

Sample CPM Specification: A Guideline for Preparing Your Own Specification

This 8th edition is taking a new approach to writing a sample specification. Previous editions included language and layout similar to those found in many federal, state, municipal, and even private guideline specifications. The reader may access the 7th edition Appendix A Guideline Specification in our on-line content (see Appendix for details.)

One of our goals with this 8th edition is to consider the current state of computer hardware and software and upgrade the methods used by the industry to utilize the additional power not available in the 1950s or even in the 2000s. As one author was taught in law school back in the late 1970s (not that long ago), a trucking company is responsible for an accident by one of its drivers *on the route instructed to be used*. But if the driver leaves the mandated highway to visit a favored bar a few miles off course, and thus is *on a private lark*, the company may avoid liability *so long as it takes reasonable steps to enforce its mandates*. Back in the 1970s such enforcement was difficult. But today, it is possible to attach a GPS tracker to the truck, perhaps even to report its location in real time. And because it is possible it is now necessary—a company not tracking its trucks and then not taking reasonable steps to detect and thwart that private lark cannot hope to escape liability. Similarly, use of a specification based on technologies of the 1950s and failure to use the power of the computer hardware and software of the 2010s may lead to liability of the errant engineer for the avoidable consequential damages that may then occur.

Therefore the authors are introducing several possibly controversial concepts to this sample CPM specification. The first relates to format and layout: we want the CPM specification to relate to preparation and submittal of the CPM submittal and not to dabble in additional instructions best included in the section on payments, coordination, or change management. These sections of the specification instruct the contractor “how to” perform. The CPM specification then is limited to preparation of the initial CPM logic plan and calculated schedule, updates, and revisions, all of which may be used to support payment, coordination, and change management.

Second, while the 7th edition and earlier editions discussed the concept of risk, and even the first edition instructed, “If you need a 12-month completion, set your CPM goal at about 11 months, and so forth,” until very recently software (and supporting hardware) to calculate this necessary contingency or factor of safety has been extremely expensive. Today there are a host of CPM products and add-on products that will calculate the probability of a specific project completing on-time and projecting a 50, 80, or 90 percent, or user-selected probable completion date. Stated crudely, one should shoot to where the duck is flying and not at where it appears in the sky. And so this sample specification requires use of built-in or added risk software to require the contractor to prepare a CPM not just to meet the contract deadline, but to have an 80 percent probability of success.

Third, while the 7th edition and earlier editions discussed the importance of distinguishing cost and schedule data, and that the primary purpose of requesting cost data in a CPM specification should be to help validate durations and perhaps to review a general estimate of total cost drawdown against both early and late completions (creating a double S-curve of cost), such rough estimates are not good enough for earned value management (EVM) or accounting purposes. A recent discussion paper of the GAO (U.S. Government Accountability Office) suggests the possible need to split some and merge other activities of a CPM to better support the EVM analysis. We believe the result may be a degraded CPM product providing false data to the EVM analysis. Therefore the authors here suggest that (1) “cost loading” of the CPM not total to the contract amount and (2) overheads and other general conditions unrelated to specific production activities not be included in the CPM cost model but rather only in a separate EVM and payment system. We thus avoid the issue of whether to create false “hammock” activities for “cleaning job trailers,” “insurance” and such, or to prorate and spread such costs among production activities. The month when a \$1,000,000 device is rigged into place does not have greater costs for cleaning the

job trailer, and the contractor is still required to pay monthly insurance and other costs during a specified quiet period. It is best to require proper cost loading for activities chosen to best support the CPM logic network, then export to a separate EVM and Payment database where activities may be split or merged and overheads separately itemized for a robust EVM program.

The use of RDM is only briefly and parenthetically mentioned. While currently marketed software products do not support the RDM format directly, this text is not expected to be updated for several years. However, several of the attributes of RDM are incorporated to facilitate better project control on behalf of the contractor and forensic analysis, should the project experience potential claims of disruption or delay. Chief among these is the requirement of the tabular listing of predecessors and successors including a column (or field) representing whether the restraint is physical (required to perform the successor activity) or merely crew or resource or otherwise preferentially based. This requirement has been incorporated to specifications written by the authors to both check for “physical” open ends and better analyze the impact of causative events.

Initially, the submitted CPM plan (after entry to schedule software) is copied to a duplicate file. The list of restraints not coded as physical (and thus being resource based) is then deleted from this duplicate either via a batch file or manually. The resultant network is then “scheduled,” and the open-end diagnostic is again reviewed. Any work previously preceded by only a resource-based restraint will now be listed as an open end without a predecessor. The contractor may then be notified to correct these issues.

The reader will see other changes and suggestions in this sample CPM specification. Comments are interspersed in italics as to the reasons why.

30.1 PROJECT CPM LOGIC PLANS, SCHEDULES, AND REPORTS

This is the primary specification for CPM. Under the old five-digit Masterformat classification, it was often cited as Section 01310. The new six-digit classification is typically 01 32 00. Please consider the several major changes to an approach to a specification for a project plan and schedule suggested here. The sample specification previously provided with this text may be found at the text website <http://www.cpmconstructionmanagement.com/>.

**SECTION 01 32 00
PROJECT CPM LOGIC PLANS, SCHEDULES, AND REPORTS**

PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.1.2 This Section is cited in other Division-1 Specification Sections including but not limited to:

003113 PRELIMINARY SCHEDULE
012600 CONTRACT MODIFICATION PROCEDURES
012900 PAYMENT PROCEDURES
013100 PROJECT MANAGEMENT AND COORDINATION
013300 SUBMITTAL PROCEDURES

Commentary: Throughout this sample specification will be references to move subsections to other Sections. The title and purpose of this Section is to prepare and submit a report or "shop drawing" and not to specify actions to be taken. Thus various subsections in previous editions (and many other published specifications) which proscribe actions should be moved to those Sections as noted above.

1.2 SUMMARY

1.2.1 General Scope and Definitions

1.2.1.1 This Section specifies administrative and procedural requirements for preparation and reporting of Contractor's preferred sequence of construction of the Work and other possible sequences of construction of the Work, for monitoring and reporting of actual performance of the Work, for incorporation of changes and unexpected events for determination of possible impact to the timely completion of the Work, and for determination of means and method necessary for timely completion of performance of the Work.

1.2.1.2 Definitions and formats within this Section shall be in general conformance with the latest edition of *CPM in Construction Management*, by James J. O'Brien and Fredric L. Plotnick, McGraw-Hill, hereinafter referenced as the "Reference Text."

1.2.2 General Description of Deliverables

1.2.2.1 Contractor shall, in the format and detail specified in this section, prepare and provide:

- A CPM logic network of its overall plan of its intended execution of performance

- Calculated schedules of dates for the activities of the initial plan
- A narrative report supporting the logic, durations, and other features of the initial plan
- Periodic reporting of its short-term schedule to effectuate the overall plan
- Periodic reporting of actual performance of efforts to effectuate the overall plan
- Calculated updated schedules of dates for the activities of the current plan including to-date actual performance
- Narrative reports supporting the updated schedules and implications of deviation from prior reports
- Revisions to the overall plan as may be necessitated by actual or projected performance or events, demanded by the Program Manager, or requested by the Contractor
- Narrative reports supporting the logic, durations, and other features of a revision
- Other reports, analyses, and narratives as may be deemed desirable by the Program Manager to facilitate the purpose of this Section

1.2.3 Purpose of the Plan and Schedule

1.2.3.1 The purpose of the required submittals is that the Contractor shall:

- Provide additional assurance by the Contractor of its adequate planning, scheduling, and reporting during the execution of the construction and related activities so they may be prosecuted in an orderly and expeditious manner, within the Contract time and the milestones stipulated herein.

Note specification of dates or days of Contract commencement and completion of work, including but not limited to access (complete or partial), final, and substantial; and intermediate milestones are typically provided in the primary Contract and not within Specifications.

