SECTION 01 75 00
SYSTEM START-UP

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures and actions, required of the Contractor, which are necessary to achieve and demonstrate Substantial Completion.
   2. Requirements for Substantial Completion Submittals.

B. Related Sections include but are not necessarily limited to:
   1. Division 00 - Procurement and Contracting Requirements.
   2. Division 01 - General Requirements.
   3. Section 01 61 03 - Equipment: Basic Requirements.
   4. Section 40 90 00 - Instrumentation for Process Control: Basic Requirements.

1.2 DEFINITIONS

A. Project Classified System (PCS): A defined part of the Project, consisting of an arrangement of items, such as equipment, structures, components, piping, wiring, materials, or incidentals, so related or connected to form an identifiable, unified, functional, operational, safe, and independent system.

B. Pre-Demonstration Period: The period of time, of unspecified duration after initial construction and installation activities during which Contractor, with assistance from manufacturer's representatives, performs in the following sequence:
   Finishing type construction work to ensure the Project [or] [each PCS] has reached a state of Substantial Completion.
   1. Equipment start-up.
   2. Personnel training.

C. Demonstration Period: A period of time, of specified duration, following the Pre-Demonstration Period, during which the Contractor initiates product through the facility and starts up and operates the facility, without exceeding specified downtime limitations, to prove the functional integrity of the mechanical and electrical equipment and components and the control interfaces of the respective equipment and components comprising the facility as evidence of Substantial Completion.

D. Substantial Completion: See the General Conditions.

1.3 SUBMITTALS

A. See Specification Section 01 33 00 for requirements for the mechanics and administration of the submittal process.

B. Submit in the chronological order listed below prior to the completion of the Pre-Demonstration Period.
   1. Master operation and maintenance training schedule:
      a. Submit 30 days (minimum) prior to first training session for Owner's personnel.
      b. Schedule to include:

1) Target date and time for Owner witnessing of each system initial start-up.
2) Target date and time for Operation and Maintenance training for each system, both field and classroom.
3) Target date for initiation of Demonstration Period.

c. Submit for review and approval by Owner.
d. Include holidays observed by Owner.
e. Attend a schedule planning and coordination meeting 90 calendar days prior to first anticipated training session.
1) Provide a status report and schedule-to-complete for requirements prerequisite to manufacturer's training.
2) Identify initial target dates for individual manufacturer's training sessions.
f. Owner reserves the right to insist on a minimum seven (7) days' notice of rescheduled training session not conducted on master schedule target date for any reason.
g. Schedule to be resubmitted until approved.

2. Substantial Completion Submittal:
a. File Contractor's Notice of Substantial Completion and Request for Inspection.
b. Approved Operation and Maintenance manuals received by Engineer minimum 30 days prior to scheduled training.
c. Written request for Owner to witness each system pre-demonstration start-up.
1) Request to be received by Owner minimum one (1) week before scheduled training of Owner's personnel on that system.
d. Equipment installation and pre-demonstration start-up certifications.
e. Letter verifying completion of all pre-demonstration start-up activities including receipt of all specified items from manufacturers or suppliers as final item prior to initiation of Demonstration Period.

SEQUENCING AND SCHEDULING

Phased Construction:

[ ].

Schedule of Events:

[ ].

1.4 COST OF START-UP

A. Contractor to pay all costs associated with System [Facility] start-up.

PART 2 - PRODUCTS - (NOT APPLICABLE TO THIS SPECIFICATION SECTION)

PART 3 - EXECUTION

3.1 GENERAL

A. Facility Start-up Divided into Two Periods:
1. Pre-Demonstration Period including:
a. Completion of construction work to bring Project to a state of Substantial Completion.
b. Start-up of Equipment.
c. Training of Personnel.
d. Completion of the filing of all required submittals.

e. Filing of Contractor's Notice of Substantial Completion and Request for Inspection.
2. Demonstration Period including:
a. Demonstration of functional integrity of facility or PCS.

