SECTION 01650

FACILITY STARTUP

1.01 FACILITY STARTUP

A. Commission all systems and equipment to verify performance, function, and correct operation by performing procedures to activate, startup, adjust, test, and demonstrate that the work is in operating order in accordance with these general requirements of this Section and the detailed requirements of the technical sections under the system or equipment specified.
To ensure that the work is ready for full-time operation the procedures include verification, balancing, calibration, witness testing, documentation, inspection by equipment manufacturers and operator training where specified.

B. Notification: Notify the Engineer five days prior to starting each system or piece of equipment.

C. Coordination: During the startup period, coordinate the operation of the facility with Engineer, subcontractors, Owner's operators, and manufacturer's representatives.

D. Furnish test equipment, measuring devices and supplies required to conduct tests.

E. Maintain the equipment until acceptance. Provide all lubricants, chemicals, and electricity necessary until acceptance.

F. Furnish all expendable supplies, gas, water, etc., required for startup, demonstration and testing and dispose of all waste or used supplies, water, etc.

1.02 SUBMITTALS

A. Startup Plan, Forms, and Schedule: Prepare a facility startup plan and schedule. The plan shall include test methods and procedures and sample forms for recording test data.

B. Affidavit.

C. Submit documentation of tests, balancing reports, and the like.

1.03 INITIAL STARTUP AND OPERATION OF FACILITIES

A. The following listing is a general sequence of startup activity steps to be used in placing facility systems into operation:
   1. Perform initial lubrication of equipment and have manufacturers check and adjust equipment. Provide all subsequent lubrication and maintenance, and such staff as required for test operation until the Owner assumes equipment maintenance responsibility after Step 14 below.
   2. Perform satisfactory testing of electrical work required prior to energizing of the electrical system.
   3. After completion of Step 2, perform satisfactory electrical testing required after energizing of the electrical system.
   4. Complete calibration of instruments.
   5. Satisfactorily complete system verification of instrumentation work.

6. After completion of Steps 1 and 3, perform a rotational test of equipment and correct backward rotating drives.
7. After completion of Steps 5 and 6, test operate the equipment by manually initiating the operation. Where manual operation bypasses alarm or safety monitoring, provide continuous supervision of such parameters. Perform this step using water in lieu of chemicals or other process liquids. Use dry air or nitrogen in lieu of hazardous gases.
8. Concurrent with Step 7, perform instrumentation and control testing and adjustments as related to the equipment being tested.
9. Concurrent with Step 7 and where possible at this stage of startup, complete the performance testing specified for the equipment.
10. Concurrent with Step 7, perform adjustments of the electrical work as related to the equipment being tested.
11. Repeat Steps 1 through 10 as required for other equipment items and plant systems until all plant process components and utility systems are ready for total plant operation. It may be necessary for the Contractor to put portions of the newly constructed facility in service before constructing other portions of the facility or completing the Work as a whole.
12. Notify the Owner and the Engineer 45 days before total plant operation is to occur so that the Owner may order chemicals and make other arrangements for full time operation. This notification shall have an accuracy of plus or minus 7 days. Notify the Owner and Engineer again, exactly 7 days before total plant operation is to begin.
13. Upon completion of all the above steps, the facility shall be started up and operated on a complete full time basis beginning on the indicated date. The Owner will provide operating personnel, chemicals, and untreated water. For five consecutive days beginning with the start-up day, the Contractor shall have at the plant site, during the day shift, a mechanic, an electrician, and an instrument engineer. Representatives of manufacturers of critical equipment shall also be present for these five days as needed or as required elsewhere in the specifications. The Contractor shall also provide these personnel, on a 24-hour per day, "on call" basis, if necessary, to adjust, repair, and correct deficiencies as required to keep the facilities in continuous operation for a period of 30 days. The Contractor shall train the operators in the proper operation and the control of the new facilities. The Contractor shall also furnish all such mechanical and electrical workers as required to make adjustments to and perform all required maintenance for the operating equipment until the end of the 30-day initial operation period. Maintenance of operating equipment shall include lubrication, adjustments, replacements, and modifications as required.
14. After successful completion of the 30-day initial operation period, the Owner will take over maintenance duties as well as operation and will begin to provide and pay for lubricants. If continuous process operation is interrupted for a period of four consecutive hours or more due to a failure of the equipment or work provided by the Contractor, then the counting of the 5-day and/or 30-day periods, described in Step 13 above, shall be restarted at day one if these periods have not reached satisfactory completion.
15. Following the commencement of Step 13, satisfactorily complete equipment performance testing, electrical testing and adjustments, and instrumentation/control testing and adjustments to the extent that such testing and adjustments could not be made prior to full plant operation.
16. Complete the documentation of test, balancing reports, and the like commissioning for submittal during the startup process and before acceptance.

1.04 MANUFACTURER'S FIELD SERVICE AND AFFIDAVITS

A. Field Service: Where specified, manufacturers of equipment shall provide field service. Field service shall be provided by an authorized factory-trained and qualified manufacturer's representative for the specific equipment. Equipment shall not be considered ready for full time operation until after the manufacturer's representative has checked and adjusted the equipment, and certified by written affidavit that the equipment has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full time operation.

B. Affidavits: Acceptable affidavits shall be submitted prior to completion of the work.
   1. Affidavits shall contain the following specific wording:
      "The *[Name of Equipment]* has been properly installed, tested, adjusted, lubricated, and calibrated, and is ready for full time operation. The installation has been inspected and has been found to be in conformance with our (the manufacturer's) standards and requirements."
   2. No amplification, dilution, or modification of this specific wording will be permitted.

1.05 TRAINING

A. Submit Operation and Maintenance Manuals and Parts Lists specified in Section 01300 at least 15 days prior to the first training session.

B. Demonstrate the operation, maintenance, and safety procedures for all systems and equipment to personnel designated by the Owner.

C. Provide 20 hours of classroom training and 20 hours of onsite demonstration of systems and equipment.
   1. Illustrate classroom training with diagrams, checklists, photographs, and other visual aids as appropriate. Use video, slides, or overhead projector to present visual materials.
   2. Prepare a course summary illustrated with copies of visual materials. Distribute one copy to each course attendee, four copies to the Owner and two copies to the Engineer.

D. In addition to overall training specified above, provide special demonstration and training for specific pieces of equipment specified in the Technical Specification Sections.

END OF SECTION