

## SECTION 01910 – COMMISSIONING - CONSTRUCTION MANAGER EDITION

### PART 1 – GENERAL

#### 1.1 Section Includes:

- A. Commissioning requirements common to all Sections
- B. Systems and equipment start-up and functional performance testing
- C. Validation of proper and thorough installation of systems and equipment
- D. Equipment performance verification
- E. Documentation of tests, procedures, and installations
- F. Coordination and requirements of training events
- G. Management of Record Construction Documentation
- H. Sequencing

#### 1.2 General Description:

- A. Commissioning (Cx) is process of ensuring that building systems are installed and perform interactively according to design intent; that systems are efficient and cost effective and meet Owner's operational needs; that installation is adequately documented; and that Operators are adequately trained. It serves as a tool to minimize post-occupancy operational problems. It establishes testing and communication protocols in an effort to advance building systems from installation to full dynamic operation and optimization.
- B. Commissioning Authority shall work with Contractor and Design Engineer to direct and oversee Cx process and perform functional performance testing.
- C. Commissioning Plan outlines commissioning process. It is part of Contract Documents and stipulates all but Contractor responsibilities.
- D. This Section and other Sections of specification details Contractor's responsibilities relative to Cx process. It expands on Cx Plan, which covers roles and responsibilities of all Parties. It also indicates details of Functional Performance Testing (FPT) in which Contractor must participate.

#### 1.3 Scope:

- A. Section covers elements, requirements, procedures, and protocols common across all Divisions of Work. Requirements specific to individual Sections are generally specified in technical specification as well as in Sections 15995 – Mechanical System Commissioning and 15959 – Building Automation Systems Commissioning.
- B. Specific systems to be commissioned are indicated in following Divisions of Specification:
  - 1. Divisions 02 – 14: Conformance to following provisions of Cx requirements is required under Division 01 and this Section:
    - a. Operation & Maintenance Manual preparation and maintenance;

- b. Record Document preparation and maintenance.
2. Division 15 - Requirements for Cx are specified in Section 15995 as well as in individual Div 15 Sections.
3. Building Automation Systems (BAS): Requirements for Cx are specified in Section 15959.

#### 1.4 Related Sections and Documents:

- A. Commissioning Plan: Cx Plan shall be considered a part of Contract Documents and outlines many of responsibilities, procedures and tasks throughout Cx process. It encompasses entire Cx process including design phase tasks prior to construction. It also describes Functional Performance Tests that will be performed during Acceptance Phase.
- B. Section 01820 – Functional Performance Testing Procedures: Provides ‘generic’ functional performance testing procedures to illustrate level-of-effort expected during acceptance testing.
- C. Individual Specification Sections: Individual sections stipulate installation, start-up, warranty, O&M documentation, and training requirements for system or device specified in Section.
- D. Section 15995 – Commissioning: Details commissioning procedures specific to Division 15 work.
- E. Section 15995 – Mechanical Systems Commissioning: Details commissioning procedures specific to Division 15 Work.

#### 1.5 Definitions and Abbreviations:

- A. Acceptance Phase: Phase of project when facility and its systems and equipment are inspected, tested, verified, and documented; and when most of Functional Performance Testing and formal training occurs. This will generally occur after Construction Phase is complete (start-up and checks have been accomplished). Acceptance Phase typically begins with Substantial Completion and ends with Functional Completion.
- B. Action Item (AI): Any issue that requires a response, completion, corrective or additional work, or any other action. Examples include a Request for Information (RFI), a work directive, a clarification request, a to-do item, an identified deficiency, or any other like item. Action Items must be categorized as appropriate.
- C. Action List: List that is maintained and updated by Cx authority that includes action items that relate to Cx activities.
- D. A/E: General reference to Architect/Engineer lead-design entity.
- E. ASHRAE: American Society of Heating, Refrigerating, and Air Conditioning Engineers.
- F. Building Automation System (BAS): Computer-based control or automation system.
- G. Contractor: As used herein, ‘Contractor’ is a general reference to installing Party and can therefore refer to Contractor, subcontractors, or vendors as inferred by its usage.
- H. Construction Manager (CM): Party retained by Owner to represent Owner and make decisions on Owner’s behalf throughout design and construction process.
- I. Construction Phase: Phase of project during which facility is constructed and/or systems and equipment are installed and started. Contractor and subcontractors complete installation,

complete start-up documentation, submit O&M information, establish trends, and perform any other applicable requirements to get systems started. Contractor and vendors may also conduct equipment specific training. Construction Phase will generally end upon completed start-up and TAB of systems and equipment.

