SECTION 23 08 00
COMMISSIONING OF HVAC SYSTEMS

PART 1 - GENERAL

1. DESCRIPTION

A. The requirements of this Section apply to all sections of Division 23.

B. This project will have selected building systems commissioned. The complete list of equipment and systems to be commissioned are specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. The commissioning process, which the Contractor is responsible to execute, is defined in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS. A Commissioning Agent (CxA) appointed by the Owner will manage the commissioning process

C. Commissioning (Cx) of the building mechanical systems and electrical systems as required by the International Energy Conservation Code.
   1. Exemptions:
      a. Buildings where the total mechanical equipment cooling capacity is less than 480 MBH and heating capacity is less than 600 MBH.
      b. Mechanical systems that serve dwelling units and sleeping units in hotels, motels, boarding houses or similar units.

2. SUMMARY

A. This Section includes requirements for commissioning the HVAC systems, subsystems and equipment. This Section supplements the general requirements specified in Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS.
   1. Commissioning is a systematic process of verifying that the building systems perform interactively according to the construction documents and the Owner's operational needs. The commissioning process shall encompass and coordinate the system documentation, equipment startup, control system calibration, testing and balancing, performance testing and training.
   2. Various sections of the project specifications require equipment startup, testing, and adjusting services. The Contractor shall complete those requirements in addition to the requirements specified by the Cx plan. Contractor to coordinate the work required by individual specification sections with the commissioning services requirements specified by the Cx Agent.
   3. The commissioning process does not take away from or reduce the responsibility of the Contractor to provide a finished and fully functioning product.
   4. Test and Balance (TAB), by a TAB specialist, of air and water systems is a requirement of this project. Refer to the TAB specification.

3. DEFINITIONS

A. Refer to Section 01 91 00 GENERAL COMMISSIONING REQUIREMENTS for definitions.

4. COMMISSIONED SYSTEMS

A. Commissioning of a system or systems specified in this Division is part of the construction process. Documentation and testing of these systems is required in cooperation with the Owner and the Commissioning Agent.

B. The following HVAC systems will be commissioned:
   1. Air Handling Systems (including terminal units and energy recovery units)
   2. Air Handling Systems (Fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, filters, dampers, safeties such as smoke detectors or freezestats and damper end switches, controls, gages, and vibration isolation).
   3. Dehumidification Systems (Energy recovery devices – such as enthalpy wheels, fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, filters, dampers, safeties, controls, gages, and vibration isolation).
   4. Heating Hot Water Systems (Boilers, controls, instrumentation and gages, flues, heating water pumps and motors, Variable Speed Drives, mixing valves).
   5. Condensate Return Systems (Condensate receivers and transfer pumps, motors, controls, pump alternator, alarms and instrumentation, deaerators, boiler feed pumps and motors, safeties).
   6. Chilled Water Systems (Chilled water pumps and motors, Variable Speed Drives, chiller motor/compressor, controls, instrumentation and safeties, isolation valves, blending valves, side stream water cleaners/scrubbers/filters).
   7. Condenser Water Systems for Chillers (Condenser water pumps and motors, Variable Speed Drives, cooling tower fans, cooling tower sump level controls, open-circuit water treatment system, water treatment injection pumps and motors, water treatment controls, cooling tower basin heaters and controls, side stream water cleaners/scrubbers/filters, tower bypass valves).
   8. Exhaust Fans (Fan, motor, Variable Speed Drives, controls and safeties).
   9. Steam System (Boilers, controls, gages and instrumentation, safety relief valves, combustion burners/fans/motors, fuel delivery pumps and motors, flues).
   10. Direct Digital Control System (BACnet or similar Local Area Network (LAN), Operator Work Station hardware and software, building controller hardware and software, terminal unit controller hardware and software, all sequences of operation, system accuracy and response time).
   11. Laboratory Exhaust Systems (Fume hoods, pressure controls, system alarms, fans, motors, and Variable Speed Drives).
   12. Laboratory Ventilation Systems (Supply air terminal units and controls, pressure controls and alarms, fans, motors, and Variable Speed Drives).
   13. OR Air Handling Systems (Fans, motors, Variable Speed Drives, Energy recovery devices – such as heat pipes, cooling coils and control valves, heating coils and control valves, filters, HEPA filter performance, dampers, safeties such as smoke detectors or freezestats and damper end switches, controls, gages, and vibration isolation).
   14. Radiology/Imaging Cooling Systems (Fans, motors, Variable Speed Drives, cooling coils and control valves, filters, dampers, safeties, controls, gages, and vibration isolation).
   15. Computer Room Air Conditioning Systems (CRAC units – including fans, motors, Variable Speed Drives, cooling coils and control valves, heating coils and control valves, humidifiers, compressors and liquid-cooled condensers, filters, safeties, controls, gages,

vibration isolation, condensate pumps, water/leak detection system and alarms, and shunt trip shut down).

