

**SECTION 23 80 00
HVAC COMMISSIONING**

PART 1 GENERAL

1.01 REFERENCE STANDARDS

- A. ASHRAE Guideline 0-2005 - The Commissioning Process; 2005, with Errata (2011) .

1.02 RELATED DOCUMENTS

- A. The Contractor is referred to the "Special Notice to Contractors Summary Form " , the "Form of Proposal"; the "Form of Bid Bond"; "Division 1 - General" of the "Contract Specifications"; the "Contract Drawings" and all Amendments and Addenda thereto; all of which govern the Work of this Section. .
- B. All related Commissioning activity shall be the full responsibility of contractor.
 - 1. Related Specifications
- C. This section includes general requirements that apply to implementation of the commissioning process without regard to specific systems, assemblies, and components.

1.03 DESCRIPTION OF WORK

- A. The purpose of this section process is to provide the Authority with assurance to upgrade this project, fully installed, and fully functional in accordance with the contract documents and to the satisfaction of the NYCHA related HAC operation
- B. Commissioning is intended to enhance the quality of system balancing and aid in the orderly completion and transfer of systems for beneficial use by the owner. The HVAC contractor will be the leader of the commissioning team, planning and coordinating all commissioning activities in conjunction with the design professionals, construction manager, subcontractors, manufacturers, and equipment suppliers.
- C. The construction manager, general contractor, and sub-contractors shall be responsible for cooperating, and coordinating the work, of this section. They shall also be responsible for carrying out all the scheduling activities required for installation of new components and modified systems, and operating them during the commissioning process as required in this Section.
- D. All systems identified in Part B – Related Sections are to be inspected, tested, signed off by installing contractors as complete and operational, and operated for the Commissioning Authority verification as described in Part 3 of this section.
 - 1. RELATED SECTIONS
 - 2. Related Sections include the following:
 - a. Division 23, Section Testing and Balancing
 - b. Division 23, Section sequence of operation

1.04 ALL ALLOWANCES SHALL BE RESPONSIBILITY OF CONTRACTOR

- A. The "Schedule of Allowances shall covers labor, instrumentation, tools, and equipment costs for technicians for the performance of commissioning testing.
- B.

1.05 UNIT PRICES

- A. Commissioning testing allowance may be adjusted up or down by the "List of Unit Prices" Article in Division 1 Section "Unit Prices" when actual man-hours are computed at the end of commissioning testing, shall be submitted to Authority.

1.06 QUALIFICATIONS

- A. Commissioning Authority Qualifications
 - 1. The Commissioning Authority is an independent agent and shall be retained by the contractor. The agent must maintain an unbiased approach to problem solving and conflict resolution. In addition the commissioning agent shall:
- B. Be certified as an independent commissioning authority by the AABC
- C. Possess knowledge of the systems, including the design, optimization, installation, operations, acceptance testing, training and maintenance.
- D. Have practical field construction background.
- E. Demonstrated ability to organize many specific activities into a coherent commissioning plan.
- F. Communication skills, both written and verbal.
- G. Proficiency in documentation.
- H. Experience in writing and directing functional performance tests.
- I.

1.07 COMMISSIONING TEAM

- A. The commissioning team will be comprised of representatives from each discipline involved in the commissioning process. The core members of the team will be required to attend all meetings. The core team members include the following:
 - 1. Owner
 - 2. Architect
 - 3. Engineers
 - 4. Construction Manager (General Contractor)
 - 5. Mechanical Contractor
 - 6. Electrical Contractor
 - 7. Automatic Temperature Control Contractor
 - 8. TAB Agency

1.08 TEAM MEMBERS APPOINTED BY CONTRACTOR(S):

- A. Representatives of each contractor, including project superintendent and subcontractors, installers, vendor, suppliers, and specialists deemed appropriate by the CxA. The individuals shall each have authority to act on behalf of the entity he or she represents, explicitly organized to implement the commissioning process through coordinated actions.
- B. The commissioning team will meet on a regular basis as defined by the CxA in the “kick-off” meeting. The frequency of the meetings will be determined by the activity of the construction and the nearness to completion of each specialty.

1.09 COMMISSIONING DOCUMENTATION & SUBMITTALS

- A. The Commissioning Plan
- B. Develop the Commissioning Plan based on scope of work , and plans
 - 1. Submit the commissioning plan to NYCHA detailing check lists, procedures for testing, balancing and related information.
 - 2. The plan will be updated throughout the project and will consist of, at a minimum, the following:
 - 3. The scope of the commissioning
 - 4. The commissioning team
 - 5. Reference documents
 - 6. Schedule
 - 7. Checklists

