SECTION 01 91 00
COMMISSIONING REQUIREMENTS

PART 1 GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis rigor for the commissioning process. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA.

1.2 LESSONS LEARNED

A. This guideline is intended for large campus managed projects such as new buildings or large renovations. It should be modified for smaller projects such as renovations and equipment replacement as agreed upon by UTA. The purpose of this guideline is not to meet any external standard such as GCBI or ASHRAE but to be used as a process to thoroughly and efficiently ensure the quality and operation of the installed systems.

B. It should be a goal for the testing documents be written, reviewed and finalized before the equipment startup process begins. Waiting to accomplish these tasks toward the end of the project will result in a compromised commissioning effort.

C. All functional testing will be done through the server at UTA's EMS systems front end. Commissioning through an equipment controller is not acceptable.

D. The contractors commissioning coordinator should not be the superintendent or project manager. The commissioning coordinator should be a person that will have this responsibility already budgeted into their time not just added to their work load as an extra item.

E. A controls sequence of operations meeting should be held early on in the construction process before any test documents are written. This is so everyone including the controls contractor agrees with the sequence of operations. Any changes in this meeting will be officially published to the project team by the PSP.

F. As much as possible the person in charge of conducting the testing on the contractor's team should be involved in reviewing the documents.

G. Including specification section numbers in the Cx documents will make it clear that these are requirements and not above and beyond the project scope.

H. Weekly meetings should be held and the following items should be discussed:

1. Schedule of activities including TAB, Pre-functional testing and functional testing.
2. Controls status
3. Deficiency Logs
4. Equipment matrix
5. Issues holding up the commissioning process and resolutions with action items identified and assigned to individuals.

1.3 SUMMARY

A. Commissioning is a process used to ensure a facility performs as intended by the contract

documents. The process provides assurance that all building systems have been installed and operated throughout their full range of intended operation, and that anticipated failures have been initiated or simulated to verify correct operation in all operational modes. All commissioning activities are to be properly documented.

B. UTA will be directing and performing the commissioning process with required assistance from the contractor as outlined in this specification.

C. Commissioning requires cooperation and direct involvement by all parties throughout the construction process. Successful commissioning requires not only that all building systems and assemblies comply with contract requirements but also that installation is achieved early enough in the construction phase to allow full operational check-out, testing, and adjusting of equipment and systems prior to Substantial Completion. Planning adequate time for testing, adjusting and balancing, functional testing, will require the development and maintenance of a detailed commissioning schedule with input from, and the active participation of, all members of the commissioning team.

D. In addition to fulfilling scheduling and planning requirements, the Contractor is responsible for verifying and documenting equipment and system installation as well as demonstrating and documenting operational performance of all systems and assemblies. Providing access to equipment and personnel required to operate the machinery. The cost of commissioning administration as outlined in this specification shall be shown as a separate line on the Contractor's schedule of values.

E. The Contractor is responsible for all commissioning responsibilities contained in the Contract Documents as directed. The Contractor shall submit to the Owner the resume of a proposed qualified individual to act as the Contractor's Commissioning Coordinator (CxC). Qualifications shall include substantial MEP, HVAC and/or building automation experience, a fundamental understanding of the total building commissioning process, and supervisory or management experience. The Owner must approve the individual proposed for the CxC position. The CxC may have additional duties such as MEP Coordinator, or Project Engineer, but not Project Manager or Superintendent. The Contractor may elect to outsource the CxC position to a third party firm with the approval of the Owner, which will be contingent upon review of proposed individual's qualifications to fill the position.

1.4 DEFINITIONS

A. The term "Contractor", as used herein, shall refer to the party having a contract Agreement with the Owner to provide construction services for the project. This term is to apply whether such contracting firm is engaged as a Prime Contractor, General Contractor, Construction Manager at Risk or Design/Build Contractor as appropriate to the particular contract agreement.

B. The term "Architect" or "A/E" as used herein, shall refer to the Prime Design Architect/Engineer Firm responsible for proving design services for the project and for affixing professional seal and signature to the construction documents, whether their contract is with the Owner or with a Design/Build Contractor as appropriate to the particular contract agreement.