16. Room Pressurization Equipment (Pressure sensors, terminal units/dampers, and controls and alarms).
17. HVAC Water Treatment Systems (Closed circuits – including shot feeders and final water analysis, open circuits – including water analysis, chemical/biocide tanks, injection piping, chemical/biocide pumps and motors, controls, water meter, and automatic blowdown).
18. Commercial Kitchen Hoods & Associated Fire Suppression Systems (Fans, motors, Variable Speed Drives, automatic shut down on fire suppression discharge, and gas valve operation).
19. Fuel Delivery and Storage Systems for Boilers and Standby Generators (Fuel level monitoring/controls/alarms, transfer pumps and motors, leak detection monitoring/alarms, and fill systems)

5. SUBMITTALS

A. The commissioning process does not require review of selected Submittals. At the Commissioning Agent's option, it may elect to review the submittals and must provide a list of submittals that will be reviewed to the General Contractor upon project engagement.

B. Commissioning Agent to Submit Following for Review and Approval:
   1. System Review Report
   2. Commissioning Plan
   3. TAB Review Report
   4. Preliminary Commissioning Report – Provide to Owner prior to request for final mechanical or electrical inspection.
   5. Final Commissioning Report

C. Copies of all Cx documentation shall be made available to the code official upon request.

PART 2 - PRODUCTS (Not Used)

PART 3 – EXECUTION

1. SYSTEM REVIEW REPORT:

A. The CxA shall review the Contract Plans and specifications and advise the Architect of any design deficiencies that would prevent the systems from effectively operating in accordance with the sequence of operation specified or prevent the effective and accurate commissioning of the system. The CxA shall provide a report individually listing each deficiency and the corresponding proposed corrective action necessary for proper system operation.

2. COMMISSIONING PLAN:

A. Plan shall include the following items:
   1. A narrative description of the activities that will be accomplished during each phase of commissioning, including the personnel intended to accomplish each of the activities.
   2. A listing of the specific equipment, appliances or systems to be tested and a description of the tests to be performed.
   3. Functions to be tested, including, but not limited to calibrations and economizer controls.

4. Conditions under which the test will be performed. At a minimum, testing shall affirm winter and summer design conditions and full outside air conditions.
5. Measurable criteria for performance.

B. Equipment Functional Testing
   1. Equipment functional performance testing shall demonstrate the installation and operation of components, systems, and system-to-system interfacing relationships in accordance with approved plans and specifications such that operation, function, and maintenance serviceability for each of the commissioned systems is confirmed.
   2. The Commissioning Agent will prepare detailed Systems Functional Performance Test procedures. The Contractor shall review and comment on the tests prior to approval. The Contractor shall provide the required labor, materials, and test equipment identified in the test procedure to perform the tests. The Commissioning Agent will witness and document the testing. The Contractor shall sign the test reports to verify tests were performed. Testing shall include all modes and sequence of operation, including under full-load, part-load and the following emergency conditions:
      a. All modes as described in the sequence of operation;
      b. Redundant or automatic back-up mode;
      c. Performance of alarms; and
      d. Mode of operation upon a loss of power and restoration of power.

C. Controls Functional Testing:
   1. HVAC control systems shall be tested to document that control devices, components, equipment, and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to document they operate in accordance with approved plans and specifications.

D. Economizer Functional Testing:
   1. Air economizers shall undergo a functional test to determine that they operate in accordance with the manufacturer's specifications.

3. TAB REVIEW REPORT:

A. The CxA shall review the written report, provided by the TAB contractor, describing the activities and measurements completed in accordance with the TAB. CxA to submit a report to the owner of any items not in compliance with the contract documents.

4. PRELIMINARY CX REPORT:

A. Preliminary commissioning report, completed by the CxA and identified as "Preliminary Commissioning Report", shall be provided to the owner and shall identify the following items:
   1. Itemization of deficiencies found during testing required by this section that have not been corrected at the time of report preparation.
   2. Deferred tests that cannot be performed at the time of report preparation because of climatic conditions.
   3. Climatic conditions required for performance of the deferred tests.

B. Acceptance of report
   1. Buildings, or portions thereof, shall not pass the final mechanical inspection until such time as the code official has received a letter of transmittal from the building owner acknowledging that the building owner has received the Preliminary Commissioning Report.

C. Copy of report
   1. The code official shall be permitted to require that a copy of the Preliminary Commissioning Report be made available for review by the code official.

5. FINAL CX REPORT:

A. Final commissioning report, completed by the CxA and identified as “Final Commissioning Report”, shall be provided to the owner and shall identify the following items:
   1. Results of functional performance tests.
   2. Disposition of deficiencies found during testing, including details of corrective measures used or proposed.
   3. Functional performance test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.
      a. Exception: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.
   4. Verify that Operations & Maintenance documentation is complete.
   5. Verify that Test and Balance documentation is complete.

B. Copy of report
   1. The code official shall be permitted to require that a copy of the Final Commissioning Report be made available for review by the code official.

C. Documentation requirements
   1. The documents described in this section be provided to the building owner within 90 days of the date of receipt of the certificate of occupancy.

END OF SECTION 23 08 00