- J. Contract Documents: Documents governing responsibilities and relationships between parties involved in design and construction of this project including (but not necessarily limited to):
  - 1. Agreements/Contracts;
  - 2. Construction Plans and Drawings;
  - 3. Specifications;
  - 4. Addenda;
  - 5. Change Orders;
  - 6. Cx Plan.
- K. Construction Documents: Refers generally to Contract Documents that dictate details of installation (all but item a. above).
- L. Commissioning (Cx): Process of ensuring that building systems perform interactively according to design intent, systems are efficient and cost effective and meet Owner's operational needs.
- M. Commissioning Authority (CA): Party retained by Owner who will oversee Cx process, develop and stipulate many of Cx requirements, manage Cx process, and ensure and validate that systems and equipment are designed, installed and tested to meet Owner's requirements.
- N. Commissioning Coordinator (CxC): Individual within each of various parties that is designated POC for that party relative to Cx activities.
- O. Commissioning Specifications ('Cx Specs'): Includes separate Cx specification sections and Cx-related subsections of other specifications. Contractor requirements relating to Cx should be conveyed within Cx Specs. Cx Specs should be referenced but not duplicated within Cx Plan (which is designed to govern non-Contractor-related issues).
- P. Commissioning Team (CxT): Group of parties involved in commissioning process for any given system. Cx Team will include a core group involved with systems. This core group will typically include CA, [CM's Cx Coordinator (CMCx)], [Owner's Cx Coordinator (O/O-CxC)] and Contractor's Cx Coordinator (C-CxC). On any given system, Cx Team will also include Cx Coordinator for Contractor(s) responsible for system or equipment.
- Q. Deficiency: A condition in installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents (that is, does not perform properly or is not complying with design intent).
- R. Factory Authorized Representative: An individual fully trained on equipment and certified by manufacturer to perform respective task.
- S. Factory Testing: Testing of equipment off-site at manufacturer's facility may be witnessed by members of project team.
- T. Functional Completion: A milestone that marks completion of Acceptance Phase and successful completion of FPTs by CA.

- U. Functional Performance Testing (FPT): Detailed and thorough testing of building systems and interactions with building components and other building systems.
- V. IAQ: Indoor Air Quality
- W. *O&M Documentation*: Refers to Contractor-developed documentation designed to address needs of facilities personnel and customized for context of specific facility and installation. Foundation of *O&M Documentation* is manufacturer's literature (including 'O&M Manuals', parts lists, troubleshooting guides, etc.) as well as Contractor-developed instructions for start-up and shut-down, sequences, and other installation-specific information.
- X. O&M Manuals: Term shall be reserved for referencing manufacturer-published O&M documents, which generally has no information specific to facility. Specifications should strive for this information to be submitted in electronic form whenever possible.
- Y. Opposite Season: Season opposite that when majority of testing occurs.
- Z. Party: Individual, company or entity. Refer to Cx Plan for specific names and definitions.
- AA. Point of Contact (POC): General reference to key individual within each party.
- BB. Preliminary Service: Systems/equipment are being used by occupants although final adjusting, balancing, and functional performance testing is on-going.
- CC. Pre-Test: Preliminary testing accomplished during a scheduled system outage to verify system functionality prior to placing system/equipment into preliminary service.
- DD. Project Phases: Phases of project include Construction Phase, Acceptance Phase, and Warranty Phase.
- EE. Project Officer (PO): Individual or entity directly employed by Owner who is in charge of design and construction coordination for project. Alternately, Owner may employ a separate CM to perform this function.
- FF. RFI: Request for Information
- GG. Scheduled Outage: A period of time, scheduled by Owner, in which system is out-of service or not to be used by occupants.
- HH. Start-Up: Refers to quality control process whereby Contractor verifies proper installation of a device or piece of equipment, executes manufacturer's starting procedures, completes Start-Up Checklist, energizes device, verifies that it is in proper working order and ready for dynamic testing, and completes Start-Up Tests.
- II. Start-Up Checklist Item: List of items to inspect to verify proper installation of equipment or systems by Contractor. Checklist items simply require a 'Yes/No' or 'OK/Not' response. These include primarily static inspections and procedures to prepare equipment or system for initial operation (e.g., belt tension, oil levels OK, labels affixed, gages in place, sensors calibrated, etc.). Start-Up Checklist items are one component of Start-Up Procedures (Other is Start-Up Tests).
- JJ. Start-Up Procedures: Refers to combination of Start-Up Checklists and Start-Up Tests. Start-Up Procedures are typically performed by Contractor with or without a formal Cx process. Contractor documents start-up process by completing and submitting Start-Up Procedures.
- KK. Start-Up Test: Test that may be involved with equipment start-up. It differs from a checklist item in that it requires more than a binary response - an observation, measurement, or sequence of events must be documented. Start-Up Tests are one component of Start-Up Procedures (Other is Start-Up Checklists).

