**CONSTRUCTION**

**MANAGEMENT**

**MASTER SPECIFICATIONS**

**DIVISION 1**

**(Construction Schedule Critical Path Method [CPM])**

|  |
| --- |
| **ISSUE HISTORY** |
| Issue | Date | Pages Affected | Comments |
| 003 | 01/03/05 | 2, 4, 5, 9, 11 | Sections 01311 Title, 1.2.B, 1.2.F, 1.3.A.1-2, 1.3.A.4, 1.3.A.5.c, 1.3.A.5.f, 1.6.B.4, 1.8.B.2.b, 1.8.C.2 |
| 004 | 03/10/05 | All | General change. |
| 005 | 04/21/05 | All | General change. |
| 006 | 07/06/05 | 2, 4, 10 | 1.2.B, 1.2.F, 1.7.A.2 |
| 007 | 12/14/05 | 2, 4, 5, 6, 10, 11, 12, 13, 14 | 1.2.B, 1.3.A, 1.3.A.1, 1.3.A.4.l, 1.3.A.4.m, 1.3.A.5.a, 1.3.A.5.j, 1.3.A.5.k, 1.3.A.5.r, 1.3.A.6, 1.3.A.7, 1.3.A.8, 1.3.A.9, 1.3.B, 1.3.G, 1.7.A.1, 1.7.A.2, All of 1.8, 1.9.A, 1.9.A.1, 1.9.A.2, 1.9.B, 1.9.C, 1.9.C.1, 1.9.D, 1.9.E |
| 008 | 01/20/06 | All | Complete revision. |
| 009 | 01/23/08 | All | Change BWXT Pantex to B&W Pantex and update references to this procedure or other Division 1 sections only. |
| 010 | 07/11/12 | All | Global changes to clarify Contractor requirements. |

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**Section 01311 ‑ Construction Schedule – Critical Path Method (CPM)**

[EDITOR: The following table depicts the graded approach for the use of this specification and the 01310 specification.]

|  |
| --- |
| Scheduling Specification Selection Matrix |
|  |  |  |
| **Pricing Information** | **Clarifying Notes** | **Division I Specification** |
|   |   |   |
| Less than $5,000,000 TPC OR Less than $2,000,000 Construction Estimate. |   | Use DIV- 01310 |
|   |   |   |
| Greater than $5,000,000 TPC & less than $20,000,000 TPC OR Greater than $2,000,000 Construction Estimate. \* | EVMS Graded Approach | Use DIV- 01311 |
|   |   |   |
| Greater than $20,000,000 TPC. \* | Full EVMS requirements including flowdown to Contractors. | Use DIV- 01311 |
|  |  |  |
| \* Excluded are minor supporting contracts less than $2,000,000 and contracted directly to CNS Pantex. These contracts may use DIV-01310. |

1. COMMENCEMENT, PROGRESS AND COMPLETION OF THE WORK
	1. Contractor shall complete the Work under the Contract to meet the Contract Milestone dates.
	2. Contractor shall give CNS Pantex full information as to its plans for performing each part of the Work. If at any time, Contractor's actual progress is inadequate to meet the requirements of this Contract, CNS Pantex may notify Contractor to take such steps as may be necessary to improve its progress. Neither such notice nor CNS Pantex’s failure to issue such notice shall relieve Contractor of its obligation to achieve the quality of work and rate of progress required by this Contract.
2. CONTRACT SCHEDULE
	1. Contractor shall, within seven (7) working days following Notice of Award, meet with the CNS Pantex representative to discuss the preparation of the detailed Contract Schedule. This meeting will establish the format and submittal time periods for the Contract Schedule and other Contract progress reports.
	2. Contractor shall, within thirty (30) working days following Notice of Award, and before the first progress payment is made, submit to CNS Pantex for its written approval a complete, electronic copy of the Contract Schedule. The schedule shall consist of a precedence diagram network (PDN) using the critical path method (CPM) to show each individual essential activity in sequence to meet the Contract Milestones as specified in the Contract. The PDN shall show durations and dependencies including off-jobsite activities such as design, fabrication of equipment, procurement, delivery of materials, and items to be furnished by CNS Pantex. It shall be resource and cost loaded and show total float. Float shall not be considered to be for the exclusive benefit of either CNS Pantex or Contractor. Extensions of time for performance shall be made only to the extent that equitable time adjustments for affected activities exceed the total float available along their paths. Schedules and reports shall be furnished in three (3) copies plus an electronic media version.
	3. Contractor shall promptly inform CNS Pantex of any proposed change in the schedule and shall furnish CNS Pantex with a revised schedule within ten (10) calendar days after approval by CNS Pantex of such change. The revised schedule shall, as determined by CNS Pantex, be sufficient to meet the requirements for the completion of the separable parts of and all the Work as set forth in this Contract.
	4. During the performance of any work Contractor shall submit periodic progress reports to CNS Pantex on the actual progress. Such reports shall include the following:

