AABC COMMISSIONING GROUP (ACG)

Certified Commissioning Technician (CxT)

Study Guide

Please note that this study guide is a supplement to the *ACG Commissioning Guideline*. Candidates should also thoroughly study the *Guideline*, which can be downloaded from the ACG website.

2401 Pennsylvania Ave. NW • Suite 330
Washington, DC 20036
Phone 202.737.7775 • Fax 202.638.4833

Introduction

ACG Certified Commissioning Technicians work on commissioning projects under the direction and supervision of a Certified Commissioning Authority (CxA). Technical aptitude along with clear communication skills and the ability to adhere to documentation and distribution protocols and other commissioning skills are necessary to achieve commissioning goals. ACG CxTs possess the following essential core technical, communication and commissioning skills.

Technical Skills

Individuals who qualify as a CxT have extensive technical field experience and expert knowledge of the systems to be commissioned. CxTs also possess an understanding of overall design intent and the construction process, thorough knowledge of contracting and construction management, and design development. Knowledge of different construction models is also needed.

Communication Skills

CxTs do not direct contractors or perform design authority functions, however, they do interact with project team members, particularly field personnel such as contractors, vendors, testing agencies, and special inspectors. CxTs utilize excellent written and verbal skills, knowledge of communication protocols, and coordination skills combined with a team building mentality to effectively implement commissioning procedures on construction projects.

Commissioning Skills

Communication, accountability, and team building are the foundation of commissioning. CxTs possess a thorough understanding of commissioning methods and a command of the commissioning process including commissioning roles and responsibilities, and practical construction site commissioning protocols, such as an understanding of what actions and decisions require the input of the CxA and those actions that the CxT performs independently, and the importance of maintaining document control in the commissioning process. Commissioning skills are gained through training and field work.

Commissioning is a process of systematically documenting and organizing verification, resolution, and testing information. Commissioning technicians should understand documentation requirements in the following areas:

Resolution tracking procedures
Start-Up requirements
Submittal reviews
Review of as-built and existing conditions drawings
Functional performance test techniques
Operations and maintenance (O&M) documentation and training requirements
Preventative maintenance practices
Protocols for CxA and CxT activities.

Proper document control is therefore essential in the commissioning process, and commissioning providers should establish defined documentation standards identifying the correct and accepted use of forms, templates, and language, as well as distribution protocols ensuring proper peer review before release of documents to clients or inclusion in commissioning reports.

CxT Responsibilities by Phase

A critical element of the CxT's success is communicating effectively with the CxA in order to deliver a consistent product to the client based on the direction of the CxA, who is responsible for the entire commissioning process on the project.

As the commissioning authority's "eyes and ears" the Certified Commissioning Technician conducts site inspections reporting daily site progress and quality control for assessment by the CxA. The CxT does not have authority to modify or interpret commissioning process without direct input from the CxA. The CxT implements tasks delineated by the Commissioning Plan and assigned by the CxA.

Design Phase Responsibilities

In the design phase of a commissioning project the CxT shares responsibility with the CxA to set up the Design Phase Kickoff Meeting, and draft System Verification Checklists (SVC) and Functional Performance Tests (FPT). The CxT needs to be aware of design development milestones and understand project objectives including sustainability, USGBC LEED certification, energy performance, indoor air quality, relative pressure, and other goals making communication between the CxA and CxT regarding design issues very important to maximizing the quality of the CxTs field services in later phases.

Construction Phase Responsibilities

CxT involvement in the construction phase usually begins with participation in the Pre-Construction Meeting, where the CxA and CxT attend to initiate understanding of the commissioning process among the installing contractors, emphasizing roles and responsibilities.

In the construction phase, the CxT attends coordination and progress meetings, providing the CxA with notes reflecting commissioning aspects of the project covered in the meetings, and notifying the CxA of upcoming site activities. Under direct supervision by the CxA, the CxT generates, updates, reviews, and distributes System Verification Checklists (SVC), Functional Performance Tests (FPT), and Resolution Tracking Forms (RTF).

