

SECTION 01800EQUIPMENT STARTUP, CERTIFICATION AND OPERATOR TRAININGPART 1 - GENERAL1.1 DESCRIPTION

A. Work Included:

1. General: The work included in this Section includes startup of equipment, certified equipment testing and manufacturer provided operator training of the facility personnel in the proper operations and maintenance of the furnished equipment. This shall include all equipment provided for the project, regardless of specification Division, unless specifically noted otherwise. Clean, test and adjust each piece of equipment and/or system to the complete satisfaction of the Engineer.
2. One Year Service Call: In addition to the manufacturer's installation and startup/testing services, the Contractor shall arrange for the manufacturer to provide one additional service call of one 8 hour working day on site upon demand of the Owner for each type of equipment within the first year of operation (commencing upon date of Substantial Completion) at no additional cost to the Owner.

B. General Definitions:

1. Equipment Startup shall be generally defined as the initial placing into operation of the equipment by representatives of the Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer.
2. Certified Equipment Testing shall generally be defined as the formal and scheduled demonstration of operations in accordance with the requirements of the Contract Documents. This formal demonstration shall be performed in the presence of the Engineer by representatives of the General Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer.
3. Operator Training shall generally be defined as the formal and scheduled instruction of plant personnel and other Owner designated representatives in the proper operations of provided equipment, and in the techniques, methods, schedules, etc. associated with maintenance. This formal training shall be performed in the presence of the Engineer, by representatives of the Contractor, any Subcontractors directly responsible for the equipment provided, and the equipment manufacturer. Operator Training shall also include assistance to plant personnel by manufacturer representatives during the initial operations of the equipment.

C. Related Work Specified Elsewhere:

1. Process equipment/systems are specified in Division 11.
2. Instrumentation systems are specified in Division 13.
3. Plumbing and HV Systems are specified in Division 15.
4. Electrical systems are specified in Division 16.

D. Submittals:

1. A minimum of ten days prior to the Pre-Startup Meeting, Contractor shall provide a preliminary equipment start-up schedule and plan for the Certified Equipment Testing and the Operator Training for each piece of equipment to the Engineer for review. This preliminary plan will include a written outline description of the means and methods to be employed during the Certified Equipment Test of each piece of equipment. The schedule and means and methods of testing will be discussed with the Engineer at the Pre-Startup Meeting for acceptance.

E. Schedules:

1. The Pre-Startup Meeting shall be held at least ten (10) working days prior to the startup of the first piece of equipment supplied under the Contract. The meeting shall be held at the office of Wright-Pierce, 99 Main Street, Topsham, ME, 04086. At that time, the Contractor shall present his plan as detailed in the previous Part D "Submittals" and review Engineer's comments and concerns associated with the general features of each piece of equipment which must be demonstrated.
2. Contractor shall provide Engineer with at least 72 hours notice of his desire to perform testing and training to allow necessary coordination with Owner representatives. Contractor shall be responsible for any and all coordination necessary with the daily operations of the facility to accommodate his testing schedule. Actual date and time for testing and/or training will be the first mutually acceptable date and time available to all parties subsequent to receipt of the request.
3. Operator Training may be conducted concurrently with the Certified Equipment Testing with prior approval of the Engineer. However, under no circumstances will conditions of the testing interfere with the ability of Owner's representatives to observe necessary features, to hear and understand instructions, or to ask questions. Under such conditions, Operator Training will be conducted separately from, and subsequent to, the Certified Equipment Testing.

PART 2 - PRODUCTS

Not Applicable

PART 3 - EXECUTION

3.1 EQUIPMENT STARTUP

- A. Equipment startup shall be performed by an duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment, including, but not limited to, drive system alignment, equipment calibration, and other mechanical or electrical components of the equipment.

