

(This annex is not a mandatory part of the referring ASHRAE SSPC 300 standard or guideline. It is merely informative and does not contain requirements necessary for conformance to the standard or guideline.)

(The following informative annex is provided to illustrate, explain, or support the ASHRAE SSPC 300 commissioning process. The information presented herein represents consensus good practice but does not contain mandatory commissioning process provisions. This informative annex supports more than one ASHRAE SSPC 300 commissioning standard or guideline and is not intended to serve as a standalone document. See the referring ASHRAE SSPC 300 standard or guideline for mandatory commissioning process requirements and guidance.)

ASHRAE SSPC 300 INFORMATIVE ANNEX 07—COMMISSIONING SPECIFICATIONS

It is acceptable, but not required, for the Cx Provider (CxP) to provide drafts of these Cx specifications for the Design Team/Construction Team to consider for inclusion in their construction or contract documents.

07.1 Specifications for the Commissioning Process

07.1.1 This informative annex provides guidance on writing specifications for Cx activities to be performed by construction contractors. The construction contractor's obligation is to construct the building and its systems and assemblies according to the requirements prescribed in the contract documents. The Design Team is responsible for converting the Owner's Project Requirements (OPR) into the contract documents, including any performance related criteria contained in the OPR. The OPR forms the basis of the CxP's evaluation of the design, construction, and operation of the project and is subject to change at the Owner's discretion. These changes come from the designer or directly from an Owner through a revision of contract documents. The OPR may be part of the contract documents, but if the OPR is included in the contract documents, the contract must define how OPR requirements affect the contract document requirements. If the role of the OPR, in terms of contractual obligations, is not clearly defined—if and when the OPR is included in the contract documents—the resulting ambiguity may lead to serious conflicts regarding contractor responsibilities.

07.1.1.1 Cx Specification Development. Cx specifications should clearly define the Cx that will be implemented during the project's construction through warranty periods. The Cx specifications should include each Project Team member's roles and responsibilities in implementing the Cx activities over the course of the project, from the start of construction through the warranty period.

07.1.2 Specification Sections

07.1.2.1 The following are commissioning-specific sections that may be utilized based on the systems to be commissioned.

- A. Section 01 33 01—Commissioning Submittal Procedures
- B. Section 01 78 01—Commissioning Closeout Procedures
- C. Section 01 79 00—Demonstration and Training
- D. Section 01 91 00—Commissioning Process Requirements
- E. Section 07 08 00—Commissioning of Thermal and Moisture Protection
- F. Section 08 08 00—Commissioning of Openings and Fenestration Systems
- G. Section 14 08 00—Commissioning of Conveying Systems
- H. Section 21 08 00—Commissioning of Fire Suppression Systems
- I. Section 22 08 00—Commissioning of Plumbing Systems
- J. Section 23 08 00—Commissioning of HVAC Systems
- K. Section 25 08 00—Commissioning of Building Automation Systems
- L. Section 26 08 00—Commissioning of Electrical Systems
- M. Section 27 08 00—Commissioning of Communications Systems
- N. Section 28 08 00—Commissioning of Electronic Safety and Security Systems

07.1.2.2 The following are non-commissioning specific sections that may require reference to commissioning specifications as necessary.

- A. Section 01 11 01—Summary of Work
- B. Section 01 29 00—Payment Procedures
- C. Section 01 31 00—Project Management and Coordination
- D. Section 01 33 00—Submittal Procedures
- E. Section 01 40 00—Quality Requirements
- F. Section 01 50 00—Temporary Facilities and Controls
- G. Section 01 60 00—Product Requirements
- H. Section 01 77 00—Closeout Procedures
- I. Section 01 78 00—Closeout Submittals

07.1.3 Example General Cx Specification Content

The following is an example of how a general commissioning specification could be set up. Note that the symbol [...] refers to project specific content which will change depending on actual project scope and is not elaborated on in this example.

Section 01 91 00

COMMISSIONING PROCESS REQUIREMENTS

PART 1—GENERAL

1.1 RELATED SECTIONS

- A. Include other specification sections that are referenced or reference this specification

1.2 DESCRIPTION

- A. Commissioning Process (Cx): A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements (OPR).
- B. Cx does not detract from the responsibility of the designers or installing contractors to provide a finished and fully functioning product.
- C. Abbreviations: Table 07-01 shows common abbreviations used in the CxP Specifications and in the Cx Plan. Select definitions are found in [...]
- D. Systems to be commissioned are listed in Section 01 91 00 [...]
- E. Cx requires the participation of the Project Team as defined in this Section 01 91 00 [...]