If the CxT chairs a meeting, official meeting minutes must be produced by the CxT for review by the CxA and distribution to the commissioning team. CxTs monitor HVAC controls installation, testing, adjusting and balancing (TAB), and specified contractor or vendor testing, such as meggar testing, duct leakage testing, and building membrane testing, to name only a few examples. The CxT observes start-up of commissioned systems. Typically start-up of equipment and systems is the responsibility of the installing contractor. Having thoroughly studied the construction drawings and specifications, the CxT observes the start-up process beginning in preparatory meetings to assure the specification requirements of owner/designer notification and factory certified start-up personnel are carried out. The CxT needs to encourage proper contractor/vendor start-up documentation as required by specifications. Frequently, the CxT must verify that follow-up actions required after start-up have occurred.

Construction Phase Responsibilities *(cont.)*

SVCs are often generated by the commissioning services provider firm and placed in the field for contractor sign-off. The CxT monitors progress of completing SVC's and reports this status during coordination and progress meetings. The CxT also verifies contractor adherence to manufacturer's checklist requirements for installation and start-up. CxTs review Operation and Maintenance (O&M) Manuals and facilitate O&M Training. The CxT tracks Requests for Information (RFI), Change Orders (CO), and Supplemental Instruction (SI) to assure installation and testing requirements account for modifications during construction. The CxT shares responsibility with the CxA to review "As-Built" Records. Throughout the construction phase the

CxT acts as a catalyst to challenge the Project Team relative to their specified responsibilities and roles as members of the Commissioning Team, continuously communicating with the CxA to maintain continuity in the delivery of commissioning services.

Acceptance Phase Responsibilities

In the acceptance phase the CxT monitors temperature controls point-to-point verification and documentation and installer performance verification and documentation of the sequence of operation. Test and Balance (TAB) monitoring and coordination with the TAB contractor, including assisting the TAB contractor to integrate with ongoing site activities, is another CxT responsibility.

The heart of commissioning is functional performance tests. The CxT works closely with the CxA in writing and distributing FPTs, which are executed by the CxT with the CxA and the commissioning team. The CxA should directly participate in initial tests of each unique system or piece of equipment. If the tests apply to multiple systems the CxA may not attend all iterations of the tests, but the CxA must understand that the test is implemented correctly and comprehended thoroughly by the CxT and the Commissioning Team before being excused from site testing. Re-testing may be required depending on initial FPT results, in which case the CxT will reorganize the commissioning team at the direction of the CxA to conduct the appropriate re-testing procedures.

The CxT facilitates O&M Training and may direct, oversee, or verify digital recording of the training depending on contract requirements. Tracking RFIs, COs, and SIs, and monitoring Authority Having Jurisdiction (AHJ) inspection reports are acceptance phase CxT tasks. The CxA and the CxT share responsibility to review existing drawings and record documents, with the CxT maintaining site observation of ongoing updates and the CxA focusing on the final deliverable versions. The CxT and CxA must work together to identify the owner and/or consultant determined warranty start dates.

Post-Acceptance Phase Responsibilities

The CxT implements off season mode FPTs and required re-testing with direct support from the CxA as noted above for initial FPTs. FPT Summaries and SPQC Reports will be generated by the CxT for approval and distribution by the CxA. The CxT monitors warranty issues work and shares responsibility with the CxA for the 11th Month Walk Through. The 11th Month walk through represents a significant commissioning process benefit for the owner in that it attempts to capture chronic problems identified by building occupants and operators prior to expiration of the installation warranties.

Post-Acceptance Phase Responsibilities *(cont.)*

This deliverable should include meeting with the owner, select occupants, and the maintenance staff or maintenance service provider. As the name describes, this step should also involve a detailed tour of the project with extensive observations of systems and equipment operation and performance. Depending on project objectives this may involve review of utility costs, evaluation of energy performance, and indoor air quality monitoring, or any of numerous other potential project goals. It is important to relate these observations to the OPR and BOD for the project, which identifies pass/fail criteria for FPT's and project objectives.

ACG Certified Commissioning Technician Candidate Prerequisites

ACG CxT experience requirements are as follows:

(1) minimum of two years field testing experience involving verification and testing of building systems,
(2) has worked for an ACG member firm for a minimum of 6 months, and
(3) is currently employed by an ACG member firm.

Each CxT candidate is required to submit an application form, a resume, and a letter of recommendation from a CxA attesting to the candidate's technical expertise, communications skills, and overall understanding of the commissioning process. A list of projects with references and a description of the candidate's roles and responsibilities must be furnished. Upon approval of the application, the candidate should participate in an ACG Workshop or Webinar prior to taking the certification exam.