8. Start-up forms
 9. Functional performance tests
 10. Operation & Maintenance staff orientation and training
 11. Documentation requirements
- C. Statement of Readiness – The contractor will provide the a written statement of readiness, certifying that systems, sub-systems, equipment, and associated controls are ready for testing, manufacturer’s checklists are completed, and system verification checklists are completed.
 - D. Statement of Completion of Installation and Start-Up – The contractor will provide a written statement that installation, pre-start, and startup activities have been completed. The statement shall include completed checklists provided by the contractor, and subcontractors as indicated in the commissioning plan.
 - E. Verify and Document Pipe Cleaning and Flushing Report shall verify that pipe cleaning, flushing, hydrostatic testing, and chemical treating have been completed. Verification will include test forms and reports by the contractor, sub-contractors and vendors.
 - F. Test and Inspection Reports – The contractor shall compile and submit specified tests, inspection reports and certifications, and shall provide these to include them in systems manuals and the commissioning report.
 - G. Final Commissioning Report – The contractor commissioning agent will prepare and submit the final commissioning report to the owner.

1.10 DEFINITIONS

- A. AContract existing conditions, and drawings are Basis of Design to satisfy performance, and applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
- B. Commissioning Plan: A document, prepared by agent, retained by contractor that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process.
- C. Agent: Commissioning Authority shall be retained by contractor as his/her sub-
- D. OPR: Owner’s Project Requirements. The document, prepared for the Owner, that details the functional requirements of the Project and expectations of how it will be used and operated. This document includes Project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.
- E. Systems, Assemblies, Equipment, and Components: Where these terms are used together or separately, they shall mean “as-built” systems, assemblies, equipment, and components.
- F.

1.11 REFERENCES

- A. ACG Commissioning Guideline-2005
- B. ASHRAE Guideline 1-2007 The HVAC Commissioning Process
- C. ASHRAE Guideline 0-2005 The Commissioning Process

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 COMMISSIONING RESPONSIBILITIES

3.02 CONTRACTOR TEAM MEMBERS

- A. The Commissioning Authority shall:
 1. Plan, organize, and implement the commissioning process as specified herein.

- a. Organize and lead the commissioning team.
 - b. Perform document review:
- B. Review the contract documents to obtain a full and complete understanding of the project requirements.
- C. Review the design documents to verify the OPR has been addressed and that adequate testing can be performed in order to document that the systems, equipment, and components will comply with the Contract documents
- D. Review the design documents for equipment accessibility for testing, service and maintenance.
- E. Review equipment submittals for use in developing testing procedures used in the commissioning plan.
- F. Develop the commissioning schedule to parallel the construction schedule. The schedule will be reviewed and adjusted as needed at each commissioning meeting, and will include, but will not be limited to:
 - 1. Commissioning meetings.
 - 2. Construction review and static testing.
 - a. Pre-start and start up check list procedures.
 - b. System Verification Checklists
 - c. Functional Performance and Tests.
 - d. Owner training.
 - e. Special testing.
 - 1) Off-season testing.
 - 2) Near end of warranty review
- G. Schedule regular commissioning meetings, attended by all team members and designed to keep the commissioning events on schedule.
- H. The “kick-off” meeting will be scheduled early in construction to review the commissioning plan.
- I. Regular meetings to review the schedule, RTF list, and other relevant matters will be scheduled once a month beginning early in the construction, and becoming more frequent (once a week) as equipment start-up approaches.
- J. Prepare and distribute commissioning meeting minutes for commissioning team members.
 - 1. Develop Resolution Tracking Forms (RTFs) to document critical path issues, non-compliance items, or deficiencies encountered during the commissioning process. The RTF format will include:
- K. A specific and individual number for each issue.
 - 1. A description of the issue.
 - 2. The date the issue was discovered.
 - 3. The date of comments and updates about the issue.
 - 4. The date the issue was corrected and identification of the responsible party.
 - 5. The date of the final verification by the CxA.
- L. Prepare the commissioning plan, and ensure its distribution for review and comment.
 - 1. Review the construction periodically to observe the general installation, the installation prior to burial or concealment, and to witness static testing (duct, hydronic, etc). Results of the reviews and tests will be included in the final commissioning report and critical path issues encountered will be included on a Resolution Tracking Form.
 - 2. Revise the commissioning plan as required during construction.
 - 3. In conjunction with the project manager or general contractor, coordinate commissioning activities among all contractors, sub-trades, and suppliers.
 - 4. Develop System Verification Checklists (SVCs) for each piece of equipment to be started up.

