

Part 1 General

1.1 INTENT

- .1 This Section specifies commissioning requirements common to all Division 21, 22, 23, & 25 equipment and systems starting and testing, Component Verifications and Systems Performance Verification Testing.
- .2 The Contractor shall expedite required revisions identified during the testing and verification in a cooperative manner to maintain the construction schedule.

1.2 WORK INCLUDED

- .1 General inspection and component verification of all mechanical equipment.
- .2 Specific equipment and system performance testing as specified herein or in other sections of the specifications.
- .3 Co-ordination with other trades and testing agencies including local Authority having Jurisdiction.
- .4 Integrated systems testing.
- .5 Instruction for the Departmental Representative's staff in the cleaning, maintenance and operation of the building systems, equipment and finishes.

1.3 OVERVIEW

- .1 The commissioning process follows a logical sequence, from Contractor equipment start-up and testing to Component Verifications through to System Performance Verification Testing and finally Integrated System Testing.
- .2 At completion of the commissioning process, all defined system components, each mode of systems operation, and each control sequence will have been started and tested in accordance with the Manufacturer's requirements and verified operational relative to design intent and operational requirements.
- .3 Equipment Starting and Testing:
 - .1 Complete equipment starting and testing procedures as defined in the respective Sections of this specification.
 - .2 All starting, testing, adjusting, balancing and calibration activities are to be documented by the Contractor.
 - .3 All Contractor and Manufacturer start-ups and testing procedures are to be completed and approved prior to conducting the System Performance Verification Testing defined herein.
 - .4 The Contractor will be responsible for identifying in the commissioning schedule, the required equipment starting and testing, including all Manufacturer's start-up and field verifications.

- .4 Component verification sheets shall be developed by this Contractor for each piece of equipment specified and installed. The Contractor shall be responsible for completion of these sheets.
- .5 System Performance Verification Testing:
 - .1 The System Performance Verification Tests provide a functional demonstration of the system performance during the various modes of operation including start-up, operation, shut down and various disturbance situations such as power failure and fire alarm.
 - .2 The System Performance Verification Tests shall be developed by the Contractor.
 - .3 All Contactor and Manufacturer's start-up and proving tests are to be completed and approved prior to conducting the defined System Performance Verification Tests.
 - .4 All Component Verifications and identified testing pre-requisites related to a given system, shall be completed and approved prior to conducting the defined System Performance Verification Testing.
 - .5 The Contractor will be responsible for the scheduling and implementation of the System Performance Verification Testing.
- .6 The commissioning process associated with the component and systems verifications does not negate the need for the normal contractor equipment and system start-up and proving and the associated training requirements.

1.4 RELATED REQUIREMENTS

- .1 Equipment start-up and testing procedures, including Manufacturer start-ups, specified in this and other Sections.

1.5 EQUIPMENT STARTING AND TESTING

- .1 Prior to starting and testing, ensure all equipment is cleaned and free of dust.
- .2 After testing, protect equipment from dust.
- .3 Do not conceal or cover components or equipment until inspected, tested and approved by the Commissioning Contractor.
- .4 Assume all liabilities associated with the starting and testing.
- .5 Assume all costs associated with the starting, testing, adjusting and balancing, including the supply of testing equipment.

1.6 WITNESSING OF EQUIPMENT STARTING AND TESTING

- .1 Prior to starting and testing of equipment and systems, prepare a schedule for the required starting and testing.

1.7 MANUFACTURER'S STARTING RECOMMENDATIONS

- .1 Prior to starting components or systems, obtain and review manufacturer's installation, operation and starting instructions. Read in conjunction with the procedures specified herein.
- .2 Use manufacturer's and supplier's starting personnel where required to maintain validity of manufacturer's warranty. Confirm with manufacturer that all testing specified in these specifications will not void any warranties.
- .3 Compare installation to manufacturer's published data and record discrepancies. Modify procedures detrimental to components performance prior to starting equipment.

1.8 CO-ORDINATION

- .1 Co-ordinate all sub-trades, other divisions, manufacturers, suppliers and other specialists as required to ensure all phases of work shall be properly organized prior to commencement of each particular start-up, testing and commissioning procedure.
- .2 Where any components or systems require testing prior to starting, ensure that such work has been completed and approved prior to starting of the components and systems.

Part 2 Products

- .1 Provide all instruments, meters, and equipment required to conduct tests during and at the conclusion of the project.

Part 3 Execution

3.1 EQUIPMENT STARTING AND TESTING

- .1 Schedule and complete the equipment start-up, run-ins and testing as defined in the respective Sections.
- .2 Submit all start-up and test reports, including Manufacturer's reports.
- .3 All start-up and testing is to be done in accordance with approved Manufacturer's procedures.

3.2 COMPONENT VERIFICATIONS

- .1 Complete Component Verifications in accordance with this Section.

- .2 In addition to the starting and testing requirements identified for each piece of equipment, as defined in the respective Sections, the Component Verifications sheets identified in this Section are to be completed by the Contractor.
- .3 The Component Verification sheets are used to track individual pieces of equipment and provide a 'Submittal Verification' and a 'Field Verification' of equipment.

The 'Submittal Verification' includes verifying and confirming the specified requirements against the shop drawing submittal data and the 'Field Verification' includes confirming that the installed parameters meet the specified requirements.

- .4 The Component Verification sheets shall be completed as follows:
 - .1 The 'Specified' fields on the sheet shall be completed by the Departmental Representative.
 - .2 The 'Shop Drawing' fields on the sheets shall be completed by the Contractor.
 - .3 The 'Installed' fields on the sheets shall be completed by the Contractor.
- .5 A Component Verification sheet is to be completed for each specified piece of equipment.

3.3 EQUIPMENT START-UP AND OPERATIONAL TESTING

- .1 Ventilation Systems
 - .1 Air Handling Units
 - .1 Check fit of all doors and casing joints for leakage.
 - .2 Check fit of all filter banks for bypass.
 - .3 Check internal surfaces for debris and general cleanliness.
 - .4 Verify fan rotation direction.
 - .5 Monitor operation of fans for abnormal vibration.
 - .6 Ensure bearings are greased.
 - .2 Exhaust Fans
 - .1 Check for good cleanliness.
 - .2 Verify fan rotation direction.
 - .3 Monitor operation of fans for abnormal vibration.
 - .4 Ensure bearings are greased.
 - .5 Ensure associated dampers operate as intended.
 - .3 Duct Systems
 - .1 Check duct sealing.
 - .2 Check duct identification.
 - .3 Check all manual balance dampers are secured and marked at balance point.

- .4 Check mounting of all grilles registers and diffusers.

END OF SECTION 23 05 90