- B. The equipment startup shall be performed prior to Equipment Certification Testing and Operator Training.
- C. No form of energy shall be applied to any part of the system prior to receipt by the Engineer of a certified statement of approval of the installation from the Contractor. This certification shall contain a statement by an authorized representative of the equipment manufacturer that the equipment is ready for testing, as outlined below, and in Specification Section 11000, Part 1.3.
- D. As part of the equipment startup, the Contractor shall:
 - 1. Verify that the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
 - 2. Verify that all manual, automatic and safety control features of the equipment functions properly, including all alarm, activation and deactivation sequences.
 - 3. Verify that the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc. during normal operating conditions.
 - 4. Check amperage draws on all power feeds with equipment running under normal operating conditions.
- E. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified during the Equipment Certification Testing are within acceptable limits. The startup shall not be considered complete until the unit is fully capable of passing the Equipment Certification Testing.
- F. Where multiple units are provided, each unit shall under go startup procedures.
- G. The Contractor shall provide all power, chemical, tools, equipment, labor, water fuel, etc. as required for startup.
 - 1. The Contractor shall be responsible for all contacts and arrangements as necessary with the proper municipal departments and/or public utility companies to arrange for temporary and/or separate billing so that bills associated with testing and startup procedures can be easily identified.
 - 2. Contacts and arrangements with the local power company shall include, but not be limited to, all arrangements as necessary so that peak power demands incurred during testing and startup procedures will not become a part of the permanent record for determining future power demand charges for the Owner.
 - 3. All waste materials shall be disposed of by the Contractor in an environmentally acceptable manner at no additional cost to the Owner.
- H. The manufacturer representative shall fill out the Equipment Certification form included at the end of this Section. Startup will not be considered complete until this form has been provided to the Engineer.

3.2 CERTIFIED EQUIPMENT TESTING

- A. Certified Equipment Testing shall be performed after the Equipment Startup is completed and it has been verified that equipment functions in accordance with the requirements of the Contract Documents in all aspects. It is required that a duly authorized representative of the manufacturer, who is fully trained in the installation,

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startup and operation of the equipment, be in attendance for the Certified Equipment Testing.

- B. Certified Equipment Testing shall not be scheduled concurrently with the Equipment Startup without the prior approval of the Engineer. In all cases, if the Engineer has arrived on-site for the scheduled Certified Equipment Testing and the equipment is not capable of demonstrating complete compliance with the Contract Documents, or if the manufacturer's representative is not present, the Contractor shall be responsible for all costs to the Engineer associated with failed testing, including travel expenses. The importance of prior and proper equipment startup demonstrations to verify the requirements of the Certified Equipment Testing is stressed.
- C. At a minimum during the Certified Equipment Testing, the Contractor shall demonstrate to the complete satisfaction of the Engineer the following:
 - 1. That the equipment is installed properly and in accordance with manufacturer's requirements and instructions, and as such, it is appropriate to apply power to the units in question.
 - 2. That all manual, automatic and safety control features of the equipment functions properly, including all alarm, activation and deactivation sequences.
 - 3. That the equipment can operate without excessive noise, vibration, overheating, overloading, jamming, etc. during normal operating conditions.
 - 4. Amperage draws on all power feeds with equipment running under normal operating conditions.
 - 5. The noise level of equipment, drives and motors, unless otherwise noted, shall not exceed 90 dBA, as measured 3 feet from the unit under free field conditions.
 - i) Each unit shall be monitored for compliance independently with other area equipment deactivated.
 - ii) For monitoring, the equipment will be run under normal operation conditions.
 - iii) Contractor shall provide certified proof of calibration for instrument utilized to measure noise level.
 - 6. Other specific requirements as outlined within the individual specifications sections.
- D. Each piece of equipment shall be tested sufficiently to ensure that all features required to be demonstrated and/or verified are within acceptable limits.
- E. Where multiple units are provided, each unit shall under go Equipment Certification Testing procedures individually and then with multiple units on-line to verify the total systems output capacity and performance.
- F. The Contractor shall provide all power, chemical, tools, equipment, piping, labor, water fuel, etc. as required for startup. All waste materials shall be disposed of by the Contractor in an environmentally acceptable manner at no additional cost to the Owner.
- G. All equipment provided on the project shall be demonstrated to function properly. Demonstration as a component of an overall system shall not relieve the Contractor

of his responsibilities to demonstrate proper operation or verify specific requirements for each individual component.