- Provide additional assurance by the Contractor of the coordination of the work of the Contractor and the various Subcontractors and suppliers at all tiers
- Assist the Program Manager in monitoring the progress of the work
Users of this Guide Specification may choose to globally replace “Program Manager” with “Contracting Officer,” “Resident Engineer,” or other named person.

- Assist the Program Manager in evaluating the Contractor's monthly progress payments requests
- Assist the Program Manager in evaluating the potential impact of proposed changes to the Contract
- Assist and be utilized by the Contractor in the coordination of its forces, subcontractors, and vendors
- Assist both Program Manager and Contractor in detecting problems for the purpose of taking timely corrective action and to provide a mechanism or tool for determining and monitoring such corrective actions

Inclusion of use by the Contractor for its own benefit may be more hoped for than mandated, but does inform and set limits to the Program Manager on demands which may reduce the usefulness of the Schedule for such purposes.

PART 2 PRODUCTS

2.1 CPM PLAN AND SCHEDULE SUBMITTALS

2.1.1 Required Initial CPM Plan and Schedules

2.1.1.1 Contractor shall develop and maintain an overall plan of its intended execution of performance (hereinafter referred to as Initial Plan). The Initial Plan shall faithfully reflect the Contractor's intended means, methods, and plan of execution relating to sequence and time frame for performance of Contractor's obligations.

2.1.1.2 Contractor shall prepare and submit a Logic Network Diagram in the CPM (Critical Path Method) format as in the Reference Text. Submittal may be hand-drafted or computer-assisted drafted and shall be provided on D-size media (defined as 22 × 34 in) or as approved by the Program Manager. Contractor shall provide six (6) copies of the Logic Network Diagram. (Note whether specified CAD format is desired.)

This element of the Specification, a hallmark of specifications of the 1960s through 1990s, provides a means for a reviewer to examine the validity of the underlying logic of the CPM. While this requirement fell out of favor when the predominant software provider dropped support of its computer-assisted drafting of logic, such support has largely been restored, and the pure logic diagram is still the best means of review.

2.1.1.3 Contractor shall prepare and submit schedules of early and late dates calculated by the CPM methodology (hereafter referred to as the CPM Schedule), as provided in the Reference Text, and modifying the Logic Plan as necessary that such calculation indicates an 80 percent or higher expectation

of completion of Contractual Milestones, Substantial Completion, and Final Completion. Contractor shall use an Optimistic Duration of –15 percent and Pessimistic Duration of +20 percent of the Most Likely Estimated Duration provided in the Logic Network Diagram except as may be further explained in its Narrative.

This is a key element of the Specification. To provide further assurance that the Contractor can (and hopefully will) meet contract deadlines, it is desired to “shoot to where the duck is flying and not to where it now is in the air.” For an extremely important deadline, a 90 percent or higher expectation may be specified; however this may increase cost and will generally result in a project completed ahead of the deadline, should more than reasonable contingencies not be required.

2.1.1.4 If Contractor does not intend to field sufficient resources to generally perform to the early start dates of the schedule calculated in 2.1.1.3, Contractor shall prepare and provide a schedule of anticipated start (hereinafter referred to as “VS”) and anticipated finish (hereinafter referred to as “VF”) dates of intended performance between the calculated early and late dates (hereinafter referred to as Performance Schedule). Contractor may make such determinations by use of a leveling routine of its CPM software or manually.

This element of the Specification distinguishes the Contractor’s chosen or preferred schedule from the CPM schedule. The Performance Schedule is in some cases referred to as a resource-leveled or resource-smoothed schedule. The CPM requirement of the CPM schedule is to provide further assurance that the Contractor can meet contract deadlines while this Section provides a “shop drawing” of the contractor’s intended means and methods to effectuate its “plan of execution.”

2.1.1.5 Contractor shall prepare and submit a tabular listing of each activity, including:

- Unique activity identification designator (“Activity Number”)
- Short description in 48 or fewer characters
- Most likely estimate of duration
- Optimistic estimate of duration (*note in Narrative if not –15 percent)
- Pessimistic estimate of duration (*note in Narrative of not +20 percent)
- Calendar or other basis of duration
- Code information as specified in Section 2.2.4
- Calculated early-start (ES) date and early-finish (EF) dates

- Calculated late-start (LS) and late-finish (LF) dates
- Calculated or Contractor selected anticipated start (VS) and anticipated finish (VF) dates
- Calculated total float

2.1.1.6 Contractor shall prepare and submit a tabular listing of each restraint between two activities, including:

- Predecessor activity
- Successor activity
- Code specifying restraint as finish-to-start, start-to-start, finish-to-finish, or other connection
- Duration of the restraint
- Calendar of duration of the restraint
- Code, if start-to-start, specifying whether duration is from date predecessor started or from completion of partial performance of predecessor activity
- Code, if finish-to-finish, specifying whether duration is from date predecessor started or reserved remaining duration of successor
- Designation of purpose of the restraint as driven by physical, resource, or contract considerations
- Contract drawing showing scope for both activities if restraint driven by physical consideration
- Contract specification section if restraint driven by contract consideration
- Driving resource if restraint driven by resource consideration
- Short description of purpose of restraint if not obvious

Note that most software does not support the Performed-to-Start (sometimes called Volume) restraint, but here the Contractor may designate that is what was meant.

2.1.1.7 Contractor shall prepare and submit a written narrative (“Narrative”) to further explain the plan as set forth in its CPM logic network and schedule. The narrative shall, at a minimum, include:

- A general summary of the Contractor’s proposed plan to execute the works of the project
- Details of exceptions from standard or default input data
- Details of exceptions from standard or default usage or settings of software
- Other information as directed in subsection 2.2.5 below

2.1.1.8 Contractor shall prepare and submit a time-scaled plot diagram of the Plan and Schedule to include:

- Activities on the critical path
- Activities having up to twenty (20) days of float relative to the critical path
- Activities on alternative critical paths of greater than twenty percent (20 percent) likelihood as calculated using risk software as provided in 2.1.1.3

The time-scaled plot diagram shall at a minimum indicate activity ID, title, duration, and total float. The time-scaled plot diagram shall have the critical path highlighted in red, and activities being the responsibility of other than the Contractor highlighted in a different color or pattern. The time-scaled plot diagram shall be provided on D-size media (defined as 22 × 34 in) or as approved by the Program Manager. Contractor shall provide six (6) copies of the Logic Network Diagram. (Note whether specified CAD format is required.)

2.1.2 Required Periodic Updates of Schedules and Minor Revisions of Logic Plan

2.1.2.1 Contractor shall periodically update the CPM Schedule on a [weekly, bimonthly, monthly] basis (hereafter referred to as the Update).

2.1.2.2 Contractor shall prepare the Update by use of previous Update, using instead the initial schedule of 2.1.1.4 if no prior updates, or latest approved Revision if such has not been subsequently updated. Data to be added to the schedule software file shall be limited to:

- An actual start date for each activity started since the last Update
- An actual finish date for each activity finished since the last Update
- An estimated remaining duration for each activity previously started but not finished since the last Update

Contractor may substitute an estimated schedule percentage complete rather than estimated duration if approved by the Program Manager and on an individual activity basis, then to add reason and substantiation as part of the Update Narrative.

Contractor shall not, as part of an Update, modify original durations, remaining durations of activities not yet started, actual dates of start or finish as previously reported, description or codes of activities, logic restraints between activities, or any other element of the pure logic network utilized in the last Update, initial plan, or revision.

Changes to original durations, remaining durations of activities not yet started, and logic restraints are to be considered Revisions rather than Updates to the Logic Network. Minor changes to description or codes or actual start or finish dates may be permitted if deemed by the Program Manager to be minor corrections of typographic or data input error, but should then be noted in the Narrative. Changes to descriptions or coding which involve a change of scope should be considered a Revision.