- LL. TAB: Can refer to the test, adjust, and balance process or Testing, Adjusting, and Balancing Contractor.
- MM. Testing Agency: Independent agency typically retained by Contractor to perform specialized testing of systems or equipment (most commonly electrical). Testing Agency shall be qualified and equipped to perform testing and shall submit appropriate qualifications.
- NN. Trending: Monitoring and recording a history of parameters typically using building automation system.
- OO. Warranty Phase: Includes early occupancy of building and can continue through Warranty Period and at least into opposite season from when it was initially tested.

1.6 References:

- A. ASHRAE Guideline 0-2005, "The Commissioning Process" and 1.1-2007, "HVAC & R Technical Requirements for Commissioning Process".
- B. ASHRAE Guideline 4-1993, "Preparation of operating and Maintenance Documentation for Building Systems"
- C. NEBB - Procedural Standards for Building Systems Commissioning

1.7 Documentation:

- A. Contractor shall provide to Commissioning Authority following:
  1. Shop Drawings and Data: One hard copy [and one electronic copy] of Shop Drawings and product data related to systems or equipment to be commissioned. Commissioning Authority shall review and incorporate comments via Design Engineer.
  2. Draft Start-Up Procedures: Contractor shall develop Start-up Procedures for applicable equipment and systems along with manufacturer's application, installation and start-up procedures. CA will initially provide to Contractor generic Start-up Checklists, content of which must be reviewed by Contractor and supplemented with manufacturer-specific requirements and Contractor's own internal quality assurance procedures and checks. CA will review draft and recommend approval.
  3. Factory Test Reports: Contractor shall provide any factory testing documentation or certified test reports required by specifications. These shall be provided prior to Acceptance Phase.
  4. Schedule Updates: Issue periodic updates to construction schedule. Provide to CA at least every two weeks. Contractor shall use schedule to notify Cx team of scheduled start-up and training activities.
  5. Action Item Response: Respond to Action Items to which Cx team members assign Contractor responsibility.
  6. Field Testing Agency Reports. Provide documentation of Work of independent testing agencies required by specification. These shall be provided prior to Acceptance Phase.
  7. Completed Start-Up Procedures: Completed Start-Up Procedure documentation for applicable equipment and systems. CA will review prior to FPT.
  8. Equipment Warrantees: Provide prior to start of Acceptance Phase.

9. Installation, Operation and Maintenance Manuals: Provide O&M Documentation content per requirements of Cx Plan, and Division 1 requirements. Submit at least one month prior to beginning of Acceptance Phase.
- B. Record Drawings: Contractor shall maintain at site an updated set of record or 'As-Built' documents reflecting actual installed conditions and approved changes and modifications to Contract Documents. Contractor shall provide access to CA to review As-Built and Record Drawings. Provide Record Drawings in accordance with Division 1 and Cx Plan.

#### 1.8 Commissioning Sequencing and Scheduling:

- A. Contractor shall incorporate Cx Precedent Schedule into construction schedule. Contractor shall collaborate with CA to determine impacts of project phasing as applicable. Contractor shall include tasks for systems in construction schedule. Examples of enumerated tasks include:
  1. Contractor preparation of draft Start-Up Procedures
  2. Testing Agency activities
  3. Documentation of Start-Up Procedures for equipment and systems
  4. TAB of applicable system
  5. Training Events
  6. Acceptance Testing
  7. Occupant or Regulatory Agency testing or approval process
- B. Contractor shall completely install, thoroughly inspect, start-up, test, adjust, and balance systems and equipment. Activities shall be documented per specified procedures and progress tracked on construction schedule. Contractor shall notify A/E, Owner, and CA in writing that systems are complete and ready for verification and functional performance testing. Notification shall be accompanied by a schedule showing coordinated start date and task duration and currently open precedent requirements.
- C. Contractor shall notify CA at least 14 days in advance of any tests, start-ups, or training. CA shall witness selected tests and start-ups. Notification shall be accompanied by a schedule showing coordinated start date and task duration and currently open precedent requirements.

