physical progress calculation. Physical costs will be used as a basis for physical progress measurement and payment.

- B Monthly Pay Estimate submission, showing updated activity, resource and cost data in accordance with requirements of this Section, and General Provisions Invoicing And Payment will be the basis upon which progress payments and requests are reviewed for acceptance by the Authority. The start of the 30-day progress payment cycle will not begin until the Contractor has submitted an updated Current CPM Contract Schedule and the Payment Application has been signed by the Contractor and accepted by the Authority.

4.2 Measurement

The Work of this Section 01310 will not be measured as separate unit.

4.3 Payment

- A. Payment will be made under:

The Work for this Section 01310 will be reimburseable costs included and paid for from the Professional Services Allowance as described in General Provisions Section 9.

Section 01310 - TABLE 1
SUBMITTAL FREQUENCY OF REQUIRED PROJECT CONTROL DOCUMENTS

REPORTING FREQUENCY AFTER NTP OR AS SPECIFIED*

Description of Schedule or Report	Within 14 Calendar Days	Within 30 Calendar Days	Within 45 Calendar Days	Updated Monthly***
1. Early Work 120 day schedule	X*			X
2. Partial Schedule of values	X*		X*	
3. Baseline CPM Contract Schedule			X*	
4. Current CPM Contract Schedule				X
5. Equipment Schedule			X*	X
6. Three Week Rolling Bar Chart Schedule**			X	
7. As-Built Schedules and Reports		30 days after final completion		

• After Notice of Award where indicated.

** Submit three Week Rolling Schedule on a weekly basis.

*** To be determined by the Authority.

END OF SECTION