Contractor shall provide a tabular listing of all data (hereinafter referred to Input Data) including:

- An actual start date for each activity started since the last Update
- An actual finish date for each activity finished since the last Update
- An estimated remaining duration for each activity previously started but not finished since the last Update
- Calculated percentage of remaining duration to original duration
- If use of an estimated percentage is permitted, then calculate the remaining duration and also provide a narrative column to denote the source of data (such as “measured cubic meters of soil excavated”)
- If demanded by the Program Manager or desired by the Contractor, an additional column to report an estimated cost percentage complete

2.1.2.3 Contractor may also submit with an Update a Minor Revision of the CPM logic network and subsequently calculated schedule to address minor changes to the logic network including:

- A new estimate of original duration of an activity
- A new estimate of restraint lag or duration between activities
- Correction of the spelling or words of an activity description without intending to modify scope
- Correction of an activity description based upon better understanding of the scope
- Correction of preferential or resource-based restraints based upon current conditions and progress

Contractor shall submit such Minor Revision only with and revised from an Update. Contractor shall continue to use the Update as the basis of further Updates unless and until the Minor Revision is Approved by the Program Manager.

The proper procedure relating to periodic evaluation of the status of the project is a two-step process. The first step is to perform an update,

reporting actual starts, finishes, and new estimates of remaining duration of work-in-progress, all to then see the impact of past period performance. Then, and only then, should minor (or major) changes to forward-looking logic (including better definition of scope, durations, and logic) be considered. Authors of this text suggest considering as few revisions as possible, understanding that minor bumps and detours need not then require changes if the intention is to return to the initial plan.

2.1.2.4 Contractor shall analyze the Update, and if applicable the Minor Revision, utilizing the same software used to accomplish 2.1.1.4 and report the calculated likelihood of expectation of completion of Contractual Milestones, Substantial Completion and Final Completion, and dates of each calculated to have an 80 percent likelihood of achievement.

Our primary purpose has been, and continues to be, to provide additional assurance by the Contractor of its adequate planning, scheduling, and reporting during the execution of the construction and related activities so they may be prosecuted in an orderly and expeditious manner, within the Contract time and the milestones stipulated herein.

2.1.2.5 Contractor shall prepare and submit an updated Performance Schedule which shall be between the early and late dates calculated by the Update or Minor Revision. Contractor shall highlight and otherwise report in the Update Narrative if the updated Performance Schedule requires additional resources or requires a major change to resource allocation.

2.1.2.6 Contractor shall prepare and submit a tabular listing of each activity, as in 2.1.1.6.

2.1.2.7 Contractor shall prepare and submit a tabular listing of each restraint between two activities, as in 2.1.1.7. Contractor shall highlight or provide an additional column to denote any changes from last approved Update or Revision. Contractor shall highlight or provide an additional column to denote any restraint which has been ignored by work proceeding out of the anticipated sequence of the logic.

2.1.2.8 Contractor shall prepare and submit a written narrative (“Update Narrative”) to discuss progress during the past period, cause and impact of deviations from the prior update, and a general approach to the future. If an activity or activities have been started prior to finish of predecessor in violation of the current logic network, provide narrative or a tabulation of:

- A short description of why the anticipated logic sequence was not followed
- Whether and if so, why Contractor believes this disruption to be chargeable to the Owner
- Cost, if any, of claimed disruption as may be reasonably be estimated

- If applicable, strategy to return to complete work disrupted
- Other information as directed in subsection 2.1.1.7 above
- Other information as directed in subsection 2.2.5 below

2.1.2.9 Contractor shall prepare and submit each week a short-term operational schedule (hereinafter referred to as Short-Term Schedule) to effectuate the overall plan.

The Short-Term Schedule shall include:

- All activities completed during the past week listing actual start and actual finish dates
- All activities started but not completed as of the Data Date
- All activities which (in accordance with the latest Update) may start within the next 3 weeks
- Additional activities anticipated to be started within the next 3 weeks

The Short-Term Schedules will include data provided in the most recent Update and for each activity therein:

- A list of contract drawings and specifications denoting scope
- Necessary labor, equipment, materials, and other required resources
- Issues of access and access plan, if applicable
- Notice of owner-provided deliverables, materials, and personnel
- Acknowledgment of review for Requests for Information (RFIs) and applicable RFIs encountered
- The most recent anticipated date to start and finish the activity

2.1.3 Required or Requested Revision of the Project Plan

2.1.3.1 Contractor shall develop and submit as a proposal a revision of its overall plan of its intended execution of performance (hereinafter referred to a Revision) if and when directed by the Program Manager. Contractor may develop and submit as a proposal a Revision. The previously approved initial plan or revision shall remain in use unless and until the submitted proposed Revision is accepted by the Program Manager.

2.1.3.2 Contractor shall prepare the Revision by use of previous Update, using instead the initial schedule of 2.1.1.4 if no prior Updates, or latest approved Revision if such has not been subsequently updated. No changes to the previous Update (or Revision) shall be made for activities already performed or to logic between such activities.

2.1.3.3 Requirements for a Revision include all elements required for the Initial Plan. The basis for a Revision shall include all activities and logic of the most recent Update already started, except as noted below, and all activities not yet started, except as noted below. Exceptions include:

- Activities which have been previously skipped over with subsequent work, then performed out of sequence shall have description modified to begin with “skipped” and duration changed to zero. Such activities shall be duplicated with a new identification after the Revision Data Date in accordance with revised logic.
- Activities to be deleted from remaining scope are to be removed from the Revision but noted in the Narrative as a tabular listing of old ID, description, duration, major resources, and other schedule and cost data as requested by the Project Manager.

2.1.3.4 Contractor shall analyze the Update, and if applicable the Minor Revision, utilizing the same software used to accomplish 2.1.1.4 and report the calculated likelihood of expectation of completion of Contractual Milestones, Substantial Completion and Final Completion, and dates of each calculated to have an 80 percent likelihood of achievement.

Our primary purpose has been, and continues to be, to provide additional assurance by the Contractor of its adequate planning, scheduling, and reporting during the execution of the construction and related activities so they may be prosecuted in an orderly and expeditious manner, within the Contract time and the milestones stipulated herein.

2.1.3.5 Contractor shall prepare and submit an updated Performance Schedule which shall be between the early and late dates calculated by the Update or Minor Revision. Contractor shall highlight and otherwise report in the Update Narrative if the updated Performance Schedule requires additional resources or requires a major change to resource allocation.

2.1.3.6 Contractor shall prepare and submit a tabular listing of each activity, as in 2.1.1.6.

2.1.3.7 Contractor shall prepare and submit a tabular listing of each restraint between two activities, as in 2.1.1.7. Contractor shall highlight or provide an additional column to denote any changes from last approved Update or Revision. Contractor shall highlight or provide an additional column to denote any restraint which has been ignored by work proceeding out of the anticipated sequence of the logic.

2.1.3.8 Contractor shall prepare and submit a written narrative (“Update Narrative”) to discuss progress during the past period, cause and impact of

deviations from the prior update, and a general approach to the future. If an activity or activities have been started prior to finish of predecessor in violation of the current logic network, provide narrative or a tabulation of:

- A short description of why the anticipated logic sequence was not followed
- Whether and if so, why Contractor believes this disruption to be chargeable to the Owner
- Cost, if any, of claimed disruption as may be reasonably be estimated
- If applicable, strategy to return to complete work disrupted
- Other information as directed in subsection 2.1.1.7 above
- Other information as directed in subsection 2.2.5 below

2.2 TECHNICAL REQUIREMENTS OF SUBMITTED PLANS AND SCHEDULES

2.2.1 Technical Requirements of Submitted Logic Networks

2.2.1.1 The CPM Logic Network, as defined in 2.1.1.1, shall be developed utilizing the Precedence Diagramming Method (PDM) or Relationship Diagramming Method (RDM) format.