[EDITOR: The following is not meant to be a comprehensive reports list, only a listing of schedule related topics.]

* + 1. Monthly: A copy of the Contract Schedule showing actual progress to date of the Work, as compared to planned progress;
		2. Monthly: A job hour comparison by craft of actual versus planned staffing;
		3. Monthly: A Scheduled Earnings Report for the Contract reflecting the scheduled end of month earnings in dollars and percentages using both the early and late finish dates for activities. The report shall also contain the actual earnings to date;
		4. Monthly: An Input Log report listing all input, changes and deletions since the first or partial update of the Contract Schedule. Failure to provide an Input Log may result in the Contract Schedule update being returned to the Contractor;
		5. Monthly: The Contractor shall provide a Narrative Report with each update of the Contract Schedule. This narrative shall include, but is not limited to:
			1. A description of current and /or anticipated problem areas;
			2. Delays and their impact;
			3. An explanation of corrective actions taken or proposed;
			4. Any matters which require evaluation or action by CNS Pantex or the DOE.
		6. Weekly: A 3-week look-ahead schedule showing forecast personnel by craft. Variation from approved schedules and plans shall be noted and rationalized.
1. REQUIREMENTS
	1. The Contractor shall use software marketed by Primavera Systems Inc., Two Bala Plaza, Bala Cynwyd, PA 19004: P6 Latest Version.
		1. The Contract Schedule shall be based on a 5-day workweek with no weekends or CNS Pantex holidays *normally* scheduled for work.
		2. The Contract Schedule shall show the order and inter-dependence of activities and the sequence in which work is to be performed.
		3. The following information shall be provided for each activity:
			1. An activity number:
				1. Use a five-digit number between 00001 and 99995, left justified in the activity I.D. field.
				2. Alphanumeric activity numbers are not acceptable, unless specifically directed by CNS for selected use.
				3. The initial network shall be numbered by 5's or 10's with the following event number greater than the preceding event number.
			2. An activity description that clearly uses an action verb and noun. Activities labeled "start", "continue", and "complete" are not specific and will not be allowed.
			3. Remaining duration.
			4. Total Cost (which includes all direct costs, indirect costs, and fee).
			5. Responsibility or Trade Code.
			6. Work location or Area Code.
			7. Early start date.
			8. Actual start date – Provided with monthly progressing.
			9. Early finish date.
			10. Actual finish date – Provided with monthly progressing.
			11. Original Duration – Contractor submissions shall be required to follow the direction of CNS Pantex regarding reasonable activity durations. Reasonable durations are those that allow the progress to be accurately determined between progress payment periods. In no instance shall work activity durations exceed 20 working days in length. Work activities shall represent definable work features.
			12. Manpower – Expressed in men per day by craft. If no resource is required for an activity, then the activity shall be identified as requiring zero men per day.
		4. The following milestones shall be reflected in the Contract Schedule:
			1. Notice of Award.
			2. Notice to Proceed.
			3. Preparation and submission of shop drawings, submittals and any required resubmittals.
			4. Obtain permits, badges, etc.
			5. Mobilize and install construction facilities.
			6. Fabrication and delivery of equipment and materials.
			7. Utility outages.
			8. Delivery of government furnished equipment.
			9. Test, balance and adjustment of systems and equipment.
			10. System Startup (Reference DIV-01800).
			11. Pre-final and final inspections.
			12. Submittal of As-Built Drawings.
			13. Training.
			14. Project Complete.
			15. Remove temporary installations.
			16. Clean sites and buildings.
			17. Equipment startup.
			18. Project Closeout.
			19. Demobilize.
		5. The use of activity external restraint dates and lags on relationships is prohibited unless specified or approved by CNS Pantex.
		6. The Contractor shall include in his Contract Schedule submittal the Inspection Hold Points of the project.
		7. The Contractor shall include separate activities for Material and Labor. Material is progressed based on verification of received materials. Labor is progressed based on completion of physical work.
		8. No Level of Effort (LOE) activities will be allowed in the Contract Schedule without prior approval from CNS Pantex.
	2. The Contractor’s initial schedule submittal will contain no progress and represent the planned work for the duration of the project. Once approved by CNS Pantex, this schedule will become the Contractors baseline (Contract Schedule) against which all future variance analysis will be performed.
	3. The Contractor’s initial schedule submittal shall include a project total planned manpower curve (expressed in man-days or men per day) and time phased cash flow curves based on early and late finish dates. The submittals will contain both tabular and graphic presentations.
	4. The Contractor shall designate an authorized representative responsible for developing and updating the Contract Schedule and preparing reports. This representative shall be capable of:
		1. Interactively addressing all project activities and resources.
		2. Rapidly evaluating alternative scenarios to optimize project management.
	5. The Contract Schedule shall consider delivery lead times, construction and access constraints and the coordination of construction with CNS Pantex operations.
	6. Construction schedules must allow work to be performed in a safe manner.
		1. The Contractor cannot reduce safety or worker protection in order to shorten construction schedules, recover lost time or accelerate the work.
		2. Schedule performance shall never take precedence over safety.
	7. The approved Contract Schedule will become part of the construction contract. The Contractor has the sole responsibility to correct any latent defects in its Contract Schedule and perform to the subsequently revised document(s). There will be no relief provided from the original contract performance provisions as a result of these required revisions, unless otherwise provided for in writing by the Contract Administrator (CA).
	8. The Contractor shall use the Contract Schedule to coordinate and monitor the work (including the activities of Subcontractors, equipment vendors and suppliers).
		1. The scope of work to be accomplished by the Contractor shall be represented to CNS Pantex in the form of a Work Breakdown Structure (WBS). The WBS shall be the basis for the development of the schedule activities and shall be imbedded and depicted in the schedule. The Contractor shall be prepared to discuss their proposed WBS at the initial kick off meeting described in Paragraph 2.1.
	9. The Contractor’s Plan and Schedule (P&S) shall reflect activity durations which include Contractor consideration of weather impacts. A weather impact is defined as a regularly scheduled work day where weather conditions prevent work for 50 percent or more of the Contractor's work day and delay work critical to the timely completion of the project. For reference, the following table contains the average number of days historically unavailable each month for outdoor work.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Month | **Days** | **Month** | **Days** | **Month** | **Days** | **Month** | **Days** |
| January | 7 | April | 5 | July | 5 | October | 5 |
| February | 6 | May | 5 | August | 4 | November | 5 |
| March | 6 | June | 6 | September | 4 | December | 9 |