#### 1.9 Coordination Management Protocols:

- A. Coordination responsibilities and management protocols relative to Cx are initially defined in Cx Plan but will be refined and documented in Construction Phase Cx Kick-Off meeting. Contractor shall have input in protocols and all parties will commit to scheduling obligations. CA will record and distribute.

#### 1.10 Contractor Responsibilities:

- A. Construction Phase: Commissioning-related responsibilities of Contractor (and their subcontractors) during Construction Phase:
  1. Include Cx requirements in price and plan for work.
  2. Designate a Cx Coordinator (CxC) from each major subcontractor with activities related to commissioning. These Cx Coordinators are to be primary contacts for Cx activities.

3. Attend Construction Phase Cx Kick Off Meeting. Cx Coordinator and Project Manager from each major subcontractor shall attend at a minimum.
4. Cx Coordinator shall attend all Cx progress meetings unless otherwise agreed to by CA.
5. Remedy any deficiencies identified throughout construction.
6. Prepare and submit required draft Start-Up Procedures and submit along with manufacturer's application, installation and start-up information.
7. TAB shall submit sample balancing forms for approval prior to starting work.
8. Schedule and coordinate Cx efforts into construction schedule. Incorporate precedent diagram provided by CA into construction schedule. Indicate at a minimum tasks enumerated on precedent diagram for systems.
9. Coordinate Work of subcontractors, vendors, manufacturers, and Testing Agencies provided with bid, and ensure they are informed of and are adhering to requirements of Cx process specified throughout contract documents.
10. Provide assistance to CA in preparation of specific Functional Performance Test (FPT) procedures. Contractors, subcontractors and vendors shall review test procedures to ensure feasibility, safety and equipment protection and provide necessary written alarm limits to be used during tests. Damage caused to equipment performed in accordance with approved procedures will be responsibility of Contractor.
11. Thoroughly complete and inspect installation of systems and equipment as detailed throughout Contract Documents, as required by reference or industry standards, and as specifically indicated elsewhere in this section.
12. Start-up, and test/adjust/balance systems and equipment prior to functional performance testing by CA. Start-Up Procedures shall be in accordance with Contract Documents, reference or industry standards, and Part I of this Section.
13. Provide skilled technicians qualified to perform Work required.
14. Provide factory-trained and authorized technicians where required by Contract Documents.
15. Record Start-up Procedures on start-up procedure forms and certify that systems and equipment have been started and or tested in accordance with requirements specified above. Each task or item shall be indicated with Party actually performing task or procedure.
16. Tag equipment that is started with individual's name and date.
17. Demonstrate operation of systems as specified.
18. Certify that systems have been installed and are operating per Contract Documents prior to Acceptance Testing.
19. Maintain an updated set of Record Documentation as required by Contract Documents.
20. Copy CA on indicated documentation.

21. Conduct and document Equipment and Systems Training events as required by applicable sections of Specifications pertaining to each piece of equipment or system.
- B. Acceptance Phase: Commissioning-related responsibilities of Contractor (and their subcontractors) during Acceptance Phase:
1. Assist CA in functional performance testing. Assistance will generally include following:
    - a. Manipulate systems and equipment to facilitate testing (as dictated in Section 01915 and Cx Plan; in some cases this will entail only an initial sample).
    - b. Provide any specialized instrumentation necessary for functional performance testing.
    - c. Manipulate BAS and other control systems to facilitate functional performance testing (as dictated Section 01820 and Cx Plan; in some cases this will entail only an initial sample).
  2. Correct any Work not in accordance with Contract Documents.
  3. Participate in Training Events relative to use of O&M information and PM program.
  4. Maintain Record Documents, and update and resubmit it after Functional Completion.
  5. Compensate CA for additional site time incurred due to incompleteness of systems or equipment at time of Functional Performance Testing.
- C. Warranty Phase: Commissioning-related responsibilities of Contractor (and their subcontractors) during Warranty Phase:
1. Provide warranty service;
  2. Participate as required in opposite season testing;
  3. Correct any deficiencies identified throughout Warranty Phase;
  4. Update record documentation to reflect any changes made throughout Warranty Phase and resubmit final Record Drawings at close of Warranty period.