CxT Examination

The ACG technician certification examination tests commissioning process knowledge and how these concepts are implemented through field activities. ACG offers workshops and web-based training to interactively teach important skills. Certification exams are offered at professional testing centers or at meeting and workshop venues.

The CxT examination includes test questions derived specifically from the *ACG Commissioning Guideline*. Other test questions will come from scenarios that depict decisions required of a CxT in executing commissioning processes. Some questions may require familiarity with the following technical references*:

- ASHRAE Guideline 0 – 2005: *The Commissioning Process*
- ASHRAE Guideline 1-1996: *The HVAC Commissioning Process*
- ACG Commissioning Guideline - 2005

*A commissioning project may require information or guidance from various standards, codes, and guidelines. Therefore, the CxT should be familiar with organizations such as AABC, ASHRAE, ANSI, ASTM, ISO, ARI, ACCA, UL, ASME, NFPA, and SMACNA.

Table 1: CxA and CxT Responsibilities

	Responsibility	
PHASE OF PROJECT	**CxA**	**CxT**
PRE-DESIGN		
Document Control	CxA	
Develop Cx Scope	CxA	
Review DID/OPR	CxA	
Prepare Cx Outline	CxA	
Attend Meetings	CxA	
DESIGN		
Document Control	CxA	
Identify Systems to Cx	CxA	
Design Reviews	CxA	
Review Cx Specifications	CxA	
Design Phase Cx Plan	CxA	
Design Phase Kick-Off Meeting	Shared	
Draft SVCs	Shared	
Draft FPTs	Shared	
Attend Meetings	CxA	
Attend Pre-Bid Meeting	CxA	
CONSTRUCTION		
Pre-Construction Meeting	Shared	
Document Control	CxA	
Construction Cx Plan	CxA	
Cx Schedule Integration	CxA	
Pre-TAB Report Review	CxA	
Review Submittals	CxA	
Update SVCs		CxT
Approve SVC Updates	CxA	
Approve SVCs	CxA	
Distribute SVCs		CxT
Update FPTs		CxT
Approve FPTs	CxA	
Approve FPT Updates	CxA	
Distribute FPTs		CxT
Site Observations		CxT
Write SPQC Reports		CxT
Approve SPQC Reports	CxA	
Distribute SPQC Reports		CxT
Create RTFs	CxA	
Approve RTFs	CxA	
Distribute RTFs		CxT
Coordination Meetings		CxT
Progress Meetings		CxT
Attend Meetings	Shared	
Supervise/Direct CxT	CxA	
Verify SVC Completion/Spot-Check SVC Accuracy		CxT

Table 1: CxA and CxT Responsibilities *(cont.)*

	Responsibility	
PHASE OF PROJECT	**CxA**	**CxT**
CONSTRUCTION *(cont.)*		
Witness Install Tests		CxT
Monitor Controls Install		CxT
Monitor TAB Execution		CxT
Facilitate Start-Up of Commissioned Systems		CxT
Collect Manuf. Checklists		CxT
Cx Schedule Updates	CxA	
Review "As-Built" Record	Shared	
Review O&M Documents		CxT
Facilitate O&M Training		CxT
Track RFI's/CO's/SI's		CxT
Monitor Project Team Field Reports		CxT
Document Control	CxA	
ACCEPTANCE		
Controls P to P Review		CxT
Control Program Review		CxT
Control SOP Review		CxT
TAB Verification		CxT
Direct FPTs	CxA	
Implement FPTs	Shared	
Write FPT Summaries	Shared	
Approve FPT Summaries	CxA	
Distribute FPT Summary		CxT
Direct Re-Testing	CxA	
Implement Re-Testing	Shared	
Facilitate O&M Training	Shared	
Review Record Documents	Shared	
Track RFIs/COs/SIs		CxT
Digitally Record Training		CxT
Monitor Field Reports		CxT
Acceptance Phase Cx Report	CxA	
Document Control	CxA	
Direct Off-Season FPTs	CxA	
Implement FPT's	CxA	
Direct Re-Testing	CxA	
POST-ACCEPTANCE		
Implement FPTs		CxT
Implement Re-Testing	Shared	
Direct Warranty Issues	CxA	
Document Control	CxA	
Direct 11th Month Review	CxA	
Monitor Warranty Issues Work		CxT
Cx Report/Addendums	CxA	
Attend 11th Month Review	Shared	