Other logic network formats, such as the original arrow diagramming method (ADM) or Project Evaluation Review Technique (PERT), both circa 1956 TO 1958, should not be used unless the Program Manager has access to one of the few software products that still support these formats. Reference to the RDM format may be deleted as it is currently not fully supported by software; however an RDM format logic network may be entered to a PDM format software product, and it is here included as this text and specification is expected to be used for at least 5 years before the next edition is written.

2.2.1.2 Development of the logic of the CPM Logic Network shall generally be in accordance with the principles as set forth in the Reference Text, except that in case of conflict, the provisions of these Contract Documents shall govern. Each activity shall be preceded by another activity, other than a designated first activity such as Notice-to-Proceed or other as designated within this Contract or approved by the Program Manager. Each activity shall be succeeded by another activity other than a designated last activity such as Final Completion or other as designated within this Contract or approved by the Program Manager. The foregoing shall be read modified as appropriate for multiple “first” or “last” activities by this Contract, such as required for multiple dates providing access or intermediate deliverables or other milestones.

2.2.2 Technical Requirements of Submitted Calculated Schedules

2.2.2.1 The CPM Schedule, as defined in 2.1.1.2, shall be calculated utilizing computer software generally following the algorithms discussed in the

Reference Text. Contractor shall provide all necessary data, in a computer-readable format acceptable to the Program Manager, so that the Program Manager or designee thereof may duplicate the calculations.

Software which has been reviewed and preapproved includes:

- Oracle Primavera P3
- Oracle Primavera P6
- Primavera Risk Analysis (previously marketed as Pertmaster)
- Deltek Open Plan
- Deltek Acumen
- Phoenix Program Manager
- Asta Powerproject
- Spider Project
- MicroPlanner X-Pert

Or other equal software may be submitted pursuant to Section 012500 “Or Equal” Provisions. Settings of Options within the selected software will be discussed and specified by the Program Manager during the preconstruction conference meeting depending upon the product selected.

Note a variety of software products are listed in this Guideline Specification. It is recommended that at least three choices be available. Note that there may exist issues with schedule algorithm options (such as “set for retained logic and not progress override,” “calculate start-to-start lag from early start and not actual start,” “schedule durations as interruptible and not contiguous,” “show open ends as critical,” and “calculate the total float as the most critical.” As these features vary from product to product and from release to release of a single product, it is probably wise to leave such settings to discussion and selection during the preconstruction conference meeting.

2.2.2.2 Risk analysis of the CPM Schedule to meet or exceed the percentile expectation provided in 2.1.1.3 shall be calculated utilizing computer software generally following the algorithms discussed in the Reference Text. The default envelope of risk associated with an activity duration shall be between 15 percent below to 20 percent above the estimated original duration provided, except as may be explained in the Narrative and subject to the Program Manager’s reasonable review. Software which has been reviewed and preapproved includes Oracle Primavera Risk Analysis (previously marketed as Pertmaster), Deltek Open Plan, Deltek Acumen Risk, Barbecana Full Monte, Risky Project, Polaris; or other equal software may be submitted pursuant to Section 012500 “Or Equal” Provisions. Settings of Options within the selected software will be discussed and specified by the Program Manager during the preconstruction conference meeting depending upon the product selected.

2.2.2.3 The Performance Schedule, as defined in 2.1.1.4, shall be based upon the most recent update of the CPM Schedule, and Contractor shall verify all dates of anticipated start (VS) are on or after the calculated early-start (ES) dates, and all dates of anticipated finish (VF) are before or on the calculated late finish (LF) dates.

2.2.3 Required Level of Detail and Durations

2.2.3.1 The level of detail of the Schedule shall be a function of the complexity of the work involved. The level of detail and total number of activities shall be subject to approval by the Program Manager. No construction activity shall have duration of longer than fifteen (15) workdays without prior acceptance of the Program Manager. Nonconstruction activities (such as procurement and fabrication) may have duration in excess of fifteen (15) workdays.

2.2.3.2 Activity descriptions shall be unique. Activity descriptions shall be clear and concise. The beginning and end of each activity shall be readily verifiable. Activity descriptions shall be augmented as necessary, by means of code fields, logs, notes, or links to the activity record, to provide a full understanding of scope to be performed, comprehensible to an individual who has not participated in preparation of the initial plan and schedule. Activity description shall be understood to include requirement of completion of predecessor activities (or partial completion where overlap logic is utilized) before commencement. Activity description shall be understood to include completion of activity (or partial completion where overlap logic is utilized) before commencement (or completion where overlap logic is utilized) of successor activities.

2.2.3.3 Normal weather conditions shall be considered and included in the planning and scheduling of all work influenced by high or low ambient temperatures and/or precipitation to ensure completion of all work within the Contract Time. Normal weather conditions shall be determined by an assessment of average historical climatic conditions based upon the preceding ten (10) year records published for the locality by the National Oceanic and Atmospheric Administration (NOAA).

Note the code requirement for seasonal basis of duration, then allowing global adjustments, should work be significantly deferred by changes or other cause.

2.2.3.4 Proposed duration assigned to each activity shall be the Contractor's best estimate of time required to complete the activity considering the scope and resources planned for the activity. Contractor, upon request, shall provide narrative explanation and substantiating data to support proposed durations.

See also subsections 2.4.11–12 below; reviewer should request explanation if activities of similar scope report differing rates of anticipated productivity based upon duration/quantity.

2.2.3.5 The Schedule shall be developed utilizing activities of specified duration of whole days between one (1) and fifteen (15) working days. Working days are defined as on a 5 day per week calendar, less recognized holidays as provided by the Program Manager, unless otherwise explained in the Narrative of Section 2.2.5. Use of multiple calendars [is] [is not] permitted (only upon separate submission to and approval by the Program Manager, then to be explained and included in the Narrative). Use of resource-based calendars [is] [is not] permitted (only upon separate submission to and approval by the Program Manager, then to be explained and included in the Narrative). Milestones or other zero duration activities, except to indicate milestones set forth in this Specification, [are] [are not] permitted (only upon separate submission to and approval by the Program Manager, then to be explained and included in the Narrative).

Definition and control of “duration” are subject to a number of considerations:

- *The maximum duration is idealized to a weekly update period. For a bimonthly update period, twenty (20) working days may be permitted; for a monthly update period, thirty (30) working days may be permitted.*
- *Inclusion in the CPM schedule software algorithm of contractor holidays beyond that of the Contract documents (such as “hunting week”) may be considered as providing a more realistic schedule (and obviously noting in advance to the owner no need for inspections during extra holidays) but should also then be considered in the Contract Modification Procedures or other “claims” sections of this Specification.*
- *Use of multiple calendars may be considered as providing a more realistic schedule but must be understood to degrade the value of the total float calculation. (A “critical path” moving through a concrete pour which completes on a Saturday of a 7-day calendar, then followed by next work to begin on Monday of a 5-day calendar will perhaps calculate the float following at zero but before as 1 day. Should this occur more than once in the network, the “critical path” will be calculated as 2 or more days of float at the start of the project.)*
- *Use of resource calendars may create additional complexity.*
- *Use of Milestones or other zero duration activities may be considered as providing a more realistic and useful schedule but should also then be carefully reviewed for unintended logic and be considered in the Contract Modification Procedures or other claims sections of this Specification.*
- *Where an expected finish constraint or other means to enter a date are to be used to calculate duration, care must be taken to require periodic confirmation or further assurance from the party responsible for performance or delivery.*

2.2.4 Required Minimum Coding of Activities, Resources, and Costs

2.2.4.1 To assist in review of and to better define the scope of an activity and basis for estimation of duration, each activity shall be identified with unique codes of one code per activity, including as a minimum:

- The responsible party for performance of the Work at the Contract level to include Owner, Contractor, other entities reporting directly to Owner, and other entities reporting neither to Owner nor to Contractor.
- Where work is to be subcontracted, the subcontractor to be responsible for the Work to include entities reporting directly or indirectly to Contractor. *Optionally, the Architect, Engineer, other consultants and subconsultants to the Owner may be listed in this Code field.*
- The size, craft, and composition of the labor crew performing the Work and estimation of duration provided. Contractor shall provide a dictionary of crew codes utilized, including but not limited to the craft composition of the crew, and additional crafts utilized on a part-time or shared basis with other crews and not counted in the size code. The size code shall be readable as a numeric field of two digits (00 to 99). *The purpose of these fields is to provide validation for the duration estimate and not to perfectly add up to the total worker-days, worker-hours, or cost for the project. In practice, such a total should approximate the total within 5 percent or create an alert for further review.*
- The total worker-hours estimated for performing the Work and estimation of duration provided, readable as a numeric field of four digits (0000 to 9999). *This separate listing of worker-hours should approximate that of the size and crew codes times duration days times hours per day, and the total should more closely match the total worker-hours by subcontract or craft.*
- The major equipment to be used for performance of the Work and estimation of duration provided. Contractor shall provide a dictionary of codes utilized, including but not limited to the type and size of equipment. Contractor may provide an additional code if multiple items of major equipment are utilized.
- The total number of hours in a workday for this activity including all shifts for performance of the Work and estimation of duration provided.
- The climate or weather season, if applicable, upon which duration estimate is based.
- The contract drawing number or specification section where the Work is best portrayed, designated as the DWG1 code. Contractor may provide additional drawing codes to be designated, for example, as DWG2, DWG3,

as deemed necessary to further describe and define the scope of work of the activity.

- Location of the Work, designated as the LOC1 code. Contractor may provide additional location codes to be designated as, for example, LOC2, LOC3, as deemed necessary to further describe and define the scope of work of the activity. Contractor shall provide a dictionary of LOC1 (and similar) codes utilized, including but not limited to Building, Floor, and Quadrant for vertical work such as where the work includes one or more structures, Milestone and Offset for linear work such as a roadway, or otherwise as deemed necessary to further describe and define the scope of work of the activity.
- The primary CSI classification associated with the Work, designated as the CSI code.
- Include if this Specification incorporates a Schedule of Values: The primary Schedule of Values associated with the Work. Contractor may provide an additional code if multiple entries from the Schedule of Values are included in this scope of work.
- The quantity of work and units in which work may be measured and reported. Contractor shall provide a dictionary of codes utilized. The quantity code shall be readable as a numeric field of five digits (00000 to 99999), and the quantity units code shall be chosen to allow proper recording and use in calculating productivity.
- The anticipated productivity of quantity per day and by worker-hour. Contractor shall calculate data for the productivity-per-day code by dividing quantity by remaining duration, and for the productivity-per-worker-hour code by dividing quantity by total worker-hours as required above. *Recognize the productivity-per-day code will be based upon remaining duration being equal to original duration with the initial submittals, but will possibly diverge during subsequent updates. Thus both productivity per day and productivity per worker-hour will assist to validate initially submitted estimated durations, while productivity per day will also be useful to determine validity of remaining durations during execution of the project.*

2.2.4.2 To assist in review of and to better define the scope of an activity, basis for estimation of duration, and determination of maximum potential utilization of resources, each activity shall be identified with one or more codes for resources utilized, including as a minimum:

- Contractor shall provide a dictionary of workface and major construction equipment resource codes utilized. Codes provided shall be at least as extensive as those used in Section 2.2.4.1. If the Contractor is utilizing

software that supports both Normal and Maximum limits of anticipated of total usage, the Contractor shall set the Normal level of resource usage as not less than that required to perform the project in a timely manner, and shall set the Maximum level of resource usage as not less than 150 percent of the Normal level of resource usage.

2.2.4.3 To assist in better defining the scope of an activity, basis for estimation of duration, and determination of maximum potential cash flow, each activity shall be identified with one or more cost codes, including as a minimum:

- Contractor shall provide a dictionary of costs codes (also herein to be referred to as Cost Account Numbers) relating to its expenditures for performance of the Work. Cost Account Numbers provided shall be at least as extensive as those in Contractor's Bid Estimate. Cost Codes shall be divided into four or more Cost Categories including "Labor," "Equipment," "Materials," "Subcontracted," and "Specific Overheads." Each of the Cost Account Numbers shall be of a detail capable of being combined to subtotal upon one item of the Schedule of Values.

2.2.4.4 To assist in better defining the scope of an activity, basis for estimation of duration, and determination of maximum potential cash flow, Contractor shall provide an estimated cost breakdown to be associated with each activity, including as a minimum:

- The assigned dollar value (also herein to be referred to as cost loading) of each activity shall be coded against one or more Cost Category and Cost Account Number. Cost Account Numbers shall be the same as line items in the Schedule of Values. Cost categories shall include Labor, Equipment, Materials, and Subcontracted. The assigned dollar value (cost loading) for each cost account for each activity shall cumulatively equal the Total Contract Amount assigned for each respective line item in the Schedule of Values.
- The assigned dollar value (cost loading) for the labor category shall cumulatively approximate the total labor worker-hours times the average cost per worker-hour plus a reasonable percentage for direct overhead but shall exclude indirect overhead and profit.
- The assigned dollar value (cost loading) for the equipment shall cumulatively approximate the total reasonable rental value for such equipment plus a reasonable percentage for direct overhead but shall exclude indirect overhead and profit.
- The assigned dollar value (cost loading) for the material category shall cumulatively approximate the total reasonable cost for materials plus a reasonable percentage for direct overhead but shall exclude indirect overhead and profit.

- The assigned dollar value (cost loading) for the subcontracted category shall cumulatively approximate the total labor worker-hours for subcontracted work times the average cost per worker-hour plus a reasonable percentage for direct overhead but shall exclude indirect overhead and profit. If requested by the Program Manager, the Contractor shall furnish either the total subcontracted cost of selected subcontractor(s) or a breakdown by such subcontractor(s) of labor, equipment, and material cost.

The purpose of cost loading of the CPM is to further assist in validation of scope and durations and it should not be mixed with indirect overheads or profit. This tabulation of direct costs may then be used for building a proper Schedule of Value for the purpose of progress payments, adding indirect overhead and profit as well as non-activity-based scope such as bonds, insurance, and other general conditions.

2.2.5 Required Minimum Elements of Narrative

2.2.5.1 Contractor shall prepare and provide a written narrative to further explain the initial plan as set forth in its CPM logic network and schedule. The narrative shall, at a minimum, include:

- A general summary of the Contractor's proposed plan to execute the works of the project
- An explanation of the format of activity descriptions including standard abbreviations used
- A list of the responsible parties for performance of the Work designated by the RESP code
- A list of the subcontractors to be utilized for performance of the Work designated by the SUBC code
- A list of the standard crews for performance of the Work designated by the CREW code including typical size and composition of each crew
- A list of the equipment to be utilized for performance of the Work designated by the EQIP code and whether such equipment is anticipated to be owned by the Contractor or leased
- A list of the contract drawings individually reviewed by the team preparing the CPM logic network
- A list of Requests for Information (RFIs) instigated based upon review of said contract drawings
- A diagram or map, and text to explain the location codes incorporated in 2.4.1.8

- A general summary of the Contractor's plan for staffing of the project including anticipated total workforce per month for direct hire and for subcontractor forces
- A list of the major items of construction equipment intended for use on this Contract's operations including types, number of units, unit capacities, and the proposed time each piece of equipment will be on the job, keyed to the activities on which the equipment will be used
- If requested by the Program Manager, the Contractor shall include in its written narrative the Contractor's determination of duration for critical, near-critical, and other specified activities. Such explanation shall include the number of crews, crew composition, number of shifts per day, number of hours in a shift, and the number of workdays per week.