3.2 PRE-DEMONSTRATION PERIOD

A. Completion of Construction Work:
1. Complete the work to bring the Project to a state of substantial completion.

B. Equipment Start-up:
1. Requirements for individual items of equipment are included in the Technical Specification Sections.
2. Prepare the equipment so it will operate properly and safely and be ready to demonstrate functional integrity during the Demonstration Period.
3. Perform Equipment Start-up to extent possible without introducing product flow.
4. Introduce product flow to complete Equipment Start-up for the following equipment:
a. 2-DWP-1.
b. P-1.
c. P-2.
5. Procedures include but are not necessarily limited to the following:
a. Test or check and correct deficiencies of:
1) Power, control, and monitoring circuits for continuity prior to connection to power source.
2) Voltage of all circuits.
3) Phase sequence.
4) Cleanliness of connecting piping systems.
5) Alignment of connected machinery.
6) Vacuum and pressure of all closed systems.
7) Lubrication.
8) Valve orientation and position status for manual operating mode.
9) Tankage for integrity using clean water.
10) Pumping equipment using clean water.
11) Instrumentation and control signal generation, transmission, reception, and response.
a) See Specification Section 40 90 00.
12) Tagging and identification systems.
13) All equipment: Proper connections, alignment, calibration and adjustment.
b. Calibrate all safety equipment.
c. Manually rotate or move moving parts to assure freedom of movement.
d. "Bump" start electric motors to verify proper rotation.
e. Perform other tests, checks, and activities required to make the equipment ready for Demonstration Period.
f. Documentation:
1) Prepare a log showing each equipment item subject to this paragraph and listing what is to be accomplished during Equipment Start-up.
2) Provide a place for the Contractor to record date and person accomplishing required work.

3) Submit completed document before requesting inspection for Substantial Completion certification.

6. Obtain certifications, without restrictions or qualifications, and deliver to Engineer:
   a. Manufacturer's equipment installation check letters (sometimes referred to as Manufacturer’s Field Services report).
   b. Instrumentation Supplier's Instrumentation Installation Certificate.

C. Personnel Training:
1. See individual equipment specification sections.
2. Conduct all personnel training after completion of Equipment Start-up for the equipment for which training is being conducted.
   a. Personnel training on individual equipment or systems will not be considered completed unless:
      1) All pretraining deliverables are received and approved before commencement of training on the individual equipment or system.
      2) No system malfunctions occur during training.
      3) All provisions of field and classroom training specifications are met.
   b. Training not in compliance with the above will be performed again in its entirety by the manufacturer at no additional cost to Owner.
3. Field and classroom training requirements:
   a. Hold classroom training on-site.
   b. Notify each manufacturer specified for on-site training that the Owner reserves the right to video record any or all training sessions.
      1) Organize each training session in a format compatible with video recording.
   c. Training instructor qualification: Factory trained and familiar with giving both classroom and "hands-on" instructions.
   d. Training instructors:
      1) Be at classes on time.
      2) Session beginning and ending times to be coordinated with the Owner and indicated on the master schedule.
      3) Normal time lengths for class periods can vary, but brief rest breaks should be scheduled and taken.
   e. Organize training sessions into maintenance verses operation topics and identify on schedule.
   f. Plan for minimum class attendance of 3 people at each session and provide sufficient classroom materials, samples, and handouts for those in attendance.
   g. Instructors to have a typed agenda and well prepared instructional material.
      1) The use of visual aids, e.g., films, pictures, and slides is recommended for use during the classroom training programs.
      2) Deliver agendas to the Engineer a minimum of seven (7) days prior to the classroom training.
      3) Provide equipment required for presentation of films, slides, and other visual aids.

h. In the on-site training sessions, cover the information required in the Operation and Maintenance Manuals submitted according to Specification Section 01 33 04 and the following areas as applicable to PCS's.
   1) Operation of equipment.
   2) Lubrication of equipment.
   3) Maintenance and repair of equipment.
   4) Troubleshooting of equipment.
   5) Preventive maintenance procedures.
   6) Adjustments to equipment.
   7) Inventory of spare parts.
   8) Optimizing equipment performance.
   9) Capabilities.
   10) Operational safety.
   11) Emergency situation response.
   12) Takedown procedures (disassembly and assembly).
i. Address above Paragraphs 1), 2), 8), 9), 10), and 11) in the operation sessions. Address above Paragraphs 3), 4), 5), 6), 7), and 12) in the maintenance sessions.
j. Maintain a log of classroom training provided including: Instructors, topics, dates, time, and attendance.

