

## **SECTION 23 08 20 – COMMISSIONING: FACILITY START-UP**

### **PART 1 - GENERAL**

#### **1.1 SUMMARY**

- A. The purpose of this section is to specify Mechanical responsibilities and participation in the commissioning process.
- B. Commissioning is the responsibility of the Contractor (including subcontractors and vendors). The Contractor is responsible to provide all scheduling, coordination and support required for start-up, testing, and commissioning. Commissioning is intended to provide an indication of the tests which shall be performed by the Contractor prior to and including verification by the Owner's Representative. The commissioning process requires Divisions 22 and 23 subcontractors participation to ensure all portions of the work have been completed in a satisfactory and fully operational manner.
- C. Work of Divisions 22 and 23 includes the following:
  - 1. Start-up and testing of the mechanical equipment and systems
  - 2. Assistance in testing, adjusting and balancing
  - 3. Operating equipment and systems as required for commissioning tests
  - 4. Providing qualified personnel for participation in commissioning
  - 5. Providing equipment, materials, and labor necessary to correct deficiencies found during the commissioning process which fulfill contract and warranty requirements
  - 6. Providing operation and maintenance information and as-built drawings to the Contractor
  - 7. Providing assistance to the Contractor to develop and edit system operation descriptions
  - 8. Providing training for the systems specified in this division with coordination by the Contractor and Owner's Representative

#### **1.2 RELATED WORK**

- A. All start-up and testing procedures and documentation requirements specified within Divisions 22 and 23.
- B. Commissioning procedures that require participation of Divisions 22 and 23.
- C. Cooperate with the Testing, Adjusting and Balancing (TAB) firm in the following manner:
  - 1. Allow sufficient time before final commissioning dates so that testing, adjusting and balancing can be accomplished.
  - 2. Put all heating, ventilating, and air conditioning equipment and systems into full operation and continue the operation during each working day of testing, adjusting, balancing and commissioning.
  - 3. Provide labor and material to make corrections when required, without undue delay.
  - 4. Include the cost of exchange sheaves and belts as may be required by the TAB firm.

5. Provide test holes in ducts and plenums where directed or necessary for pitot tubes to take air measurements and to balance the air systems. Test holes shall be provided with an approved removable plug or seal. At each location where ducts or plenums are insulated, test holes shall be provided with an approved extension with plug fitting.
6. Provide pressure and temperature taps as indicated on construction documents in locations as required by the TAB firm to adequately test and/or balance the hydronic systems.

## PART 2 - PRODUCTS

### 2.1 TEST EQUIPMENT

- A. Provide test equipment as necessary for start-up and commissioning of the mechanical equipment and systems. The TAB firm will provide the test equipment required to perform TAB services.
- B. Proprietary test equipment required by the mechanical equipment manufacturer, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall demonstrate its use and assist the Contractor in the commissioning process.

## PART 3 - EXECUTION

### 3.1 WORK PRIOR TO COMMISSIONING

- A. Complete all phases of work so each system can be started, tested, adjusted, balanced, and otherwise commissioned. Divisions 22 and 23 subcontractors has primary start-up responsibilities with obligations to complete systems, including all sub-systems, so they are fully functional. This includes the complete installation of all equipment, materials, pipe, duct, wire, insulation, controls, etc., per the contract documents and related directives, clarifications, change orders, etc.
- B. A commissioning plan will be developed by the Test Engineer and approved by the Owner's Representative.
  1. Divisions 22 and 23 subcontractors are obligated to assist the Contractor in preparing the commissioning plan by providing all necessary information pertaining to the actual equipment and installation.
  2. If system modifications/clarifications are called for in the contractual requirements of this and related sections of work, they will be made at no additional cost to the Owner.
  3. If Contractor-initiated system changes have been made that alter the commissioning process, the Contractor will notify the Owner's Representative for approval.

- C. Specific pre-commissioning responsibilities of Divisions 22 and 23 subcontractors are as follows:
1. Factory start-up services for the following items of equipment: Air-handling equipment, heating equipment, cooling equipment, plumbing equipment, pumps, chillers, cooling towers, variable speed drives
  2. Normal start-up services required to bring each system into a fully operational state include the following:
    - a. Cleaning, filling, purging, leak testing, alignment, lubrication, motor rotation check, control sequences of operation, full and part load performance, etc.
    - b. The TAB firm will not begin the TAB work until each system is complete, including normal contractor start-up.
    - c. The Contractor will not begin the commissioning process until each system is complete, including normal contractor start-up, and the TAB work has been completed.
  3. Commissioning is intended to begin upon completion of a system but may proceed prior to the completion of systems, or sub-systems, and will be coordinated with the Contractor. Start of commissioning before system completion will not relieve Division 15 from completing those systems as per the schedule.
  4. Red-lined as-built drawings shall be available during commissioning.