- M. The SVC will include a pre-start check, as well as start up data to document the proper procedures used per the specification and the equipment manufacturer.
- N. Witness and sign off on the SVC along with the representative contractors responsible for the start up procedures.
- O. Enter any issues discovered on the Resolution Tracking Form (RTF) for resolution prior to continuing with the SVC.
- P. Develop Functional Performance Tests (FPTs) to challenge each component, piece of equipment, and system.
- Q. The FPT will be supervised by the CxA with each associated contractor in attendance to operate the equipment for the test.
- R. The contractor will provide specified equipment or devices necessary to provide artificial loading.
- S. Monitor controls point-to-point checks done by the controls contractor, and ensure the results are documented as the checks are executed.
- T. Observe start-ups and initial system operations tests and checks.
- U. Direct the contractors to operate equipment and systems as required to ensure that all required Functional Performance Tests are carried out for verification purposes.
- V. Witness all Functional Performance Tests and document the results.
- W. Prepare and submit a commissioning report, which documents all checks and tests done throughout the commissioning process, and the results obtained from each.
 - 1. Ensure specified O&M manual, instructions, and demonstrations are provided to the Owner's designated operating staff.
- X. Schedule the contractors and vendors for O & M training.
- Y. Video record training sessions.
- Z. The contractor will supply one complete set of O & M data to the CxA prior to the completion of construction.
 - 1. Commissioning Report: The report will include a narrative description of systems, equipment, and components for each division of the specifications commissioned. In addition, the commissioning report will include, but will not be limited to:
 - a. Executive Summary
 - b. Manufacturer's checklists.
 - c. Resolution Tracking Forms (RTFs).
 - d. System Verification Checklists (SVCs).
 - e. Functional Performance Tests (FPTs).
 - f. Functional Performance Test summaries
 - 1) Site Observation Reports
 - 2) Design Reviews
 - 3) Submittal Reviews
 - 4) O&M Manuals Reviews
 - 5) As-Built Drawings Reviews
 - 6) O&M Training Documentation
 - 7) Start-Up Documentation
 - 8) TAB Report Review and Verification
 - 9) Commissioning Specification
 - 10) List of Acronyms and Abbreviations
 - 2. Off- Season Mode Testing: plan for off-season mode testing that may be required to properly test systems, equipment, or components.
- AA. Notify the appropriate contractor of the off-season test requirements.
- BB. Report off-season mode tests as an addendum to the commissioning report.

CC. Owner

DD. Provide the OPR documentation to the CxA.

EE. Assign operation and maintenance personnel and schedule them to participate in commissioning team activities, including witnessing functional performance testing.

FF. Provide the documents, prepared by Architect and Engineers (the Design Authority) to the agent for use in developing the commissioning plan, systems manual, and operation and maintenance training plan.

1. Ensure engagement of the operation team in the commissioning process.

GG. Architect

- a. Review the commissioning plan.
- b. Provide information to contractors as requested.
- c. Review and approve all changes.
- d. Participate in commissioning meetings as appropriate.
- e. Review site work as necessary
- f. Analyze the installation and building performance
- g. Provide final acceptance of the building

HH. Mechanical Engineer

- a. Review the commissioning plan.
 - b. Provide information to contractors as requested.
 - c. Review and approve any changes.
 - d. Participate in commissioning meetings as appropriate.
 - e. Review site work as necessary
 - f. Witness TAB verification
 - g. Witness functional performance testing
 - h. Analyze the installation and system performance
 - i. Provide final acceptance of the systems
2. Contractor Responsibilities
 3. The Contractor and his subcontractors at a minimum shall assign representatives with expertise and authority to act on their behalf and shall schedule them to participate on the contractor assigned Commissioning Team and perform commissioning process activities including, but not limited to the following:
 4. Evaluate performance deficiencies identified in test reports and with approval of the design authority and the entity responsible for system and equipment installation implement corrective action.
 5. Cooperate with CxA for resolution of issues recorded in Resolution Tracking Form (RTF)
 6. Attend and participate in commissioning team meetings.
 7. Integrate and coordinate commissioning process activities into the construction schedule.
 8. Review and accept construction checklists provided by the commissioning authority.
 9. Complete manufacturer and commissioning checklists as work is completed and provide to the commissioning authority on a regular basis.
 10. Review and accept commissioning process test procedures provided by the commissioning authority.
 11. Complete commissioning process test procedures.
 12. Sub-Contractors
 - a. Participate in commissioning team meetings.
 13. Cooperate with all commissioning team members and work in a cohesive manner to accomplish the commissioning process objectives.
 - a. Provide schedules for O&M data submittals and equipment start up and testing to the CxA for incorporation into the commissioning plan. Update the schedule on a regular basis throughout the construction phase.
 - b. Provide information to the CxA for developing the construction phase commissioning plan.

- c. Participate in specified training sessions for owner's O & M personnel.
 - 1) Provide statements of system readiness for testing.
 - (a) Gather and submit O & M data, coordination drawings and as-built drawings to the CxA.
- d. Assign technicians who are familiar with the construction and operation of the installed systems to operate and participate in the testing of the systems, assemblies, equipment, and components.
- e. Assure that all subordinate contractors (sub-sub contractors, etc) meet the requirements of this section.
- f. Assure that vendors and suppliers required for the commissioning process is properly coordinated, scheduled, and participate as required.
- g. Complete the pre-start and start-up system verifications checklist (SVC) and manufacturer checklists.
- h. Operate the equipment and systems for the Functional Performance Tests (FPTs).

END OF SECTION 23 80 00