

SECTION 23 08 00
COMMISSIONING OF HVAC SYSTEMS
Construction Specifications

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to the Work of this Section.
- B. Specific commissioning requirements are given in the following sections of these specifications. It is the contractor's responsibility to coordinate all HVAC systems testing with the GC and all other trades performing related testing services. The division 23 contractor shall provide all T24 required testing by what T24 calls "Certified Acceptance Test Technician". All such tests shall be provided to the districts CxA for inclusion into the CxA reports and submitted according to T24 requirements.
 - 1. 01 91 00, "General Commissioning Requirements"
 - 2. 26 08 08, "Commissioning of Electrical Systems."
 - 3. 22 08 08, "Commissioning of Plumbing Systems."
 - 4. 25 55 00, "Facility Management System"
 - 5. ASHRAE Guideline 0-2013 or superseding ASHRAE guideline
 - 6. Title 24/2016 Section 120.8 or superseding CA Title 24 requirement

1.2 SUBMITTALS

- A. General:
 - 1. Comply with Section –Submittal Procedures.
 - 2. See submittal requirements in Section 01 91 00–General Commissioning Requirements
- B. Prior to pre-functional testing:
 - 1. Provide a TAB and T24 testing plan for approval by the CxA
 - 2. Provide a DDC Systems test plan including project specific proposed I/O check and sequence test approval by the CxA in coordination with the FMS contractor
 - 3. Provide all Pre Functional Tests for approval to the CxA

1.3 COORDINATION

- A. The Contractor shall coordinate all testing and balancing and major equipment startup and installation with the Commissioning Provider (CxA) and the CM.
- B. For the primary HVAC equipment, the Controls Contractor shall provide a short discussion of the control of the equipment during the mechanical or electrical training conducted by others.
- C. Close coordination with the FMS provider is required to coordinate testing and commissioning requirements with the provider of the Facility Management System 25 55 00 as required to provide the necessary commissioning services for all metering equipment.

- D. Close coordination with the FMS provider is required to facilitate the installation of devices specified in 25 55 00. Even if provided by the FMS contractor, they are to be installed by the HVAC Contractor. All metering equipment provided by the FMS contractor may require assistance by the mechanical contractor for the testing and verification of the metering device.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

- A. All standard testing equipment required to perform startup and initial checkout and required functional performance testing shall be provided by the Trade Contractor for the equipment being tested.
- B. Datalogging equipment or software required to test equipment will be provided by the contractor, if required, but shall not become the property of the Owner.
- C. All testing equipment shall be of sufficient quality and accuracy to test or measure system performance required by the Contract Documents.

PART 3 EXECUTION

3.1 TESTING PREPARATION

- A. General Procedures are described in Section 01 91 00 – General Commissioning Requirements.
- B. Contractor shall perform all pre-functional performance tests with the tests approved by the CxA. The CxA and the owner shall be advised of all tests as required in this section and by the general commissioning requirements in 01 91 00.
- C. Pre-functional Checklists shall be completed and provided to the CxA for the following HVAC systems:
 - 1. Contractor to develop, fill out and sign approved pre-functional checklists according to 01 91 00 for the following equipment and systems. These tests shall be provided even if the CxA does not provide related Functional performance tests for these systems:
 - a. Chillers, Towers and related equipment
 - b. Boilers and related equipment
 - c. Chilled water system and pumps
 - d. Hot water system and pumps
 - e. Heat pumps systems and related equipment
 - f. Air Handling Units (with supply, return and outside air duct, variable air volume boxes and units, air distribution equipment, fan coil units, unit heaters, etc., and temperature control system)
 - g. Exhaust air systems (including fans, ductwork and interconnection with air handling/supply systems)
 - h. Supply or make-up air systems (including fans, ductwork and interconnection with air handling and/or exhaust systems)

- i. Terminal unit systems including but not limited to VAV's, FCU's, radiant zone systems or any other terminal space system
 - j. Specialty air removal/ventilation systems (including fans, ductwork and inter-connection with air handling/supply systems)
 - k. Equipment vibration monitoring systems (including sensors, transmitters and software)
 - l. HVAC, Test, Adjust, and Balance
 - m. Additional Items to be added as required
 - n. Btu Meters and associated sensor and equipment
 - o. Flow Meters
- D. Prerequisites for Functional Testing:
- 1. Contractor shall certify that HVAC systems, subsystems, and equipment are completed, calibrated, and started based on the tests verified and approved by the CP
 - 2. Contractor shall certify that air and water TAB has been completed with discrepancies and problems resolved.
 - 3. Contractor shall certify that HVAC instrumentation and control systems have been completed and calibrated; are operating according to the Contract Documents.
 - 4. Contractor shall certify that the Facility Management systems pre-functional testing has been complete per 25 55 00. Coordinate with the 25 55 00 contractor if their work is not thru the HVAC contractor.

3.2 FUNCTIONAL PERFORMANCE TESTING

- A. General procedures are described in the Division 01 Section "General Commissioning Requirements." 01 91 00
- B. Contractor shall execute all functional performance tests provided by the Commissioning Provider. No functional tests shall be performed without the CxA present.
- C. The details of the functional performance tests shall be reviewed and refined during the construction phase by the CxA. The final test will be provided to the contractor at least 5 business days before the test is conducted.
- D. The HVAC contractor is responsible to provide assistance in the implementation of the following minimum requirements. The tests are to be executed by the FMS contractor assisted by the mechanical contractor for the following items:
 - 1. A point to point checkout that includes the testing of all I/O points in all states. For Digital point that must include two positions, either active or inactive. Digital output points with associated digital input point that include status alarms do not need trending. For analog positions such as valves & actuators and I/O transmitters it must include both end positions and at least one position in between.
 - 2. The setup of trends for all I/O's and all setpoints. All digital points shall be based on COV. All analog point shall be 5 minutes or shorter.
 - 3. Testing of the stand-alone system based on the approved SOO.

4. The verification of all alarms per SOO.
5. All other tests as specified in 01 91 00

3.3 ELECTRONIC DOCUMENT REQUIREMENTS

- A. All working documents shall be provided in electronic format whenever feasible. Hard copies are only permissible if soft copies of the documents are not available.
- B. In addition to the hard copy requirements required in this section, at least all final documents shall be provided in pdf format, organized and tabulated identical to any hard copies provided. Coordinate media requirements with the owner at the time of submission

END OF SECTION