Table 07-01 Common Abbreviations Used in the Cx Specifications and in the Cx Plan

Abbreviation	Subject	Abbreviation	Subject
A/E	Architect/engineer (design professional team)	CxP	Commissioning Provider
GC	General contractor	ELECC	Electrical contractor
MECHC	Mechanical contractor	PLMBC	Plumbing contractor
TABC	Testing, adjusting, and balancing contractor	C/IC	Controls and instrumentation contractor
WPC	Waterproofing contractor	MC	Masonry contractor
GLC	Glazing contractor	RFC	Roofing contractor
Const-CK	Construction checklist	CxP-PM	Commissioning Provider project manager
HVAC	Heating, ventilation, and air conditioning	O&M	Operations and maintenance
O-REP	Owner's representative	TP	Test procedure
GC-SUPER	General contractor's field superintendent	GC-PM	General contractors project manager
ESSC	Electronic safety and security contractor	COC	Communications contractor

Note: The letter "C" at the end of any abbreviation denotes the word, "Contractor"

1.3 DEFINITIONS

1.4 COORDINATION

- A. Commissioning Provider (CxP) Team: the CxP Team is the team of specialists and related support staff who are responsible for the management of actions and the generation of deliverables by the CxP as outlined in the contract between the Owner and the CxP and in the Cx Plan. The CxP Team may comprise several companies, including subcontractors to the CxP who acts as the contact to the Owner.
- B. Management: The CxP works for the Owner. The CxP directs and coordinates the project Cx activities and reports to the Owner and/or the O-REP. Team members work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. The organization chart in Figure 07-01 clarifies the roles.
- C. Scheduling

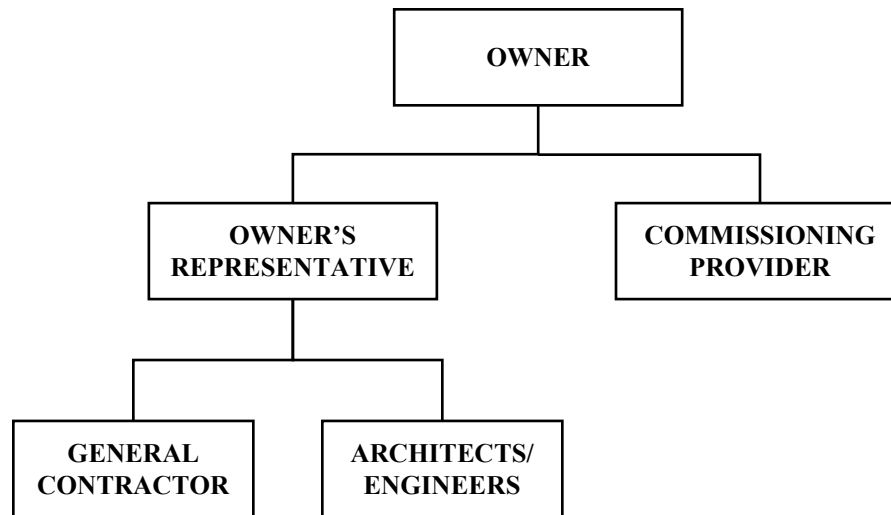


Figure 07-01 Organizational Chart

1.5 COMMISSIONING PROCESS

- A. Cx: The following narrative provides a brief overview of the typical Cx tasks during construction and the general order in which they occur.

