

## SECTION 01 91 13 - GENERAL COMMISSIONING REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- B. OPR and BoD documentation may be included by reference for information only.
- C. The Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
  - 1. Uniform General Conditions for Construction Contracts, State of Texas, 2010 (UGC).
  - 2. The University of Houston's Supplemental General Conditions and Special Conditions for Construction.

#### 1.2 SUMMARY

- A. Section includes general requirements that apply to implementation of commissioning without regard to specific systems, assemblies, or components. Commissioning is intended to achieve the following specific objectives according to the Contract Documents:
- B. Commissioning is intended to verify and document proper installation and intended full performance of building equipment, systems, and integrated systems.
- C. Related Sections:
  - 1. Section 01 79 00 – “Demonstration and Training”.
  - 2. Section 23 05 93 “Testing, Adjusting and Balancing”.
- D. INCLUDED SYSTEMS AND EQUIPMENT
  - 1. The following is a list of the equipment and system test requirements included in this section (not all systems may be applicable or included within the same commissioning contract):
  - 2. HVAC Systems
    - a. Air Handling Units
    - b. Exhaust Fans
    - c. Chilled Water System
    - d. Condenser Water Systems
    - e. Heating Hot Water System
    - f. Fan Coil Units
    - g. Air Terminal Units
    - h. TAB Verification

- i. Pressure Mapping
    - j. Building Automation System
  3. Electrical Systems
    - a. Normal Power Distribution System
    - b. Emergency Power Distribution System
    - c. Lighting & Daylighting Control Systems
    - d. Low Voltage (Telecom, Data, etc)
    - e. Lightning Protection
  4. Plumbing Systems
    - a. Domestic Hot & Cold Water Distribution
    - b. Vacuum Systems
    - c. RO Water System
    - d. Sump Pumps
    - e. Medical air, gas and vacuum systems
  5. Building Envelope & Roof System (Thermal Imaging)
  6. Conveying Systems
    - a. Elevator
  7. Life Safety Systems
    - a. Fire Suppression System
    - b. Fire Alarm System
    - c. Emergency Egress Lighting & Pressurization
  8. Security Systems
  9. Laboratory Equipment
    - a. Fume Hood
    - b. Biosafety Safety Cabinet
  10. Other Systems
    - a. Irrigation Systems

### 1.3 DEFINITIONS

- A. BCAS: Building Controls and Automation System: System and components associated with the Building Automation System (Refer to Section 23 06 00).
- B. BoD: Basis of Design. A document that records concepts, calculations, decisions, and product selections used to meet the OPR and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- C. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- D. CxA: Commissioning Authority.
- E. OPR: Owner's Project Requirements. A document that details the functional requirements of a project and the expectations of how it will be used and operated.

These include Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

- F. Systems, Subsystems, Equipment, and Components: Where these terms are used together or separately, they shall mean "as-built" systems, subsystems, equipment, and components.

#### 1.4 COMMISSIONING TEAM

- A. Members Appointed by Contractor(s): Individuals, each having the authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated action. The commissioning team shall consist of, but not be limited to, representatives of Contractor, including Project Superintendent and subcontractors, installers, suppliers, and specialists deemed appropriate by the CxA.
- B. Members Appointed by Owner:
  - 1. CxA: The designated person, company, or entity that plans, schedules, and coordinates the commissioning team to implement the commissioning process. Owner will engage the CxA under a separate contract.
  - 2. Representatives of the facility user and operation and maintenance personnel.
  - 3. Architect and engineering design professionals.

#### 1.5 OWNER'S RESPONSIBILITIES

- A. Provide the OPR documentation to the CxA and Contractor for information and use.
- B. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities.
- C. Provide the BoD documentation, prepared by Architect/Engineer and approved by Owner, to the CxA and Contractor for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

#### 1.6 CONTRACTOR'S RESPONSIBILITIES

- A. Contractor shall assign representatives with expertise and authority to act on its behalf and shall schedule them to participate in and perform commissioning process activities including, but not limited to, the following:
  - 1. Evaluate performance deficiencies identified in test reports and, in collaboration with entity responsible for system and equipment installation, recommend corrective action.
  - 2. Cooperate with the CxA for resolution of issues recorded in the Issues Log.
  - 3. Attend commissioning team meetings held on a variable basis.
  - 4. Integrate and coordinate commissioning process activities with construction schedule.