C. The term "Subcontractor," as used herein, shall refer to any subcontractor, vendor, supplier, etc., that has a contractual agreement with the Contractor or Owner to provide goods or services to the project.

D. The term "FTC" will refer to a Functional Test Checklist. This document verifies the installation and functional readiness of the equipment on the equipment matrix.

E. The Term "Cx Team Members" as used herein, shall refer to all parties which represent the Owner, A/E, Contractor, Subcontractors, Manufacturers, Vendors, and Suppliers and Consultants associated with the project.

1.5 RELATED DOCUMENTS

A. The Uniform General and Supplemental Conditions, applicable requirements of all Divisions of the Contract Specifications and all Contract Drawings apply to work of this Section. In the event of conflict between specific requirements of the various documents, the more restrictive, the more extensive (i.e., more expensive) requirement shall govern.

1.6 WORK INCLUDED

A. Scope Summary (Section 1.5)

B. Commissioning Plan (Section 1.6)

C. Commissioning Documentation Requirements (Section 1.7)

D. Commissioning and Closeout Manual (C&C) (Section 1.8)

E. Test Equipment (Section 2.1)

F. Commissioning Schedule (Section 3.1)

G. Required Commissioning Meetings (Section 3.2)

H. Contractor's Verification of Installation (Section 3.3)

I. Initial Startup (Section 3.4)

J. Functional Testing (Section 3.5)

K. Owner Training (Section 3.6)

1.7 SCOPE SUMMARY

A. It is of primary concern that all systems installed in the project perform in accordance with the design intent and the Owner's specified operational needs. This is particularly critical for systems affecting life safety, building controls, plumbing, HVAC, lighting and power delivery systems. The process of assuring that such performance is achieved and appropriately documented is commonly referred to as "Commissioning."

B. This Section establishes minimum general and administrative requirements pertaining to documentation of installation, startup and performance testing of equipment, devices, assemblies and building systems. Additional technical and operational requirements for particular systems and components are established in the various technical Sections of the specifications.

C. The Commissioning and Closeout Manual (C&C Manual) contains the necessary documentation for the commissioning process including: Equipment matrix, Functional Testing, Equipment Start-up, required forms from the State Fire Marshal and other inspection and test report forms required by the contract documents. Although the C&C Manual may illustrate the extent of the commissioning effort, it does not limit it. The Owner is maintaining this manual to standardize the commissioning process and aid the Contractor. The Contractor shall enforce use of these forms for commissioning documentation.

D. The Owner’s Quality Assurance (QA) testing and inspection program is independent of the

Commissioning program. The Contractor is required to perform all testing as specified in the contract documents in addition to the Commissioning requirements outlined herein. Coordination of these processes by the Contractor will help minimize any duplication of effort. Unless stipulated elsewhere in the contract documents, QA testing and inspection documentation shall be provided for inclusion in the Commissioning and Closeout Manual.

1.8 COMMISSIONING PLAN

A. The Commissioning (Cx) Plan identifies processes and procedures necessary for a successful commissioning effort. The Owner is responsible for development, implementation and maintenance of the commissioning plan, and associated tools for scheduling and tracking Cx activities. The Contractor is required to review and submit recommended changes. The Preliminary Cx Plan is included in the appendix of this specification.

1.8.A.1 Project Commissioning Team Members

1.8.A.1.1 As a minimum, these will include:

1.8.A.1.1.1 Contractor's Commissioning Coordinator (CxC)

1.6.1.1.1.3 A/E and relevant consultants

1.6.1.1.1.4 Institution representatives

1.6.1.1.1.5 Subcontractors

1.6.1.1.1.6 Manufacturer, Vendors and Suppliers as appropriate

1.6.1.1.1.7 Owner's Testing, Adjusting and Balancing (TAB) contractor

1.6.1.1.1.8 Independent testing labs

1.6.1.2 Commissioning Activities

1.6.1.2.1 These activities shall be identified and tracked by the Contractor and coordinated with the Owner and Owner designated consultants and shall include, but not be limited to:

1.6.1.2.1.1 Inspections/Tests (As required by plans and specifications)

1.6.1.2.1.3 Equipment Startup

1.6.1.2.1.4 Coordinate Functional Tests

with the Owner.