* 1. CNS Pantex will only consider requests for time extension due to weather impacts if the actual days experienced by month exceed the monthly average shown in the table. All time extension requests for weather impacts shall be submitted to Pantex for approval.
1. CONTRACT SCHEDULE UPDATES AND REPORTS
	1. The Contractor shall update the Contract Schedule each month to input:
		1. Actual Start Dates.
		2. Actual Finish Dates.
		3. Percent Complete for each activity.
		4. Remaining durations for activities:
			1. The remaining duration shall be the actual time in workdays to complete the activity.
			2. Remaining duration shall not be automatically computed based on the percent complete of the activity.
	2. The Contractor shall provide Contract Schedule reports on a frequency as specified in the Paragraph 2 above:
		1. Each report shall contain the following activity information:
			1. Activity number.
			2. Activity description.
			3. Original duration.
			4. Remaining duration.
			5. Early and late start dates.
			6. Early and late finish dates.
			7. Total float.
			8. Budgeted cost.
			9. Budgeted Cost of Work Scheduled (BCWS).
			10. Budgeted Cost of Work Performed (BCWP).
		2. Each report or schedule update shall have a unique file name.
	3. Three copies of each update of the Contract Schedule shall be submitted. In addition, the Contractor shall provide one set of electronic media.
2. CONTRACT SCHEDULE REVISIONS
	1. The Contractor shall revise the Contract Schedule when necessary to reflect:
		1. Changes in the planned sequence of work.
		2. Approved change orders.
		3. Approved time extensions.
	2. Any request to revise the Contract Schedule shall be submitted, in writing, to the CA. Each request shall include:
		1. Proposed Contract Schedule revisions.
		2. A written narrative describing the reasons for the request.
		3. A sketch or fragmentary network showing proposed changes to the Contract Schedule.
		4. A description of changes to the estimated cost of the project.
		5. A description of the relationship between the proposed change and other activities in the Contract Schedule.
		6. Contract Schedule revisions will only address the portion of the schedule concerning To-Go work (i.e., work after the Data Date).
	3. When CNS Pantex issues a proposed change order, the Contractor shall submit proposed revisions to the network logic and duration estimates for all affected activities as part of his change proposal.
		1. Time extensions associated with approved Contract modifications will be limited to the amount of time the project or critical phase of construction is actually delayed.
		2. The Contractor shall submit revisions within fifteen (15) workdays after the date of the change request.
		3. The changes in logic or durations approved by CNS Pantex shall be used to analyze the impact of the change. This impact shall be included in the change order.
	4. Revisions to the Contract Schedule shall not become effective until approved through the formal submittal process.
3. EARNED VALUE MANAGEMENT SYSTEM