H. Minimum Certified Equipment Testing Requirements for Pumps

1. If sufficient effluent is not available for tests, Contractor will provide water at his expense for testing, if so directed.
2. During tests, observe and record head, output, rpm and motor input. Sufficient test points shall be obtained to develop accurate pump system curve. If multiple operational points are specified, compliance with all points must be sufficiently demonstrated.
3. Fully demonstrate ability to operate at specified conditions without motor overload.
4. For mechanical seals, after a run-in period of 30 minutes, the seal area shall be wiped dry. The pump shall be operated for a 10 minute period. No measurable leakage shall be detected from the mechanical seal.
5. Refer to Sections 11000 and 15400, as applicable, for additional details.

I. Minimum Certified Equipment Testing Requirements for Instrumentation/Control Systems.

1. All instruments shall be calibrated in the presence of the Engineer.
2. All transmitters or direct-operated receivers shall be calibrated to imposed-input values representing zero percent, ten percent, and eighty percent of full scale.
3. The inputs and outputs of devices, as appropriate, shall be connected to manometers for differential pressure devices, or compared to measured levels, rates or quantities, during calibration. The receiving devices shall be adjusted to read the calibrated output of the initial calibration.
4. After placing each measuring system in service, an actual comparison of the measured variable versus readout shall be made. For each differential pressure based measuring system, a manometer shall be connected to the connections provided in the piping, tank or other appropriate device. Each system shall meet the manufacturer's standard accuracy.
5. Secondary functions, such as sequencing, timing features, alarm actuation and pacing shall be adjusted during initial calibration and demonstrated after the system is placed in service.
6. Linkage or range adjustments shall be sealed by colored lacquer in the presence of the Engineer immediately following calibration.
7. Process calibration, such as volumetric drawdown tests on flows and level measurements, shall be conducted on all measuring systems as requested by the Engineer. Once established as being within acceptable accuracy limits, future tests which require use of the measuring device to demonstrate system operations can utilize generation of mA signals to simulate level, flow or similar variable variations.
8. Refer to Sections 13440, 13443 and 15604, as applicable, for additional details.

- K. Minimum Certified Equipment Testing Requirements for Electrical Systems.
 - 1. Refer to Section 16950.

3.3 OPERATOR TRAINING

- A. Operator Training shall be performed by a duly authorized representative of the manufacturer, who is fully trained in the installation, startup and operation of the equipment.
- B. Unless otherwise noted within the specific specification sections, provide minimum of one day (8-hour days, not including travel time) of combined training and operational assistance for plant operators for each piece of equipment in the proper operations of provided equipment, and in the techniques, methods, schedules, etc. associated with maintenance.
- C. The level of the training and operational assistance provided shall be as required to ensure proper understanding of the equipment's operations, maintenance and warranty conditions. Should manufacturer require time in addition to the minimums indicated herein, or within the individual specification sections, to sufficiently detail the proper operations and maintenance of the equipment, it will be provided at no additional cost to Owner. Under absolutely no circumstances shall warranties become void due to Owner's failure to follow operational and maintenance procedures which were not fully detailed and described to Owner's representatives during these sessions.
- D. At the Owner's discretion, the training sessions may be video recorded for Owner's future use.
- E. Refer to individual equipment specification sections for further requirements.
- F. The manufacturer representative shall fill out the Equipment Training Certification form included within this Section. Training will not be considered complete until this form has been provided to the Engineer.

EQUIPMENT CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

As an authorized representative of the Equipment Manufacturer, the undersigned certifies that the equipment listed above conforms to the requirements of the construction contract between the Contractor and the Owner. The undersigned further certifies that the equipment has been installed in accordance with the Manufacturer's written instructions, that it is ready for permanent operation and that nothing in the installation will render the Manufacturer's warranty null and void.

(Authorized Representative
of the Manufacturer)

(Date)

(Witness)

(Date)

EQUIPMENT TRAINING CERTIFICATION

Owner: _____ Date: _____

Project: _____

Contractor: _____

Equipment Manufacturer: _____

Equipment: _____

1. I have trained the Owner's personnel in the proper operation and maintenance of the above equipment.

(Authorized Representative of the manufacturer) (Date)

2. The personnel listed below attended the training session.

(Owner's Representative) (Date)

3. Witnessed by

Wright-Pierce (Date)

Wright-Pierce
Engineers
99 Main Street
Topsham, ME 04086

END OF SECTION