1.6 COMMISSIONING PROCESS

- A. All participating parties
 - 1. Follow the Cx Plan
 - 2. Attend Cx scoping meeting and additional meetings, as necessary
- B. Architect (of A/E)
 - 1. Construction and Acceptance Phase
 - 2. Warranty Period
- C. Mechanical and electrical designers/engineers (of the A/E)
 - 1. Construction and Acceptance Phase
 - 2. Warranty Period
- D. Commissioning Provider (CxP):
 - 1. Construction and Acceptance Phase
 - 2. Warranty Period
- E. Owner and/or the O-REP
 - 1. Construction and Acceptance Phase
 - 2. Warranty Period
- F. Contractor–general
 - 1. Construction and Acceptance Phase
 - 2. Warranty Period
- G. Contractor–mechanical, controls, and HVAC testing, adjusting, and balancing (TAB)
 - 1. Construction and Acceptance Phase
- H. Contractor–mechanical
- I. Contractor–controls and instrumentation
- J. Contractor–TAB
- K. Contractor–electrical, communications, electronic safety and security
 - 1. Construction and Acceptance Phase

- L. Material Suppliers
- M. Contractor–building enclosure
 - 1. Construction and Acceptance Phase

1.7 SYSTEMS TO BE COMMISSIONED

- A. The following systems will be commissioned in this project
 - 1. Building enclosure
 - 2. Mechanical and related systems
 - 3. Electrical and related systems

1.8 SUBMITTALS

- A. The general contractor will provide the CxP with a submittal log and submission schedule during preconstruction phase of the project [...]

1.9 QUALITY ASSURANCE

- A. Test personnel
- B. Test equipment

PART 2—PRODUCTS

2.1 MATERIALS

- A. The contractor provides their own respective tools, instruments, and consumables required to meet the requirements of the Cx as described in this section and related sections.

2.2 DESCRIPTION

- A. Commissioning Process (Cx): A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements (OPR).

PART 3—EXECUTION

3.1 MEETINGS

- A. Commissioning kick-off meeting and scoping meeting
- B. Miscellaneous meetings

3.2 CONSTRUCTION CHECKLISTS, START-UP, AND INITIAL CHECKOUT

- A. The following procedures apply to equipment and assemblies to be commissioned:
 - 1. Start-up and initial checkout plan
 - 2. Execution of construction checklists and start-up

3.3 COMMISSIONING TESTING

- A. This subsection applies to Cx testing for all divisions
- B. The contractor shall be responsible to fully execute testing of equipment, systems, and assemblies according to the specifications
- C. Testing requirements
- D. Objectives and scope
- E. Development of test procedures
- F. Test procedure format: A sample test form is provided in the Cx Plan. The test procedure forms developed by the CxP shall include, but not be limited to, the following information:
- G. Commissioning test methods
- H. Problem solving: The burden of problem solving is on the contractor and the architect, though the CxP may recommend solutions to problems found.

3.4 NON-CONFORMANCE AND APPROVAL OF Cx TESTS

- A. Nonconformance
- B. Failure due to manufacturer defect
- C. Approval and acceptance

3.5 DEFERRED Cx TESTING

- A. Unforeseen deferred tests
- B. Seasonal testing
- C. Scheduled deferred tests

3.6 TRAINING OF OWNER'S PERSONNEL

- A. The CG shall [...]
- B. The CxP shall [...]

3.7 DOCUMENTATION

- A. The CxP Plan is [...]
- B. Schedule
- C. Reporting and documentation by the CxP
- D. Systems Manual
- E. O&M documentation review: Prior to [...]

END OF SECTION 01 91 00

07.1.4 Example Specific Discipline Cx Specification Content

Section 23 08 00

COMMISSIONING OF HVAC

PART 1—GENERAL

1.1 RELATED SECTIONS

- A. Include other specification sections that are referenced or reference this specification

1.2 SUMMARY

1.3 ALLOWANCES

- A. Retained if commissioning testing is paid for by contractor under an allowance

1.4 UNIT PRICES

- A. Retained if commissioning testing is paid for by contractor under an allowance

1.5 CONTRACTOR'S RESPONSIBILITIES

1.6 CxP's RESPONSIBILITIES

1.7 COMMISSIONING DOCUMENTATION

1.8 SUBMITTALS

- A. Certificates of readiness
- B. Certificates of completion of installation, prestart, and start-up activities

PART 2—PRODUCTS (NOT USED)

PART 3—EXECUTION

3.1 TESTING PREPARATION

- A. Certify that HVAC&R systems, subsystems, and equipment have been installed, calibrated, started, and are operating according to the contract documents

- B. Certify that HVAC&R instrumentation and control systems have been completed and calibrated
- C. Certify that testing, adjusting, and balancing (TAB) procedures have been completed