2.2.5.2 Contractor shall prepare and provide a written narrative with each update to further explain the consistency or variance with the initial plan and prior updates and revisions. The narrative shall, at a minimum, include:

- A general summary of any changes to the Contractor's proposed plan to execute the works of the project
- A general summary of actual progress if differing from the Contractor's proposed plan to execute the works of the project, specifically noting reasons for such variation
- Identification and discussion of out-of-sequence work including reason for variation from proposed plan
- A list of the subcontractors utilized during this past period of performance
- A list of the standard crews utilized during this past period of performance, including typical size and composition of each crew
- A list of the equipment utilized during this past period of performance
- A list of the contract drawings individually reviewed by the team preparing the CPM logic network
- A list of Requests for Information (RFIs) instigated during this past period of performance
- A list of Requests for Information (RFIs) resolved during this past period of performance
- A list of Requests for Information (RFIs) previously reported but unresolved during this past period of performance

PART 3 EXECUTION

3.1 SUBMITTAL OF BASELINE PLAN AND SCHEDULE

3.1.1 Within twenty (20) working [(30) calendar] days following Notice to Proceed, Contractor shall submit to the Program Manager the Required Initial Plan and Schedules as described in Section 2.1.1.

It is important to keep this period as short as possible. If there is an extended period between award and Notice to Proceed with access to begin work, there may be advantage to requiring the CPM submittals prior to beginning work.

3.1.2 Within five (5) working days of receipt of submittals of Section 3.1.1, the Program Manager will provide either an Approval or Rejection of the format of submittal. If it is rejected, the Program Manager will provide a list of specific deficiencies to be addressed and referenced to specific subsections of Part 2 of this Specification. If it is rejected, the Contractor shall revise to correct deficiencies and resubmit within five (5) working days to repeat this review cycle of this Subsection.

3.1.3 Within twenty (20) working days of receipt of submittals of Section 3.1.1, or fifteen (15) working days after Approval per 3.3.2 above, whichever is less, the Program Manager will provide an Approval, Rejection, or Request for Additional Information relating to all other issues than the format of the submittal. Contractor shall respond to provide Additional Information or revise to correct deficiencies within five (5) working days. Subsequent cycles of review and response are to be within five (5) working days each.

3.1.4 If the Contractor believes the Program Manager has improperly rejected a submittal, Contractor shall notify the Program Manager of its disagreement within five (5) working days in writing, and then shall use the rejected submittal as the basis for further actions, including updates and revisions, until the Baseline Plan and Schedule have been Approved.

3.2 SUBMITTAL OF PERIODIC UPDATES

3.2.1 Contractor shall submit periodic Updates to the CPM Schedule and Short-Term Schedule as described in Section 2.1.2 on a [weekly, bimonthly, monthly] basis, on a [day or date] as directed by the Program Manager.

3.2.2 Within three (3) working days of receipt of submittals of Section 3.2.2, the Program Manager will provide an Approval, Rejection, or Request for Additional Information relating to all issues of the submittal including both format and content. *If weekly updates:* Contractor shall respond with next Update to issues of format, corrections of actual dates, and estimates of remaining duration (if applicable) and note all corrections

in the included Narrative. *If other than weekly updates:* Contractor shall respond to provide Additional Information or revise to correct deficiencies within five (5) working days. Subsequent cycles of review and response are to be within five (5) working days each but not to extend beyond the next scheduled Update.

3.2.3 Program Manager may assess a penalty up to \$1000 per Update for repeated or deemed intentional failure to provide a proper Update submittal; this is to be deemed as liquidated damages for the loss of additional assurance of the Contractor's ability to complete the project in a timely manner.

3.3 SUBMITTAL OF REQUIRED REVISION

3.3.1 Within ten (10) working days following demand, Contractor shall submit to the Program Manager the demanded Required Revision as described in Section 2.1.3.

3.3.2 Within five (5) working days of receipt of submittals of Section 3.3.1, the Program Manager will provide either an Approval or a Rejection of the format of submittal. If it is rejected, the Program Manager will provide a list of specific deficiencies to be addressed and referenced to specific subsections of Part 2 of this Specification. If it is rejected, the Contractor shall revise to correct deficiencies and resubmit within five (5) working days to repeat this review cycle of this Subsection.

3.3.3 Within twenty (20) working days of receipt of submittals of Section 3.3.1 the Program Manager will provide an Approval, Rejection, or Request for Additional Information relating to all other issues than the format of the submittal. Contractor shall respond to provide Additional Information or revise to correct deficiencies within five (5) working days. Subsequent cycles of review and response are to be within five (5) working days each.

3.3.4 Program Manager may assess a penalty up to \$1000 per cycle of submittal and review for repeated or deemed intentional failure to provide a proper Revision submittal; this is to be deemed as liquidated damages for the loss of additional assurance of the Contractor's ability to complete the project in a timely manner. Contractor's declaration that it reserves rights for additional compensation to accelerate will not be a basis for rejection.

3.4 SUBMITTAL OF CONTRACTOR REQUEST FOR REVISION

3.4.1 Contractor may submit to the Program Manager a Request for Revision as described in Section 2.1.3.

3.4.2 Within five (5) working days of receipt of submittals of Section 3.3.1, the Program Manager will provide either an Approval or a Rejection of the format of submittal. If it is rejected, the Program Manager will provide a list

of specific deficiencies to be addressed and referenced to specific subsections of Part 2 of this Specification. If it is rejected, the Contractor shall revise to correct deficiencies and resubmit within five (5) working days to repeat this review cycle of this Subsection.

3.4.3 Within twenty (20) working days of receipt of submittals of Section 3.3.1 the Program Manager will provide an Approval, Rejection, or Request for Additional Information relating to all issues other than the format of the submittal. Contractor shall respond to provide Additional Information or revise to correct deficiencies within five (5) working days. Subsequent cycles of review and response are to be within five (5) working days each.

30.2 PROJECT PRELIMINARY SCHEDULE

This Section is new and represents a departure from our previous and most suggested standard specifications which attempt to address all instructions regarding scheduling or CPM in one specification section. Since the purpose of this preliminary schedule differs from that of 01 32 00, being to assist the temporary administration of the project rather than provide assurances that the contractor can complete on time, the authors believe such should be moved to a new Section 01 32 10.

SECTION 01 32 10 PROJECT PRELIMINARY SCHEDULE

PART 1 GENERAL

1.1 RELATED DOCUMENTS

1.1.1 Drawings and General Provisions of Contract, including General and Supplementary Conditions and other Division-1 Specification Sections, apply to this Section.

1.1.2 This Section is cited in other Division-1 Specification Sections including but not limited to:

- 012900 PAYMENT PROCEDURES
- 013100 PROJECT MANAGEMENT AND COORDINATION
- 013200 CPM SCHEDULES AND REPORTS
- 013300 SUBMITTAL PROCEDURES

1.2 SUMMARY

1.2.1 General Scope and Definitions

1.2.1.1 This Section specifies administrative and procedural requirements for preparation and reporting of Contractor's anticipated sequence of

construction of the Work during the period while a full CPM Schedule per Section 013200 is being prepared, submitted, reviewed, and revised until approved.

1.2.1.2 Definitions and formats within this Section shall be in general conformance with the latest edition of *CPM in Construction Management*, by James J. O'Brien and Fredric L. Plotnick, McGraw-Hill, hereinafter referenced as the "Reference Text."

1.2.2 General Description of Deliverables

1.2.2.1 Contractor shall, in the format and detail specified in this section, prepare and provide a "90-Day Schedule" comprised of:

- A detailed plan of its intended execution of performance during the first ninety (90) days of the project
- A detailed schedule of its intended execution of performance during the first ninety (90) days of the project
- A narrative report supporting the logic, durations and other features of the plan of the first ninety (90) days
- Periodic reporting of actual performance upon the 90-Day Schedule
- Periodic reporting of changes to its intended plan and schedule of execution of performance during the first ninety (90) days of the project
- Other reports, analyses, and narratives as may be deemed desirable by the Program Manager to facilitate the purpose of this Section

1.2.3 Purpose of the Preliminary Schedule

1.2.3.1 Provide notice of the Contractor's anticipated actions and sequence of construction of the Work to assist the Program Manager in facilitating proper staffing and support during the period prior to acceptance of the Section 013200 CPM Schedule.