[EDITOR: Reserve 1.7 if project is less than $20,000,000 TPC.]

* 1. Earned Value Management (EVM) as used in this paragraph, means a project management system used by the Contractor that effectively integrates the project technical scope of work with schedule and cost elements for optimum project planning and control. The qualities and operating characteristics of earned value management systems are described in American National Standards Institute (ANSI)/Electronic Industries Alliance (EIA) Standard-748- A-1998, *Earned Value Management Systems, approved: May 19, 1998, Reaffirmed: August 28, 2002.* A copy of the standard is available from Global Engineering Documents (1-800-854-7179).
	2. In the performance of this contract the Contractor shall use an earned value management system (EVMS) to manage the contract that –
		1. At the time of contract award has been recognized by the CA as compliant with the guidelines in ANSI/EIA Standard –748-A. If, at the time of award, the Contractor’s EVMS has not been recognized by the CA as complying with EVMS guidelines, the Contractor shall apply the system to the contract and shall be prepared to demonstrate to the CA that the EVMS complies with the EVMS guidelines referenced in paragraph 1.7.A.
		2. Provides, in a format prescribed by the CA, (XML, direct on-line access, or other) on a monthly basis, or more often as negotiated by the CA, the following project status information at WBS level 3, with capability to report at any lower level at the request of the CA:
			1. Budgeted (planned) cost for work scheduled (BCWS) = Planned Value;
			2. Budgeted cost for work performed (BCWP) = Earned Value;
			3. Actual cost of work performed (ACWP) = Actual Cost;
			4. Budget at completion (BAC);
			5. Estimate to complete (ETC);
			6. Estimate at completion (EAC); and
			7. Provide a performance curve graph plotting cumulative BCWS, BCWP, and ACWP on a monthly basis from inception of the contract, with BCWS plotted to completion and projecting the ACWP curve to the estimate at completion (EAC) value.
			8. In addition, provide the following EVMS variance analysis:
				1. Cost variance (CV) = (BCWP minus ACWP);
				2. Cost Variance % = (CV/BCWP X 100%);
				3. Cost Performance Index (CPI) = (BCWP/ACWP);
				4. Schedule Variance (SV) = (BCWP minus BCWS);
				5. Schedule Variance % = (SV/BCWS X 100%);
				6. Schedule Performance Index (SPI) = (BCWP/BCWS);
				7. Estimate at Completion (EAC) = (ACWP plus ETC);
				8. Variance at Completion (VAC) = (BAC minus EAC);
				9. Variance at Completion % = (VAC/BAC X 100%); and
				10. Expected Completion Date.
		3. Explain the reasons for all variances that exceed the statutory threshold of 10 percent or a lower threshold specified in the contract.
		4. Define technical performance variance. Explain, based on work accomplished as of the date of the report, whether the performance goals will be achieved, and the impact to the cost and schedule goals.
		5. Discuss the Contractor EAC.
		6. Discuss the corrective actions that will be taken to mitigate all variances identified, the risk associated with the actions, and how close these actions will bring the project to the original baseline. Define proposed baseline changes, if necessary.
			1. CNS Pantex may require an integrated baseline review (IBR) at (1) contract award, (2) exercise of significant options, or (3) incorporation of major modifications. Such reviews will normally be scheduled before award of the contract action. If the CA determines that the urgency of the award does not allow time to conduct the IBR before award, the IBR shall be scheduled as early as practicable, but not later than 180 days after the award action. The objective of the integrated baseline review is for CNS Pantex and the Contractor to jointly assess technical areas, such as the Contractor’s planning, to ensure complete coverage of the statement of work, logical scheduling of the work activities, adequate resources, methodologies for claiming BCWP, and identification of inherent risks.
			2. Contractor-proposed EVMS changes require approval of the CA prior to implementation. The CA shall advise the Contractor of the acceptability of such changes within 20 working days after receipt of the notice of proposed changes from the Contractor.
			3. The Contractor agrees to provide access to all pertinent records and data requested by the CA or a duly authorized representative. Access is to permit CNS Pantex surveillance to ensure that the EVMS conforms, and continues to conform, to the performance guidelines referenced in Paragraph 1.7.A.