1.6.1.2.1.5 Training

1.6.1.3 Commissioning Responsibilities

1.6.1.3.1 This shall be part of the Commissioning Plan and modified to include all necessary entities with an interest or role in each commissioning activity. The Cx activities shall be updated to reflect all Cx activities included in the project.

1.6.1.4 Equipment Matrix

1.6.1.4.1 The Owner will prepare an equipment matrix. This matrix shall contain a complete

listing of operating equipment, devices, and systems, with certain information as herein noted. The Contractor will review the equipment matrix and assist in identifying and prioritizing components, equipment, and systems to be commissioned.

1.6.1.4.2 The equipment matrix shall be formatted as an electronic spreadsheet with capability for the printing of selected data columns (ranges) to meet documentation requirements at various stages of construction, and for various purposes as required by other technical specification Sections. The Preliminary Equipment Matrix is included at the end of this section.

1.6.1.4.3 The matrix shall (at a minimum) identify all operable devices and equipment to be commissioned.

1.6.1.4.4 The matrix shall be populated with all available information for the Commissioning Kickoff Meeting. The equipment matrix may include additional columns for progress tracking but shall, as a minimum, include the following data for each device:

1.6.1.4.4.1 Brief equipment identification text 1.6.1.4.4.2

Equipment or device ID number (device tag)

1.6.1.4.4.3 Startup inspection required (Yes/No) 1.6.1.4.4.5

Governing specification section 1.6.1.4.4.6

Appropriate submittal reference number(s)

1.6.1.4.4.7 Installation location, by room number or column coordinates, as indicated in contract documents.

1.6.1.4.4.8 Actual date of Submittal Approval

1.6.1.4.4.9 Manufacturer and model number

1.6.1.4.4.10 Actual date of the Equipment Startup by the Contractor

1.6.1.4.4.11 Actual completion date of Functional Testing

1.6.1.4.4.12 Trending Data required (Yes/No)

1.6.1.4.4.13 Date of Trending Data Delivery (graphical data and tabular logs to be filed in the Commissioning and Closeout Manual)

1.6.1.4.4.14 Date of completion of Training

1.6.1.5 During construction, the matrix data shall be continuously updated at regular intervals and provided to all commissioning team members. The matrix is to be stored in the Commissioning and Closeout Manual under a separate tab and updated as commissioning activities/documentation are completed. Updates should occur at least weekly, and more often as deemed necessary by the Owner.

1.7 COMMISSIONING DOCUMENTATION REQUIREMENTS

1.7.1 To verify the commissioning efforts, a logical sequence of documentation shall be completed by the Contractors and maintained and organized by the Owner. Sequence of operations testing procedures

shall be contained in appropriate Functional Tests. It is the Owners responsibility to gather all data required for completion of the commissioning documentation requirements. It is the Contractors responsibility to populate and provide all necessary documentation required by the specifications to the Owner.

1.7.1.1 Equipment or System Startup Request (ESR)

1.7.1.1.1 This shall be used to request the start-up of any operable equipment/device. All completed manufacturer's start- up instructions associated with the equipment shall accompany this request upon submittal to the Owner. Equipment shall not be energized or started for operation prior to successful completion of Equipment Startup. Authorization for temporary or continuous operation of equipment must be obtained from the Owner. This requirement is indicated on the equipment matrix.

1.7.1.2 Functional Test Checklist (FTC)

1.7.1.2.1 This form shall be used to document an individual system's performance and will be provided by the Owner. The FTC will exercise the equipment/system function throughout the full range of operation and verify operational performance in accordance with the contract documents. Operational performance includes the exhaustive testing of the sequence of operation for all modes of operation. Sequence of operation testing shall be scripted for each and every control action and all associated controlled and monitored responses for the equipment, controller inputs and outputs, soft points (software derived variables), graphics workstation responses, and facility monitoring alarms.

