

SECTION 18000

COMMISSIONING

PART 1 GENERAL

1.1 OBJECTIVE

- A. The objective with the commissioning effort is to make sure that all essential HVAC equipment and other building systems work as intended. The commissioning agent shall verify equipment performance and efficiency.

1.2 COMMISSIONING EFFORT

- A. The Construction Manager shall be the prime contractor and is responsible for the overall commissioning program and schedule together with the commissioning agent.

1.3 COMMISSIONING TEAM

- A. Each member of the commissioning team must attend commissioning meetings, in accordance with the Commissioning Agent's schedule.
- B. Commissioning team shall consist of the following:
  1. Commissioning Agent (to be determined by Dartmouth College)
  2. Construction Manager
  3. HVAC Contractor
  4. ATC Contractor
  5. Testing and Balancing Contractor
  6. Electrical Contractor
  7. Dartmouth Representative

1.4 FUNCTIONAL PERFORMANCE TEST

- A. Functional Performance Test (FPT) will take place as soon as equipment is ready to be tested and is in control. The system shall be started, tested, and balanced before the FPT. Before the FPT start, the construction manager shall provide the commissioning agent with the following:
  1. Preliminary O&M's (1 copy)
  2. Copy of on-site as-built drawings
  3. Preliminary balance report (if applicable)
  4. Factory start up personnel if required.

1.5 FUNCTIONAL COMPLETION

- A. The Commissioning Agent will submit a final commissioning report when all Division 18 requirements have been met.

1.6 COMMISSIONING SCHEDULE

- A. The Construction Manager's schedule for construction, shall include commissioning to be complete for Owner occupancy (except for seasonal tests).

**1.7 RESPONSIBILITIES**

- A. The Commissioning Agent shall:
  - 1. Plan and manage all functional performance tests.
  - 2. Develop commissioning schedules.
  - 3. Develop test procedures and forms for documentation of all equipment tests, system functional tests, and cross system functional tests.
  - 4. Provide qualified personnel for participation in commissioning tests.
  - 5. Provide engineering and technical expertise to oversee and direct the correction of deficiencies found during the commissioning process.
  - 6. Observe the start-up and initial testing of equipment by the Contractor and subcontractors, and then all final tests of equipment and systems.
  - 7. Manage all cross system testing such as HVAC, building fire alarm, emergency power, life safety, elevators, etc.
  - 8. Note any inconsistencies or deficiencies in system operations, enforce system compliance or recommend modifications.
  - 9. In the event that a functional test fails, the cause of failure shall be determined and rectified as soon as possible, and then retested.
  - 10. Review operation and maintenance information and as-built drawings provided by the various subcontractors and vendors for verification, organization, and distribution.
  - 11. Oversee and/or provide training for the systems specified.
  - 12. Verify installed equipment versus the submitted shop drawings for all systems treated. Provide written verification of all components within the tested systems for the final report. Verify that model numbers match and all motors are premium efficient type.

**1.8 RELATED WORK**

- A. A commissioning plan will be developed by the Commissioning Agent. Divisions 15, 16, and 17 are obligated to assist the Commissioning Agent in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation.

**1.9 WORK TO RESOLVE DEFICIENCIES**

- A. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process.

**1.10 SEASONAL COMMISSIONING AND OCCUPANCY VARIATIONS**

- A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part-load conditions in the spring and fall. Initial commissioning will be done as soon as contract work is completed regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different seasons.
- B. All equipment and systems will be tested and commissioned in a peak season to observe full-load performance. Each Contractor and supplier will be responsible to participate in the initial and the alternate peak season test of the systems required to demonstrate performance, as scheduled by the Commission Agent, with three day (minimum) advance notification.
- C. Subsequent commissioning may be required under conditions of minimum and/or maximum occupancy or use.

1.11 RECOMMISSIONING

- A. If more than three functional tests of the same system(s) are required, the Contractor shall reimburse all associated costs for the extraordinary participation of the A/E and Owner's staff.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT - PROPRIETARY

- A. Proprietary test equipment required by the manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist the Test Engineer in the commissioning process.
- B. Identify the proprietary test equipment required in the test procedures submittals and in a separate list of equipment to be included in the operations and maintenance manuals.

PART 3 EXECUTION

3.1 SYSTEMS TO BE COMMISSIONED

- A. HVAC
  1. Each exhaust fan.
  2. Each supply fan.
  3. Each return fan.
  4. Each air handling unit.
  5. Each HEX.
  6. Each pump set and system.
  7. Each air flow station.
  8. Each VSD.
  9. Fuel oil gauge and alarm system.
  10. Cabinet unit heaters and unit heaters.
  11. Each differential pressure valve.
  12. Each DDC terminal box.
  13. Steam system.
  14. Where pneumatic systems are installed, verify actual compressor run time versus the calculated run time.
  15. Air pressure in expansion tanks shall be measured and compared with specs. And the pressure reducing valve setting.
- B. Plumbing
  1. Domestic hot water heater system.

- C. Electrical
1. Generator , Automatic Transfer Switch, Annunciator and other control interfaces.
  2. Circuit breakers :verify trip settings.
  3. Fire Alarm System including interface to HVAC/ATC.
  4. Battery powered Emergency and Exit Lights. Buildings with battery powered emergency and exit lights, the system shall be subjected to the 1.5 hour test.
  5. Emergency Lighting Relays
  6. Addressable Smoke Detectors. Buildings with addressable fire alarm systems shall have all smoke detectors tested for cleanliness. The minimum acceptable parameter is level 9 (out of a possible 10). If the commissioning agent does not have the equipment to perform this test, Dartmouth College can perform the test inconjunction with the on-site agent.
  7. Variable Frequency Drives. Systems equipped with variable frequency drives shall be tested when the drive is engaged as well as in the bypass mode.
  8. Lighting Control Systems/Panels
  9. Lighting Control Devices (includes occupancy sensors, photocells and timers, dimmers, contactors, )
  10. Access Control Systems
  11. Uninterruptable Power Supplies (UPS)

END OF SECTION 18000