

AABC COMMISSIONING GROUP (ACG)  
Certified Commissioning Technician (CxT)  
**Study Guide**

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**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.**



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## 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 11<sup>th</sup> Month Walk Through. The 11<sup>th</sup> 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**

| PHASE OF PROJECT                              | Responsibility |     |
|---|----------------|-----|
|   | CxA            | CxT |
| <b>PRE-DESIGN</b>                             |                |     |
| Document Control                              | CxA            |     |
| Develop Cx Scope                              | CxA            |     |
| Review DID/OPR                                | CxA            |     |
| Prepare Cx Outline                            | CxA            |     |
| Attend Meetings                               | CxA            |     |
|   |                |     |
| <b>DESIGN</b>                                 |                |     |
| 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            |     |
|   |                |     |
| <b>CONSTRUCTION</b>                           |                |     |
| 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.)**

| PHASE OF PROJECT                            | Responsibility |     |
|---|----------------|-----|
|   | CxA            | CxT |
| <b>CONSTRUCTION (cont.)</b>                 |                |     |
| 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            |     |
|   |                |     |
| <b>ACCEPTANCE</b>                           |                |     |
| 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            |     |
|   |                |     |
| <b>POST-ACCEPTANCE</b>                      |                |     |
| 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         |     |