5. Review and accept construction checklists provided by the CxA.
6. Complete electronic construction checklists as Work is completed and provide to the Commissioning Authority on a weekly basis.
7. Review and accept commissioning process test procedures provided by the Commissioning Authority.
8. Provide all specialized tools, test equipment and instruments required to execute start-up, checkout, and testing of equipment
9. Complete commissioning process test procedures.
10. Successful Commissioning requires that installation of all building systems complies with Contract Document requirements and that full operational check-out and necessary adjustments are performed prior to Substantial Completion, with the exception of deferred tests approved in advance by Owner.
11. Contractor shall incorporate all commissioning and closeout documentation and/or verification into a Commissioning and Closeout Manual for the Owner as specified in 017700. The manual submitted to Owner must contain all documentation related to the Commissioning process, including but not limited to: all checklists, calibrations, related correspondence, test procedures and results, deficiency reports, data trends, punchlists, and signoffs.

#### 1.7 CxA'S RESPONSIBILITIES

- A. Organize and lead the commissioning team.
- B. Convene commissioning team meetings.
- C. In the schematic design and design development phases, support the design consultants with focused design reviews and supportive recommendations regarding construction document clarity, system and component accessibility and maintainability, training requirements and commissionability of the installed systems.
- D. In the construction phase, review submittals as an aid in development of functional testing procedures, to verify compliance with equipment specifications and to advise the Owner, Contractor, and A/E on overlooked procedures or issues with the submittals
- E. Provide project-specific construction checklists and commissioning process test procedures. Develop Functional Performance Tests based on submitted products and submit to Project Team for review and comment,
- F. CxA shall have the right to witness any startup and preliminary equipment testing.
- G. Verify the execution of commissioning process activities using random sampling. The sampling rate may vary from 1 to 100 percent. Verification will include, but is not limited to, equipment submittals, construction checklists, training, operating and maintenance data, tests, and test reports to verify compliance with the OPR. When a

random sample does not meet the requirement, the CxA will report the failure in the Issues Log.

- H. Prepare and maintain completed construction checklist log.
- I. Prepare and maintain the Issues Log.

## PART 2 - PRODUCTS

- 2.1 All specialized tools, test equipment and instruments required to execute start-up, checkout, and testing of equipment shall be of sufficient quality and accuracy to test and/or measure system performance within manufacturer's specified tolerances. A testing laboratory must have calibrated test equipment within the previous twelve (12) months. Calibration shall be NIST traceable. Contractor must calibrate test equipment and instruments according to manufacturer's recommended intervals and whenever the test equipment is dropped or damaged. Calibration tags must be affixed to the test equipment or certificates readily available.

## PART 3 - EXECUTION

- A. Commissioning kick-off meeting shall be held within 90 days of award of project.
- B. Approximately 6 to 8 weeks prior to the commencement of equipment start-ups, the CxA shall conduct a commissioning functional testing schedule workshop with the Commissioning Team in order to establish a coordinated approach to the integration of the function testing activities within the master construction schedule.
- C. Each system shall be operated through all modes of operation (seasonal, occupied, unoccupied, warm-up, cool-down, part- and full-load, etc.) where there is a specified system response. Systems shall also be tested under "black start" conditions in which all systems are powered down to verify correct transition and start-up of systems under emergency power conditions. Verifying each sequence in the specified sequence of operation is required including responses to conditions such as power failure, freeze condition, low oil pressure, no flow, equipment failure, etc.
- D. Each contractor shall comprehensively test all systems for which they are responsible to provide to the project. Systems that contain many repeated identical devices may be selected and demonstrated to the project team based on a sampling strategy at the option of the owner. However, no fewer than 20 percent of any group of identical devices shall undergo functional testing.
- E. Opposite Season Testing: Testing procedures shall be repeated and/or conducted as necessary during appropriate seasons. "Opposite season" testing is primarily for environmental systems and shall be required where scheduling prohibits thorough testing in all modes of operation. Air Handler and Central heating system testing for heating related modes of operation and control loops shall be tested when there is an

adequate differential temperature between the outside air and the conditional air within the facility to place a demand on the operational systems. The CxA shall schedule the opposite season testing during the warranty period to coincide with a design day condition when possible.

- F. CxA shall document results of Functional Performance Test to FPT forms. Deficiency or non-conformance issues shall be noted and reported to commissioning team as a punchlist item with specific responsibility indicated. Corrections of minor deficiencies identified may be made during testing at discretion of CxA. In such case, deficiency and resolution shall be documented on procedure form and to punch list as a resolved issue.
- G. Contractors shall be held responsible for expenses incurred by Owner for retesting due to the contractor's state of reported readiness or lack thereof as represented on the checklists. Cost to recheck checklist or re execute Functional Performance Test, if Contractor is responsible for deficiency or failure, shall be Contractor's.

END OF SECTION 01 91 13