

SECTION 01756
TESTING, TRAINING, AND FACILITY START-UP

PART 1 – GENERAL

1.01 SUMMARY

A. Section Includes: Equipment and system testing and start-up, services of manufacturer's representatives, training of OWNER's personnel, and final testing requirements for the complete facility.

1.02 CONTRACT REQUIREMENTS

A. Testing, training, and start-up are requisite to the satisfactory completion of the Contract.

B. Complete testing, training, and start-up within the Contract Time.

C. Allow realistic durations in the Progress Schedule for testing, training, and start-up activities.

D. Furnish labor, power, tools, equipment, instruments, and services required for and incidental to completing functional testing, performance testing, and operational testing.

E. Provide competent, experienced technical representatives of equipment manufacturers for assembly, installation and testing guidance, and operator training.

F. Coordinate with Equipment Suppliers and Owner as to start-up plan provisions.

1.03 START-UP PLAN

A. Submit start-up plan for each piece of equipment and each system not less than 3 weeks prior to planned initial equipment or system start-up.

B. Provide Detailed Subnetwork of Progress Schedule with the Following Activities Identified:

1. Manufacturer's services.
2. Installation certifications.
3. Operator training.
4. Submission of Operation and Maintenance Manual.
5. Functional testing.
6. Performance testing.
7. Operational testing.

C. Provide testing plan with test logs for each item of equipment and each system when specified. Include testing of alarms, control circuits, capacities, speeds, flows, pressures, vibrations, sound levels, and other parameters.

D. Provide summary of shutdown requirements for existing systems which are necessary to complete start-up of new equipment and systems.

E. Revise and update start-up plan based upon review comments, actual progress, or to accommodate changes in the sequence of activities.

1.04 PERFORMANCE TESTING

A. Test equipment for proper performance at point of manufacture or assembly when specified.

B. All equipment shall be tested in accordance with specific requirements listed in Specifications.

C. When Source Quality Control Testing Is Specified:

1. Demonstrate equipment meets specified performance requirements.
2. Provide certified copies of test results.
3. Do not ship equipment until certified copies have received written acceptance from ENGINEER. Written acceptance does not constitute final acceptance.

D. Include costs associated with witnessing performance tests in the bid price. Include costs for OWNER's representative for travel, lodging, transportation to and from lodging, and 50 Dollars meal allowance per person per day.

1.05 GENERAL START-UP AND TESTING PROCEDURES

A. Mechanical Systems: As Specified in Division 15:

1. Remove rust preventatives and oils applied to protect equipment during construction.
2. Flush lubrication systems and dispose of flushing oils. Recharge lubrication system with lubricant recommended by manufacturer.
3. Install and adjust packing, mechanical seals, O-rings, and other seals. Replace defective seals.
4. Remove temporary supports, bracing, or other foreign objects installed to prevent damage during shipment, storage, and erection.
5. Check rotating machinery for correct direction of rotation and for freedom of moving parts before connecting driver.
6. Perform cold alignment and hot alignment to manufacturer's tolerances.
7. Tighten leaking flanges or replace flange gasket. Inspect screwed joints for leakage.
8. Install gratings, safety chains, handrails, shaft guards, and sidewalks prior to operational testing.

B. Electrical Systems: As Specified in Division 16.

C. Pipe Testing: As specified in Division 15.

D. Instrumentation Test: As specified in Division 16.

1.06 FUNCTIONAL TESTING

PROJECT NAME
[PROJECT NO. XX-XXXX.XX]

01756-2

TESTING, TRAINING AND FACILITY
START UP

A. Functionally test mechanical and electrical equipment for proper operation after general start-up and testing tasks have been completed.

B. Demonstrate proper rotation, alignment, speed, flow, pressure, vibration, sound level, adjustments, and calibration. Perform initial checks in the presence of and with the assistance of the manufacturer's representative.

C. Demonstrate proper operation of each instrument loop function including alarms, local and remote controls, instrumentation and other equipment functions. Generate signals with test equipment to simulate operating conditions in each control mode.

D. Conduct continuous 8 hour test under full load conditions. Replace parts which operate improperly.

1.07 CERTIFICATE OF PROPER INSTALLATION

A. At Completion of Functional Testing, Furnish Written Report Prepared and Signed by Manufacturer's Authorized Representative, Certifying Equipment.

1. Has been properly installed, adjusted, aligned, and lubricated.
2. Is free of any stresses imposed by connecting piping or anchor bolts.
3. Is suitable for satisfactory full-time operation under full load conditions.
4. Operates within the allowable limits for vibration. Provide test results to OWNER.
5. Controls, protective devices, instrumentation, and control panels furnished as part of the equipment package are properly installed, calibrated, and functioning.
6. Control logic for start-up, shutdown, sequencing, interlocks, and emergency shutdown have been tested and are properly functioning.

B. Furnish Written Report Prepared and Signed by the Electrical And/or Instrumentation Subcontractor Certifying:

1. Motor control logic that resides in motor control centers, control panels, and circuit boards furnished by the electrical and/or instrumentation subcontractor has been calibrated and tested and is properly operating.
2. Control logic for equipment start-up, shutdown, sequencing, interlocks and emergency shutdown has been tested and is properly operating.

C. Co-sign the reports along with the manufacturer's representative and subcontractors.

1.08 TRAINING OF OWNER'S PERSONNEL

A. Provide factory-authorized, on-site operations and maintenance training for items of mechanical, electrical and instrumentation equipment. Utilize manufacturer's representatives to conduct training sessions.

B. No training of OWNER personnel shall commence until substantial completion of the project, unless agreed to in writing by ENGINEER.

C. Coordinate training sessions to prevent overlapping sessions. Arrange sessions so that individual operators and maintenance technicians do not attend more than 2 sessions per week.

D. Provide approved Operation and Maintenance Manual for specific pieces of equipment or systems 2 weeks prior to training session for that piece of equipment or system.

E. Operation and Maintenance Manuals must be approved and available for use no later than 30 days prior to scheduled training (reference Section 01300, Operating and Maintenance Manuals). Each manufacturer shall provide, as a minimum, the number of days of training specified in the specific section.

1. The manufacturer's instructor shall incorporate training aids as appropriate to assist in the instruction. As a minimum, the training aids shall include text and figure handouts.
2. The manufacturer's instructor shall present a hands-on demonstration of operations and maintenance of the equipment for each scheduled group. The proposed hands-on demonstrations should be described in the manufacturer's proposed Lesson.

1.09 OPERATIONAL TESTING

A. Conduct operational test of each individual item of the entire facility after completion of operator training. Demonstrate satisfactory operation of equipment and systems in actual operation.

B. Conduct operational test for continuous 7 day period.

C. OWNER will provide operations personnel, power, fuel, and other consumables for duration of test.

D. Immediately correct defects in material, workmanship, or equipment which became evident during operational test.

E. Repeat operational test when malfunctions or deficiencies cause shutdown or partial operation of the facility or results in performance that is less than specified.

1.10 RECORD KEEPING

A. Maintain and submit following records generated during start-up and testing phase of project:

1. Daily logs of equipment testing identifying all tests conducted and outcome.
2. Logs of time spent by manufacturer's representatives performing services on the job site.
3. Equipment lubrication records.
4. Electrical phase, voltage, and amperage measurements.
5. Insulation resistance measurements.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

Not Used.

END OF SECTION 01756