1.8 COMMISSIONING AND CLOSEOUT MANUAL

1.8.1 The Owner shall incorporate all commissioning and closeout documentation and/or verification into a Manual at the conclusion of the project. This Manual is intended to be a consolidation of documentation/verification for the project Commissioning and the Closeout process.

1.8.2 The contractor will be required to submit documentation for incorporation into this manual as specified in this section and/or individual technical specifications.

1.8.2 Included in the Commissioning and Closeout (C&C) Manual shall be (but not be limited to) the following:

1.8.2.1 Copy of the Commissioning Plan

1.8.2.2 Responsibility Matrix

1.8.2.3 Equipment Matrix

1.8.2.4 Closeout Documentation Matrix

1.8.2.5 Executed Functional Test Checklists

1.8.2.6 Matrix shall include all project deliverables to be transmitted to the Owner prior to substantial completion. Deliverables listed shall reference the prescribing specification section, description of item(s), type of item to be transmitted (warranty, O&M, keys, training, etc.), quantities transmitted and transmittal date. The Closeout Matrix should include, but not be limited to: spare parts, attic stock, training, warranties beyond one year, O&M manuals, as-builts, keys checklist, service contracts, etc.

1.8.2.7 Paint/Finish Schedule

1.8.2.7.1 Schedule shall include all paints, wall coverings, flooring, finishes, etc. used on the project.

1.8.2.7.2 Provide manufacturer, model #, color formula, location on project, purchase source and any other information helpful to the Institution's maintenance personnel.

1.8.2.8 Field Observation Reports

1.8.2.7 Cx Meeting Minutes

1.8.2.8 TAB Reports

1.8.2.9 Pipe Pressure Tests

1.8.2.10 Duct Pressure Tests

1.8.2.11 Fire Alarm and Suppression System Tests and Reports

1.8.2.12 Completed NFPA Forms

1.8.2.13 Commissioned Component/equipment/system Documentation. The following commissioning documentation may be organized and tabbed in the C&C Manual in a manner appropriate to specifics of the project.

1.8.2.11.1 Equipment Startup Plans & Equipment Startup Requests

1.8.2.11.2 Functional Test Checklists

1.8.3 Equipment and System submittals shall be submitted separately as required elsewhere in the Contract Documents.

1.8.4 Operating and Maintenance Manuals for each system, equipment, and device shall be submitted separately as required elsewhere in the Contract Documents.

PART 2 PRODUCTS

2.1 TEST EQUIPMENT

2.1.1 The contractor shall provide all tools, test equipment and instruments required to execute startup, checkout, functional performance and integrated systems testing of equipment under their contract.

2.1.2 Test equipment shall be of sufficient quality and accuracy to test and/or measure system performance within tolerances specified. A testing laboratory shall use test equipment that has been calibrated within the previous 12 months. Calibration shall be NIST traceable. Equipment shall be calibrated according to manufacturer's recommended intervals and whenever it is dropped or damaged. Calibration tags shall be affixed or certificates readily available.

PART 3 EXECUTION

3.1 COMMISSIONING SCHEDULE

The objective of scheduling commissioning process activities is to integrate and coordinate commissioning activities with other construction phase activities. Detailed scheduling will allow Cx Team members to coordinate work with other team members in order to complete all Cx activities prior to Substantial Completion. The Commissioning Schedule shall include major Cx activities, essential prerequisites for major equipment and system activities, and operable equipment/system/assembly functional systems performance demonstrations. The Cx Schedule shall account for Testing, Adjusting and Balancing (TAB) consultant activities properly scheduled and coordinated into the project work flow to allow for the completion of all TAB work prior to Substantial Completion. As applicable, the following milestones and activities shall be scheduled and incorporated into the project master construction schedule by the contractor:

3.1.1.1 Commissioning Kickoff Meeting

3.1.1.2 Building Automation System submittal approval

3.1.1.3 Control Sequence of Operation Coordination meeting

3.1.1.4 Major systems startup

3.1.1.5 Testing of equipment

3.1.1.6 System Specific Testing Adjusting and Balancing activities

3.1.1.7 Training

3.2 REQUIRED COMMISSIONIG MEETINGS

3.2.1 Within 120 days after the effective date of the Notice to Proceed for the construction phase that includes building operational systems, the Contractor's Commissioning Coordinator (CxC) will schedule, a Commissioning Kickoff Meeting with all parties involved in the Commissioning process. At a minimum the meeting should include the major sub-contractors, specialty manufacturers/suppliers, the A/E, mechanical and electrical consultants, the Owner's testing, adjusting and balancing (TAB) firm, the Commissioning Authority, the Owner and representatives from the Institution.

3.2.1.1 The Contractor shall prepare for the meeting by creating or reviewing and commenting on drafts of the following documents to be reviewed at the meeting:

3.2.1.1.1 The Commissioning Plan (including the Equipment Matrix, Responsibility Matrix and Closeout Documentation Matrices

3.2.1.1.2 The Commissioning and Closeout Manual

3.2.1.1.3 Preliminary Commissioning Schedule incorporating commissioning activities to coincide with the work flow contained in the master construction schedule

3.2.1.2 The Owner shall conduct the meeting and review all aspects of the Commissioning specification. Documentation requirements will be discussed and available test procedures and commissioning forms reviewed.

3.2.1.3 The Commissioning Plan shall be reviewed to ensure understanding of roles and responsibilities of each commissioning team entity and the potential schedule impact as related to commissioning requirements.

3.2.1.4 The Commissioning Schedule shall be presented and reviewed. The dates and durations for major systems start up and functional testing that are included in the master construction schedule shall be identified

3.2.2 Commissioning shall be an agenda item for all Contractors project progress meetings until separate commissioning meetings are/if deemed necessary.

3.3. CONTRACTOR'S VERIFICATION OF INSTALLATION

3.3.1 The Contractor will perform a review of all Functional Test Checklist forms to ensure correct completion of installation and understanding of functional tests. This verification shall include, but not be limited to:

3.3.1.1 Each component device has been installed in accordance with the governing specifications and codes as well as the manufacturer's written recommendations.

3.3.1.2 All shop drawings and product data submittals have been approved for each component device.

3.3.1.3 All valve schedules, wiring diagrams, control schematics, electrical panel directories, etc. have been submitted, approved, and installed in accordance with specifications.

3.3.1.4 All tabulated data has been submitted for each system and/or device as required by other specification sections.

3.3.1.5 All test reports and/or certifications required have been submitted and accepted. If required, provide certification of acceptance from manufacturer representative and/or engineering technician. Provide copies of all checklist/inspection documentation completed by the manufacturer or certified technician.

3.3.1.6 The Contractor shall be responsible for correction of all noted deficiencies. Any request for inspection/re-inspection or test/retest of a device or system shall first be confirmed as being compliant by the Contractor before requesting inspection/re-inspection, and testing/retesting.

3.4 INITIAL STARTUP

3.4.1 Startup of Independent Systems, Assemblies, and Devices

3.4.1.1 The Contractor shall not energize or activate, or allow to be activated, any operable device prior to submission of an Equipment Startup Request (ESR) as indicated on the Equipment Matrix for that device to the Owner, so that the Owner may witness the startup. It is permissible to “bump” motors prior to submission of the ESR to verify rotation/electrical phasing and other applicable measurements needed as appropriate to verify readiness for startup.

3.4.1.2 The Contractor and manufacturer's representative and/or engineering technician (if required by the contract documents) shall inspect and accept the installation and preparedness for startup. The installation shall not vary from provisions of the applicable specifications and the manufacturer's written recommendations for startup.