PART 2 PRODUCTS

2.1 PLAN AND SCHEDULE SUBMITTALS

2.1.1 Required Initial 90-Day Plan and Schedules

2.1.1.1 Within five (5) days after Notice to Proceed, and prior to commencement of Work on the site other than mobilization, Contractor shall prepare and submit a list of activities anticipated to be performed within the first ninety (90) days, hereinafter referred to as the "90-Day Schedule."

Matching the purpose, no work requiring the Owner's inspectors should be permitted prior to the Contractor providing its anticipated plan of execution so as to permit the Owner notice of inspection and other staffing needs.

2.1.1.2 The 90-Day Schedule shall cover the following project phases and activities:

- Proposed procurement activities to be accomplished during the first ninety (90) days of the Contract. Procurement activities shall include mobilization, key shop drawing and sample submittals, reviews, and the fabrication and delivery of key and long-lead procurement elements. Indicate planned submittal dates and delivery dates for fabrication and delivery activities.
- Proposed preconstruction activities to be accomplished during the first ninety (90) days of the Contract. Preconstruction activities include mobilization, permits, key submittals required for environmental, safety, and other government and third-party entities as may be necessary to permit the Contractor to perform the Work.
- Proposed construction activities to be accomplished during the first ninety (90) days of the Contract.

2.1.1.3 The 90-Day Schedule submittal shall include:

- A pure logic diagram of the activities and restraints between activities for work anticipated to be performed in the first ninety (90) days, which may be either hand- or machine-drawn. If machine-drawn, activities shall be separated by a minimum of 1 inch horizontally and 0.5 inch vertically. The diagram shall be drawn or plotted on D- or E-size media.
- A tabular list of activity identification, description, anticipated start and finish dates

Notice how the 90-Day Schedule does not require the level of information provided with the full CPM plan and schedule. The purpose here is to assist the Program Manager to administer the project while awaiting the full CPM, and this does not require backup information to support the validity of the full CPM which has the more important purpose of providing additional assurances that the contractor can complete on time.

2.1.1.4 Contractor shall assign an approximate cost to the Proposed Construction Activities and to Summary Activities. If requested by the Program Manager, the Contractor shall furnish a written narrative supporting such approximate costs.

Payments made during this preliminary period and prior to submittal and approval of the full CPM will likely be made from a schedule of values which may then be compared to the suggested costing provided here.

PART 3 EXECUTION

3.1 Contractor shall fulfill the requirements of Part 2 of this Section of the Specifications.

30.3 PROJECT MANAGEMENT AND COORDINATION

A specification following the Masterformat template will usually include a Section 01 31 00 relating to project management and coordination. Note that 01 31 00 comes before 01 32 00. While project coordination may be greatly improved and benefit from the preparation and upkeep of a good CPM logic network and hence the calculated schedule, such management and coordination require so much more. It is the opinion of the authors that these instructions should call for the use of a proper CPM but leave the details of such to a separate section of the specification. This is akin to separating the section on how to paint from that on the qualities of paint to be purchased.

SECTION 01 31 00 PROJECT MANAGEMENT AND COORDINATION

Incorporate into this Section instructions often tacked onto 01 32 00 CPM SCHEDULES AND REPORTS Part 3 Execution. We deliberately begin with Section 3.5, expecting other language to precede.

3.5 USE OF SCHEDULE FOR PROJECT COORDINATION

3.5.1 Weekly Progress Meetings

It is suggested the Program Manager require under this specification a weekly meeting during which, among other topics, progress and issues that may impact progress will be discussed. Pursuant to this general concept the Project Schedule of 013200 should be discussed with emphasis on the current Update and possible Revision.

3.5.1.1 [At the weekly meeting] Contractor shall be prepared to discuss the current status of the Project Schedule, most recent Update and Revision, proposed input to the next Update, and if applicable, proposed input for further Revision. Contractor shall bring current 3-week look-ahead, noting thereupon the dates of actual start and finish of activities performed during this past week as well as the anticipated performance during the next 3 weeks. Contractor shall report work that has been started prior to completion of the logic of the Project Schedule, noting the reason why and anticipated costs if claiming such to be due to disruption caused by the Owner.

3.5.1.2 The Contractor shall mark on this computer-generated bar-chart schedule the choice and timing of those activities it intends to actually perform during the upcoming 3 weeks. The Contractor may add further details to monitor this short interval schedule.

3.5.1.3 A copy of this short interval schedule shall be submitted to the Program Manager.

**3.5.2 Minor Revisions to the Schedule
for Unanticipated Events**

3.5.2.1 If the Contractor and Program Manager agree to a Change Order (CO), such agreement shall include an Impact Analysis and agreement on the acceptance for such impact (in part or whole by each party) and costs for mitigation thereof. In the event that such agreement is not part of the agreement for the price of the Change Order, the Contractor shall treat such Change Order as a directive for purposes of the schedule.

3.5.2.2 If the Contractor believes that a submitted Request For Information (RFI), claimed Change In Conditions (CIC), request to delay or defer work pending a Proposed Change Order (PCO), directive to perform a Change Order (CO), or claimed Constructive Change Order (CCO) may impact its work, the Contractor shall perform an Impact Analysis upon a copy of the most recent "UPDATE" file and submit such to the Program Manager as soon as practicable after determination of such belief. The failure to promptly notify the Program Manager shall be deemed a waiver of any compensation or extension of time due to such cause. Where the parties are in disagreement over the responsibility of the delaying event, the Contractor shall use a description for such which is responsibility-neutral.

3.5.2.3 As part of its Impact Analysis, the Contractor shall suggest means of mitigation including but limited to use of greater resources, modification, or deletion from the logic network of selected restraints and selective overtime.

If the Contractor believes that its efforts to mitigate such impact will entitle it to additional compensation, the Contractor shall submit an estimate of the unmitigated and mitigated impact and cost consequences of each. The failure to provide such a submittal in a timely manner shall be deemed a waiver of any additional compensation.

3.6 MAJOR REVISIONS TO THE SCHEDULE

3.6.1 In the event that, pursuant to a Change Order, a Revised Baseline Schedule is adopted for the work remaining on the project, such revised baseline schedule shall be used as the target for further update to the project.

3.7 RECOVERY SCHEDULE

3.7.1 In the event that the Contractor determines that it can no longer perform according to the schedule, the Contractor shall prepare and submit a Recovery Schedule.

3.7.2 In the event that the Most Recent Update indicates that the project is more than twenty (20) days behind schedule, or that a major subcontractor performing more than ten percent (10 percent) of the labor on the site leaves for any reason without completion of its work, or that a specialty subcontractor employing proprietary means and methods leaves the site for any reason without completion of its work, or the Contractor becomes aware of an anticipated delay of specially ordered materials or equipment calculated to delay the project more than twenty (20) days behind schedule or the Contractor anticipates for any reason that the project is likely to be delayed more than twenty (20) days behind schedule, and upon notice of such to and subsequent request of the Program Manager, the Contractor shall prepare and submit a Recovery Schedule.

3.7.3 The Recovery Schedule submittal may include, without limitation:

3.7.3.1 Revisions to the Original Durations of Activities not yet started, which are to individually be supported with a narrative of the actual productivity to date or increased resources or hours per day to effectuate such.

3.7.3.2 Revisions to the Calendar, including indicating work on Saturdays, Sundays, or holidays, subject to approval by the Program Manager.

3.7.3.3 Splitting of activities to indicate more precise coordination, which are to be individually supported with a narrative of how a portion of the previously indicated activity may now suffice for a successor activity.

3.7.3.4 Revisions to Logic Relationships, deleting restraints based upon limited resources, which are to individually be supported with a narrative indicating the ability and willingness to engage additional resources.

3.7.4 The Recovery Schedule shall be prepared to indicate, where practicable, recovery within 1 month or within ten percent (10 percent) of the remaining duration until the mandated deadlines threatened.