#### 1.11 Equipment Supplier Responsibilities:

- A. Construction Phase: Commissioning-related responsibilities of Equipment Supplier (and their subcontractors) during Construction Phase:
1. Provide shop drawings and product data in hard copy and electronic format.
  2. Provide manufacturer's application, installation and start-up instructions within 30 days of shop drawing/product data approval.
  3. Where factory-authorized start-up is specified, coordinate and participate in specified commissioning process and document start-up on appropriate forms.
  4. Review and approve Functional Test Procedures affecting supplied equipment.
  5. Provide spare parts and materials as required by Specifications.
  6. Provide special tools as required by Specifications.

7. Provide warranties.
- B. Acceptance Phase: Commissioning-related responsibilities of Equipment Supplier (and their subcontractors) during Acceptance Phase:
1. Participate in any Functional Testing Procedures required.
  2. Consult on issues identified relative to supplied equipment.
- C. Warranty Phase: Commissioning-related responsibilities of Equipment Supplier (and their subcontractors) during Warranty Phase:
1. Provide any warranty service required to supplied equipment as applicable with agreement with Contractor.
  2. Provide technical support to Owner's facilities personnel.

1.12 Start-up Procedures and Documentation:

- A. Purpose: Cx process requires that normal quality control processes involved with preparing systems and equipment for operation are performed to a high standard of care and are thoroughly documented. Required commissioning-related Start-Up Procedures involve nothing additional than that which would be done for any good installation. These procedures shall be performed to installed systems and equipment and no sampling strategy is used for start-up process. Cx process requires all parties to collaborate to establish optimal standard of care for starting systems and equipment. After procedures are established, Contractor performs them and documents them with Start-up Procedures that are developed by joint effort of Contractor and CA.
- B. Creation of Start-up Procedures: Start-up Procedures (consisting of checklists and tests as above) for each type of equipment and system shall be submitted to CA for approval prior to start-up. Appropriate subcontractors or vendors shall design forms, meeting requirements of Contract Documents. Forms shall be developed for equipment being installed for this project and as such indicate project-specific values, settings, targets, acceptance criteria, and other parameters as appropriate. 'Generic' Start-Up Procedure forms available from CA may be used as examples.
- C. 'Generic' Start-Up Procedures: Refer to Section 15995 for generic Start-up Procedures for a variety of mechanical and electrical systems. Content of these Start-Up Procedures shall provide minimally acceptable content.
- D. Content of Start-Up Procedures: Start-Up Procedures for each item of equipment or system generally includes following:
1. Project-specific designation, location and service.
  2. Indication of Party performing and documenting Start-Up Procedure.
  3. Clear explanation of inspection, test, measurement, and outcome with a Pass/Fail indication and a record of measure parameters.
  4. Include a checklist item indicating that all O&M instructions, Warranties, and Record Documents have been completed and submitted.
  5. Include a Start-up Checklist item indicating that proper maintenance clearances have been maintained.
  6. Include a Start-up Checklist item indicating that special tools and/or spare tools required for normal operation and maintenance were turned over to Owner.

- 7. Include Start-up Checklist item indicating that required dependent or prerequisite equipment and systems were previously started successfully.
- E. Manufacturer's Requirements: Start-up Procedures shall incorporate manufacturer specified procedures. As applicable, include acceptance criteria specified therein. Manufacturer's start-up and checkout procedures shall be submitted to CA along with Contractor's draft Start-Up Procedure.
- F. Related Sections and Contract Documents: Refer to technical specifications and commissioning-related Sections for additional information.
- G. CA Review: CA shall review draft Start-Up Procedures and request any additional information required to meet Cx criteria. CA will also review and spot-check procedures during Functional Performance Testing.
- H. Completion: Individual executing start-up must complete Start-Up Procedure for equipment and acknowledge acceptability with indication of who did associated task. Systems shall be started per approved procedures and no sampling strategy shall be used. Completed Start-up Procedures for pieces of equipment shall be submitted to CA prior to any associated Functional Performance Testing. Outstanding items shall be clearly indicated and an associated Action Item must be entered to track resolution.