D. Complete the filing of all required submittals:
   1. Shop Drawings.
   2. Operation and Maintenance Manuals.
   3. Training material.

E. Filing of Contractor's Notice of Substantial Completion and Request for Inspection of Project or PCS:
   1. File the notice when the following have been completed:
      a. Construction work (brought to state of Substantial Completion).
      b. Equipment Start-up.
      c. Personnel Training.
      d. Submittal of required documents.
   2. Engineer will review required submittals for completeness within 5 calendar days of Contractor's notice. If complete, Engineer will complete inspection of the Work, within 10 calendar days of Contractor's notice.
   3. Engineer will inform Contractor in writing of the status of the Work reviewed, within 14 calendar days of Contractor's notice.
      a. Work determined not meeting state of Substantial Completion:
         1) Contractor: Correct deficiencies noted or submit plan of action for correction within 5 days of Engineer's determination.
         2) Engineer: Reinspect work within 5 days of Contractor's notice of correction of deficiencies.
         3) Reinspection costs incurred by Engineer will be billed to Owner who will deduct them from final payment due Contractor.
      b. Work determined to be in state of tentative Substantial Completion: Engineer to prepare tentative "Engineer's Certificate of Substantial Completion."
      c. Engineer's Certificate of Substantial Completion:

1) Certificate tentatively issued subject to successful Demonstration of functional integrity.
2) Issued for Project as a whole or for one or more PCS.
3) Issued subject to completion or correction of items cited in the certificate (punch list).
4) Issued with responsibilities of Owner and Contractor cited.
5) Executed by Engineer.
6) Accepted by Owner.
7) Accepted by Contractor.

d. Upon successful completion of Demonstration Period, Engineer will endorse certificate attesting to the successful demonstration, and citing the hour and date of ending the successful Demonstration Period of functional integrity as the effective date of Substantial Completion.

3.3 DEMONSTRATION PERIOD

A. General:
1. Demonstrate the functional integrity of the mechanical, electrical, and control interfaces of the respective equipment and components comprising the facility as evidence of Substantial Completion.
2. Duration of Demonstration Period: 120 consecutive hours.
3. If, during the Demonstration Period, the aggregate amount of time used for repair, alteration, or unscheduled adjustments to any equipment or systems that renders the affected equipment or system inoperative exceed 10 percent of the Demonstration Period, the demonstration of functional integrity will be deemed to have failed.
   a. In the event of failure, a new Demonstration Period will recommence after correction of the cause of failure.
   b. The new Demonstration Period shall have the same requirements and duration as the Demonstration Period previously conducted.
4. Conduct the demonstration of functional integrity under full operational conditions.
5. Owner will provide operational personnel to provide process decisions affecting plant performance.
   a. Owner's assistance will be available only for process decisions.
   b. Contractor will perform all other functions including but not limited to equipment operation and maintenance until successful completion of the Demonstration Period.
6. Owner reserves the right to simulate operational variables, equipment failures, routine maintenance scenarios, etc., to verify the functional integrity of automatic and manual backup systems and alternate operating modes.
7. Time of beginning and ending any Demonstration Period shall be agreed upon by Contractor, Owner, and Engineer in advance of initiating Demonstration Period.
8. Throughout the Demonstration Period, provide knowledgeable personnel to answer Owner's questions, provide final field instruction on select systems and to respond to any system problems or failures which may occur.
   a. Provide final field instruction on the following systems:

b. For the above systems, provide a total of 8 HRS instruction, divided among the systems as follows:
   1) Tank operation 2 hr, 2) Tank Pumps fill and drain 2 hr, 3) Valve operations 2 hrs, 4) Switch over to emergency operation 2.

9. Provide all labor, supervision, utilities, chemicals, maintenance, equipment, vehicles or any other item necessary to operate and demonstrate all systems being demonstrated.

END OF SECTION