3.4.2 Startup of Building Systems

3.4.2.1 The Contractor shall not energize or activate any building system until the following conditions have been met:

3.4.2.1.1 The Contractor shall submit an ESR to the Owner's Construction Inspector five (5) days prior to requested startup of the system if required by the Equipment Matrix.

3.4.2.1.2 As a minimum, the Contractor shall verify:

3.4.2.1.2.1 That all wiring and support components for equipment are complete and have been tested in accordance with the technical specifications and/or the manufacturer's written recommendations.

3.4.2.1.2.2 That each component device has been checked for proper lubrication, vibration isolation, drive rotation, belt tension, control sequence, or other conditions that may cause damage.

3.4.2.1.2.3 That all tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer and are in compliance with applicable specifications.

3.4.2.2 The Contractor shall execute startup under supervision of responsible manufacturer's representative in accordance with manufacturer's instructions as specified in the contract documents.

3.4.2.3 Successful completion of the above for the system is required before any system can be placed into operation, even on a temporary basis.

3.4.2.4 The Contractor shall coordinate and schedule equipment/system(s) startup in a timely manner allowing the equipment/system(s) to be operated for a minimum period of time only sufficient to evaluate and adjust performance as necessary, prior to demonstration by the Owner.

3.5 FUNCTIONAL TESTING

3.5.1 The Contractor shall operate, each system, device, assembly or equipment item, both intermittently and continuously, for the duration in accordance with the manufacturer's written recommendations and in accordance with the documented FTC procedures.

3.5.2 For operable equipment/systems, each component device and each building system shall be exercised to the full extent of its capability, from minimum to maximum, and under automatic and manual control, and in bypass when applicable. The equipment/assembly/system shall be exercised using the campus graphical user operator's workstation, if applicable. All inputs, outputs, and calculated values, as displayed on the operator's workstation graphics, shall be verified and documented.

3.5.3 The Contractor and, when applicable, manufacturer's representative, shall supervise and coordinate adjustments, alignments, calibrations, and balancing of all devices, equipment, and systems for proper operation prior to functional test demonstrations.

3.5.4 Final Test and Balancing as indicated in the technical specifications will be completed and test reports submitted for review one week prior to the scheduled functional testing.

3.6 OWNER TRAINING

3.6.1 Contractor will provide training per each individual specification section requirements.

3.6.2 Training shall consist of classroom type sessions and/or on-site demonstrations of system operation. See specification technical sections for requirements. If a system/equipment requires both demonstration and training, they may be combined if the Contractor is prepared and the Owner approves.

3.6.3 Training will be incorporated into the master construction schedule.

3.6.4 The contractor will provide an agenda for each training to the Owner for review and comment 10 days prior to the scheduled training. Owner may request alteration of the agenda to maximize the benefit of the training to the Owner.

End of Section 01 91 00

Appendix A of 01 91 00 - Commissioning Plan – Preliminary

1. General Building Information

- Project Name: West Campus Dining Facility
- Address: 440 W Nedderman Drive, Arlington Texas 76019
- Square Footage:
- Owner: University of Texas at Arlington
- Scheduled Completion Date:

2. Overview

a. Purpose: To provide direction for the commissioning process during construction, providing resolutions for issues such as scheduling, responsibilities, communication, reporting and coordination.

b. Goals/Objectives:
   i. Facilitate the final acceptance of the project at the earliest possible date.
   ii. Facilitate transfer of project to the facilities staff.
   iii. Ensure building systems meet the requirements of the occupants.
   iv. Document that that building equipment is installed and started per contract documents.
   v. Document system performance meets the design intent and contract document requirements.
   vi. Verify completeness of maintenance and operational manuals.
   vii. Ensure UTA facility maintenance personnel are adequately trained on the building systems.

c. The following systems/equipment will be commissioned. See equipment matrix for detailed information.
   i. Air Handling Units
   ii. Makeup Air Unit
   iii. Natural Gas Boilers for Heating Hot Water
   iv. Exhaust Fans
   v. Chilled/Hot Water Pumps
   vi. All VAV Terminal Boxes
   vii. Split DX Systems
   viii. Domestic Water Heaters
   ix. Lighting Controls
   x. Emergency Generator
   xi. Switchboards
   xii. Panelboards
   xiii. Transformers