### 3.2 PARTICIPATION IN COMMISSIONING

- A. Provide skilled technicians to start up all systems within Divisions 22 and 23.
1. These same technicians shall be made available to assist the Contractor and Commissioning Authority in completing the commissioning program as it relates to each system and their technical specialty.
  2. Work schedules, time required for testing, etc., will be requested and coordinated by the Contractor.
  3. Divisions 22 and 23 subcontractors shall ensure that qualified technician(s) are available and present during the agreed-upon schedules and for sufficient duration to complete the necessary tests, adjustment, and problem resolutions.
- B. System problems and discrepancies may require additional technician time which shall be made available for the subsequent commissioning periods until required system performance is obtained.
- C. The Owner's Representative reserves the right to judge the appropriateness and qualifications of the technicians relative to each item of equipment or system. Such qualifications include expert knowledge relative to the specific equipment involved, adequate documentation and tools to service/commission the equipment, and an attitude/willingness to work with the Contractor to get the job done.

### 3.3 WORK TO RESOLVE DEFICIENCIES

- A. In some systems, misadjustments, misapplied equipment and/or deficient performance under varying loads will result in additional work being required to commission the systems. This work shall be completed under the direction of the Owner's Representative with input from the Contractor and equipment supplier. Whereas all members will have input and the opportunity to discuss the work and resolve problems, the Owner will have final jurisdiction on the work needed to achieve performance.
- B. Corrective work shall be completed in a timely fashion to permit timely completion of the commissioning process.
  - 1. Experimentation to render system performance will be permitted.
    - a. If the Owner's Representative deems the experimentation work to be ineffective or untimely as it relates to the commissioning process, the Owner's Representative will indicate the nature of the problem, expected steps to be taken, and the deadline for completion of activities.
    - b. If deadlines pass without resolution of the problem, the Owner's Representative reserves the right to obtain supplementary services and/or equipment to resolve the problem.
    - c. Costs incurred to solve the problem in an expeditious manner will be the Contractor's responsibility.

### 3.4 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.
  - 1. Initial commissioning will be done as soon as contract work is completed regardless of season.
  - 2. Commissioning under conditions representing other than the current season may be undertaken at a later time by the Test Engineer and Commissioning Authority.
  - 3. Discrepancies discovered with the Contractor's equipment or workmanship will be handled as warranty items.
- B. Commissioning may be required under conditions of minimum and/or maximum occupancy or use.
  - 1. All equipment and systems effected by occupancy variations will be tested and commissioned at the minimum and peak loads to observe system performance.
  - 2. The Contractor will be responsible to participate in the occupancy-sensitive testing of systems to provide verification of adequate performance.
  - 3. If such occupancy is not available within the contract period, related commissioning may be undertaken at a later time by the Owner's Representative. The Contractor will not be expected to participate in this later commissioning.
  - 4. Discrepancies discovered with the Contractor's equipment or workmanship will be handled as warranty items.

### 3.5 RETESTING AND RECOMMISSIONING

- A. Any fault in material or in any part of the installation revealed by commissioning tests shall be investigated, replaced, or repaired by the Contractor, and the same test repeated at the Contractor's expense until no fault appears.

### 3.6 TRAINING

- A. Participate in the training of the Owner's engineering and maintenance staff, as required in Divisions 01, 22 and 23 Sections, on each system and related components. Training, in part, will be conducted in a classroom setting, with system and component documentation, and suitable classroom training aids.
- B. Training shall be conducted jointly by the Contractor, the Design Engineers, and the equipment vendors. The Contractor shall be responsible for highlighting system peculiarities specific to this project.

### 3.7 MISCELLANEOUS SUPPORT

- A. Divisions 22 and 23 subcontractors shall remove and replace covers of mechanical equipment, open access panels, etc., to permit Contractor and Owner's Representative to observe equipment and controllers provided. Furnish ladders and flashlights as necessary.

**END OF SECTION 23 08 20**