[EDITOR: At end of following paragraph, insert list of applicable Contractors or remove paragraph from spec.]

* + - 1. The Contractor shall require the Subcontractors specified below to comply with the performance guidelines of this clause, and allow an authorized representative of the CA to perform surveillance and monitor monthly EV performance. The Contractor shall conduct IBR’s with CNS Pantex participation for the below listed Subcontractors.
1. REQUESTS FOR PAYMENT
	1. The approved P&S shall be used as a basis for substantiating the Contractor requests for payment.
	2. Prior to submitting a request for payment, the Contractor shall prepare a report on construction progress by updating the previous month’s schedule. The Contractor shall submit by the 2nd workday of the current month an updated Contract Schedule with progress through the end of the previous month and a file Data Date of the 1st of the current month. The submittal shall be in the form of one electronic and two paper copies of the schedule file. The Contractor’s Superintendent and the CNS Pantex PSTR will review the schedule in the field and claimed progress will be validated. The validated copy of the updated schedule will be returned to the Contractor by the 6th working day of the current month for use, with any corrections, with his monthly pay request.
		1. The report shall show:
			1. The activities, or portions thereof, completed during the reporting period and their total value shall be the basis for the Contractor's request for payment.
			2. The percentage of work actually completed and scheduled as of the Contract Schedule data date.
	3. The Contractor’s monthly pay request shall be submitted by the 15th day of the current month for the previously worked month and will include the field-validated Contract Schedule reviewed in 1.8.B. The approved Contract Schedule update is considered an integral part of the Contractor’s invoice.
		1. The invoice date shall be the 1st day of the current month, corresponding to the Contract Schedule Data Date.
		2. Failure to submit all required documentation will result in the return of the Contractor's pay request.
		3. The Contractor’s schedule update is expected to be error free.
	4. The Contractor shall also submit by the 15th of the current month a PX-4094 accrual form that lists the amount of estimated services performed or expected to be performed between the 1st and the end of the current month. Detailed documentation of the submitted estimate must be attached to the statement.
		1. Payments will be made after CNS Pantex has verified reported progress.
2. REFERENCES
	1. Governing Documents

<https://iw.pxplant.com/LinksMgr/linksMgr?docType=RMSFlowdown&docNum=DIV-01311>

* 1. Authorizing Documents
1. DIR-0001, “Roles and Responsibilities for the Management and Operation of Pantex Plant (U)”
	1. Related Documents
2. DIV-01310, “Construction Management Master Specifications Division 1 (Construction Schedule)”
	1. Forms
		1. Generated Forms
			1. PX-4094, “Pantex Accrual Form”
		2. Related Forms
			1. None
	2. Records
3. PX-4094, “Pantex Accrual Form” R\_024344
	1. Exhibits
4. PX-4094, “Pantex Accrual Form”

END OF SECTION 01311

**EXHIBIT 1**

**PX-4094 “Pantex Accrual Form”**