3. Commissioning Team

Function	Name	Contact Information
Owners Cx Coordinator	Robb Chock	Phone: 817-272-7498, rchock@uta.edu
Contractor Cx Coordinator		
Architect		
Mechanical Engineer		

Electrical Engineer		
General Contractor		
Mechanical Contractor		
Electrical Contractor		
Controls Contractor		

4. Responsibilities

a. Owners Cx Coordinator: Coordinates and directs the Cx process, writes testing plans, directs and documents performance testing.
b. Contractor Cx Coordinator: Contact person for the general contractor that coordinates/directs the Cx activities as outlined in the commissioning specification. These include scheduling, operating equipment, providing installation documentation, providing required test equipment, provide training, attending commissioning meetings.
c. Architect: Perform inspections and attend meetings for issue resolution.
d. Mechanical Engineer: Perform inspections and attend meetings for issue resolution.
e. Electrical Engineer: Perform inspections and attend meetings for issue resolution.
f. Controls Contractor: Operate equipment and EMS system during functional testing. Perform inspections and attend meetings for issue resolution.

5. General Protocols

Issue	**Protocol**
Notifying Contractors of Deficiencies	The Owners Cx Coordinator will provide all commissioning deficiency lists to the Contractors Cx Coordinator.
Scheduling Functional Tests	The General Contractor will schedule functional tests with approval from the Owners Cx Coordinator.
Scheduling Cx Meetings	The Owners Cx Coordinator requests dates through the Contractor Cx Coordinator.
Sequence of Operations changes	Any required changes in sequences of operations required to correct operational deficiencies must be approved and documented by the A/E.
Any issue that arises during the Cx process	Resolve issues at lowest possible level.

6. Commissioning Activities

a. Commissioning Kickoff Meeting:
    i. All members of the commissioning team are required to attend. The Owners Cx Coordinator will run the meeting and the Preliminary Commissioning Plan will be finalized with comments from all parties. The intent is to streamline the commissioning process while achieving the stated commissioning goals. Owners Cx Coordinator issues a final Commissioning Plan with agreed upon changes.
b. Commissioning Schedule:
    i. Contractor schedules commissioning activities in the construction schedule and updates the schedule as the project proceeds.
c. Site Observations:
    i. The Owner will schedule with the contractor periodic site observations.
d. Functional Testing Checklists:
    i. The Owners Cx Coordinator will provide the Functional Test Checklists to the contractor prior to any scheduled testing for the contractors review and comment.
e. Equipment Startup Requests:
    i. This form provided by the Owner will be submitted prior to equipment startup if indicated on the equipment matrix.
f. Execution of Functional Testing Checklists:
    i. Under supervision of the Owners Cx Coordinator the contractor performs the Functional Testing by manipulating hardware/software required to achieve the testing. The Owners Cx Coordinator will document each step, results and deficiencies. Deficiencies will be documented in a deficiency report and transmitted to the contractor. Resolutions to each deficiency will be resolved at the lowest level generally between the Owners Cx Coordinator and the contractor/subcontractors. Once the issues are resolved, the contractor will be responsible for retesting a portion or entire functional tests to document system compliance.
g. Operation and Maintenance Manuals:
    i. These will be reviewed by the Owners Cx Coordinator for compliance with the specifications and deficiencies relayed to the general contractor.
h. Training: Training will be scheduled by the general contractor and documented with the provided training documentation form. A training agenda and instructor name will be provided to the Owner prior to scheduling the training.
i. Warranty Period:
    i. Owner will provide General Contractor with any warranty related items.
j. Final Commissioning Report:
    i. Owners Cx Coordinator will compile the final Cx Report. This will include:
        1. Final Cx Plan
        2. Executed Functional Test Checklists
        3. Deficiency Reports
        4. Field Observation Reports
        5. Open Items/deferred testing required