3.7.5 Recovery Schedule Reports submission shall consist of:

3.7.5.1 All reports required for an Update.

3.7.5.2 The pure logic diagram required for the Baseline Schedule submission, highlighted, where practicable, to indicate where the Recovery Schedule differs from the Baseline Schedule.

3.7.6 Where the Recovery Schedule has been ordered by the Program Manager, it shall be submitted within five (5) working days. The Contractor and all parties under its control called to the Initial Schedule Conference shall be prepared to attend, upon forty-eight (48) hours' notice, a Recovery Schedule Meeting which may be called by the Program Manager within the next three (3) to seven (7) working days. The Program Manager may

also request the Contractor's Surety to attend the Recovery Schedule Meeting.

3.7.6.1 If a Recovery Schedule Meeting is called, the parties attending shall provide additional assurances to or revise the proposed Recovery Schedule to the satisfaction of the Program Manager.

3.7.6.2 Once approved by the Program Manager, the Recovery Schedule shall be treated as a Minor Revision to the Schedule or a Major Revision to the Schedule as may be directed by the Program Manager.

3.7.6.3 Once it is approved by the Program Manager, failure by the Contractor to strictly follow the Recovery Schedule until back on schedule shall be deemed a Material Breach of the Contract.

30.4 PAYMENT PROCEDURES

A specification following the Masterformat template will usually include a Section 01 29 00 relating to payment procedures. Note that 01 29 00 comes before 01 32 00. While the payment procedure may dovetail into a cost-loaded CPM, management of a proper payment system will require so much more. Moreover, a proper earned value management (EVM) program will require costing of additional items beyond those included in a proper CPM logic plan, and often even require the splitting or merging of activities of such plan. Adding activities which are nonperformance and nonprocurement, or the splitting or merging of activities other than to mimic instructions to the lowest-level responsible parties (such as forepersons), will degrade the CPM for its intended purpose and ultimately for EVM analyses. It is the opinion of the authors that aspects involving cost loading for the purpose of payment should then be shifted out of 01 32 00 and to 01 29 00.

SECTION 0129 00 PAYMENT PROCEDURES

Incorporate into this Section instructions often tacked onto 013200 CPM SCHEDULES AND REPORTS Part 3 Execution. We deliberately begin with Section 3.5, expecting other language to precede.

3.5 ENFORCEMENT OF SCHEDULE SUBMITTAL DEADLINES

Note similar language may be considered for other initial submittal requirements.

3.5.1 Progress payment applications will not be processed until submittal and approval of the Project Preliminary Schedule (also referred to as the 90-Day Schedule) pursuant to Section 013210.

Note how this clause may dovetail with 013100 and 013210.

3.5.2 Progress payment applications beyond __ days after Notice to Proceed will not be processed until submittal and approval of the Project CPM Logic Plans, Schedules and Reports pursuant to Section 013200.

Note how this clause may dovetail with 013100 and 013200.

3.6 USE OF SCHEDULE FOR PROJECT PAYMENT PROCEDURES

3.6.1 Schedule of Values Supported by Cost

Loading of Project Schedule

3.6.1.1 Within twenty (20) working [(30) calendar] days following Approval of the Project Schedule in Section 013200, the Contractor shall prepare and provide a Schedule of Values in a spreadsheet format as directed below and linked to the activities of the CPM of Section 013200.

3.6.1.2 Columns of the Schedule of Values Spreadsheet shall include:

- An Item Identification Number from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Title or description from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Total cost from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Cost associated with labor from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Cost associated with equipment from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Cost associated with materials from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Cost associated with subcontracted work from CPM specification section 013200 2.2.4.4 or as may be required to cover costs not associated with a specific activity of the CPM
- Additional cost for indirect overheads to be spread to this Item
- Additional costs for profit to be spread to this Item
- Sum of total cost and additional costs above for this Item
- Earliest dates of commencement and completion from CPM specification section 013200 2.1xx Initial CPM or as contemplated by the Contractor for Items not included on the CPM

- Planned dates of commencement and completion from CPM specification section 013200 2.1xx Initial Performance Schedule or as contemplated by the Contractor for Items not included on the CPM
- Planned dates of commencement and completion from CPM specification section 013200 2.1xx Updated Performance Schedule or as contemplated by the Contractor for Items not included on the CPM
- Actual dates of commencement and completion from CPM specification section 013200 2.1xx Updated Performance Schedule or as reported by the Contractor for Items not included on the CPM
- Sum of total cost and additional costs above for this Item earned this past reporting period
- Sum of total cost and additional costs above for this Item earned to date

30.5 CONTRACT MODIFICATION PROCEDURES

A specification following the Masterformat template will usually include a Section 01 26 00 relating to contract modification procedure. Note that 01 26 00 comes before 01 32 00. The contract modification procedure should address modification of time as well as cost. Similar to how a traditional Section 01 26 00 may refer to the specification on Surveying to determine quantities (of, say, excavation), this section should refer to the initial CPM, current approved Revision, and current Update to determine the impact of changes to an entitlement for extension of time.

SECTION 01 26 00 CONTRACT MODIFICATION PROCEDURES

Incorporate into this Section instructions often tacked onto 013200 CPM SCHEDULES AND REPORTS Part 3 Execution.

3.5 USE OF SCHEDULE FOR CONTRACT MODIFICATION PROCEDURES

3.5.1 Analysis of Claimed Impacts to the Project Schedule

3.5.1.1 Prior to Approval of the Project Schedule in Section 013200, the Contractor shall provide written notice, in a format as directed by the Program Manager, of any incident, event, or causative factor which may, in the Contractor's opinion, lead to a request for an extension of time, within 2 days of recognition of the issue. Requests for extensions of time shall be held in abeyance until Approval of the Project Schedule. In the event that a proposed and submitted Project Schedule is rejected and analysis thereby differs from that of the Approved Project Schedule, the logic most closely matching

that of the Project Preliminary Schedule will be used to ascertain entitlement based upon impact to the Contractor's anticipated plan of execution.

3.5.1.2 After Approval of the Project Schedule in Section 013200, the Contractor shall provide written notice, in a format as directed by the Program Manager, of any incident, event, or causative factor which may, in the Contractor's opinion, lead to a request for an extension of time, within 2 days of recognition of the issue. Contractor shall include with such notice, or append to such notice within a reasonable time but not more than another 2 days, a fragnet indicating the incident, event, or causative factor; impacted activities of the current approved initial, update, or revision of the project schedule; and necessary additional measures required or taken. Contractor shall provide its opinion as to why such is beyond the contractual obligations of the Contractor, citing specific clauses of the contract documents. If requested by the Program Manager, Contractor shall provide with 5 days a quote to accelerate or mitigate the need for an extension of time.

3.5.1.3 After receipt of a notice of a potential or actual request for extension of time, the Program Manager will respond within 2 days if desiring a quote to accelerate and within 5 days of notice or quote, whichever is later, with direction to the Contractor. In the absence of a response, or if indicating the opinion of the Owner that the impact is within the contractual obligations of the Contractor, such shall be construed as direction to accelerate or mitigate while reserving rights to request additional compensation as otherwise provided in these contract documents.

3.5.1.4 If Contractor disagrees with the Program Manager's rejection of a request for extension of time, Contractor may file an appeal [or Claim as provided elsewhere in these contract documents] with the Program Manager. An appeal shall include an analysis provided in accordance with the instructions provided in the Reference Text, the latest edition of *CPM in Construction Management*, by James J. O'Brien and Fredric L. Plotnick, McGraw-Hill. The Program Manager will review and consider additional and alternate analyses as presented.

Further details may create a conflict between the Reference Text and language provided. Note the Contractor may provide its claim in any form it desires, and a third-party factfinder may choose to be persuaded by an alternate analysis. However, use of the method provided in the Reference Text, which is believed by the authors to be the most objective and least prone to subjective influence, should provide a solid rebuttal to an overreaching claim.