1.13 Functional Performance Testing:

- A. Objective of Functional Performance Testing is to demonstrate that each system is operating according to Contract Documents. Functional Performance Testing facilitates bringing systems from a state of Substantial Completion to full dynamic operation. Additionally, during testing process, areas of deficient performance are identified and corrected, improving operation and functioning of systems.
- B. Logistics and procedures involved in Functional Performance Testing are outlined below and in Section 01915.

1.14 Deficiencies Identified During Functional Testing:

- A. Non-Conformance: Non-conformance deficiencies identified during Functional Performance Testing shall be resolved as follows:
  - 1. CA will record results of functional test in project database. Deficiencies or non-conformance issues shall be noted as Action Items and reported to Owner.
  - 2. Corrections of identified minor deficiencies may be made during tests at discretion of CA. In such cases, deficiency and associated resolution will be documented in database.
  - 3. Every effort will be made by CA to expedite testing process and minimize unnecessary delays, while not compromising integrity of procedures.
  - 4. As tests progress and a deficiency is identified, CA will discuss issue with executing Contractor.
    - a. When there is no dispute on deficiency and Contractor accepts responsibility to correct it:
      - 1) CA shall document deficiency along with Contractor's response and intentions, and proceed to another test or sequence. A copy/email of deficiency shall be generated and provided to Contractor and CA. Contractor corrects deficiency, completes Action Item response certifying that issue is resolved and /or equipment is ready to be retested, and sends it back to CA.

- 2) CA reschedules test and test is repeated.
- b. If there is a dispute about a deficiency, regarding whether it is a deficiency and/or who is responsible:
- 1) Deficiency shall be documented as an Action Item with Contractor's response and Owner will be notified. Owner will track this issue under construction contract dispute resolution provisions.
  - 2) Final interpretive authority is with A/E. Final acceptance authority is with Owner.
  - 3) CA documents resolution to Action Item.
  - 4) Once interpretation and resolution have been decided, appropriate party corrects deficiency, and responds to Action Item indicating completion. CA reschedules test and test is repeated until satisfactory performance is achieved. CA then closes Action Item.
- B. Cost of Retesting: Cost for CA to retest a Start-up or Functional Performance Test shall be paid by Contractor responsible for deficiency. Owner shall pay CA directly and back charge responsible Contractor.
- C. Failure Due to Manufacturer's Defects. If 10% or three, whichever is greater, of identical pieces of equipment fail to perform to Contract Documents (mechanically or substantively) due to manufacturing defect, identical units may be considered unacceptable by Owner. (For purposes of defining 'identical equipment' for this Section, size or capacity alone does not constitute a difference.) In case of failure due to manufacturer's defects, Contractor shall provide Owner with following:
1. Manufacturer's response in writing as to cause of failure and proposed resolution.
  2. Manufacturer shall implement proposed resolution on a representative sample of product.
  3. Owner will determine whether a replacement of all identical units or a repair is acceptable.
  4. Upon acceptance, manufacturer shall replace or repair all identical items at their expense and shall extend warranty accordingly (if original equipment warranty had begun).
  5. Manufacturer shall pay costs of all retesting necessitated by failure.

## **PART 2 - PRODUCTS**

### **2.1 Instrumentation:**

- A. General: Testing equipment used in commissioning process shall be of sufficient quality and accuracy to test and/or measure system performance within tolerances specified. Equipment shall be calibrated according to manufacturer's recommended intervals. Calibration tags shall be affixed or certificates readily available.
- B. Standard Testing Instrumentation: Standard testing instrumentation normally used for performance assessment and diagnosis will be provided by CA. Refer to Section 15995 for a list of applicable test equipment.

- C. Special Tools: Special equipment, tools and instruments (only available from a vendor, and specific to a piece of equipment) that are required for testing equipment in accordance with Contract Documents shall be included in base bid price to Contractor and left on site for Owner.

### **PART 3 - EXECUTION**

#### 3.1 Start-up Standard of Care:

- A. Procedures that establish a minimum Standard-of-Care for start-up, check out and testing of applicable equipment are specified in individual technical specifications as well as Section 15995. Contractor shall apply Standard-of-Care and document per Cx requirements.

#### 3.2 Functional Performance Test Execution:

- A. Functional Performance Testing procedures are specified in Section 01915. Contractor shall participate in development and approval of testing procedures, as well as participate as required in initial sample of tests as indicated herein.

**END OF SECTION**