3.2 TESTING AND BALANCING VERIFICATION

3.3 GENERAL TESTING REQUIREMENTS

- A. Scope of HVAC&R testing
- B. Modes to be tested
- C. Testing requirements
- D. Objectives and scope
- E. Development of test procedures

3.4 HVAC&R SYSTEMS, SUBSYSTEMS, AND EQUIPMENT TESTING PROCEDURES

- A. Procedures specific to commissioned systems

3.5 PROCEDURES FOR SPACE PRESSURIZATION MEASUREMENTS AND ADJUSTMENTS

3.6 PROCEDURES FOR STAIR-TOWER PRESSURIZATION SYSTEM MEASUREMENTS AND ADJUSTMENTS

3.7 PROCEDURES FOR VIBRATION MEASUREMENTS

3.8 PROCEDURES FOR SOUND-LEVEL MEASUREMENTS

3.9 PROCEDURES FOR SMOKE-CONTROL SYSTEM TESTING

3.10 PROCEDURES FOR INDOOR AIR QUALITY MEASUREMENTS

END OF SECTION 23 08 00

- 07.1.5** This annex provides guidance on content and basic format. While the OPR are Owner-developed criteria, few Owners have the resources to develop the OPR. Owners without these resources depend on the CxP Team to assist them in developing the OPR.

07.2 The Cx Provider

- 07.2.1** The primary role of the CxP is to verify achievement of the OPR throughout the project, from the Predesign Phase through the Occupancy and Operations Phase. The Owner could perform the CxP role.
- 07.2.2** When the Owner's organization cannot perform the CxP duties with qualified personnel, then the CxP should have a separate professional services agreement with the Owner, as this avoids conflicts of interest and provides independence from the other parties (the Owner's project manager, designers of record, construction managers, suppliers, and construction contractors). This professional services agreement defines the duties, rights, and responsibilities of the CxP for each phase of the project. This separate relationship allows the CxP to act independently as director of Cx activities, to focus on achieving the OPR, and to communicate directly with the Owner.
- 07.2.3** The CxP is a group of personnel with expertise and experience in the design, construction, and operations of the various systems and assemblies included in the project. These personnel are led by an individual who has expertise and experience in successfully implementing the Cx.
- 07.2.4** If the CxP is an employee, associate, or partner of the same organization as the designer of record or construction management firm, there is a conflict of interest. While not a recommended approach, in these instances the CxP must have a separate professional services agreement, be organizationally separate from the Design Team or Construction Team, and define and manage the conflicts of interest to provide the Owner with the independence required for the Cx to be successful.
- 07.2.5** The CxP's level of engagement during the testing process can vary. In one instance, the CxP may provide direction to the contractor and document the process. However, at another point, the CxP may perform limited testing. The CxP plans, schedules, and supervises Cx activities to verify achievement of the OPR. The contractor completes construction checklists, performs tests, and accomplishes other Cx activities.

07.3 Organizational Strategy for Inclusion of Commissioning Activities in the Specifications

- 07.3.1** Specifications (as a part of the construction contract documents) should include only the Cx activities that the contractors perform during the life of the construction contract, including the work required during the correction period and for warranties.
- 07.3.2** Supplementary conditions modify the general conditions of the contract for construction in a document titled “Supplementary Conditions.” Among other provisions, define the CxP and include the CxP’s duties, rights, responsibilities and limits of authority, and additional requirements for substantial completion. AIA Document A511, *Guide for Supplementary Conditions*, provides guidance on how to write a supplementary conditions document.
- 07.3.3** General commissioning requirements that define the Cx for the project, each team member’s roles and responsibilities in the Cx, systems being commissioned, etc., should be in the general requirements specification of the contract documents or Division 1 if using the Construction Specifications Institute (CSI) organizational format (refer to Section 07.1.3 of this annex for more detail). Other Cx specifications, such as submittal procedures, commissioning closeout procedures, and demonstration and training specifications, should also reside in the general specification section of the contract documents or Division 1 if using CSI format. Specific system commissioning specifications should reside in the specification section relevant to the commissioning specification. The project specification outside the U.S. formats would define the location of the Cx specifications. See local practices for specific guidance.
 - 07.3.3.1** Specific sampling strategies, testing requirements, and pass/fail criteria should be in specification divisions related to the systems and assemblies being commissioned so that each trade is aware of the criteria to which their installation will be subject.
 - 07.3.3.2** The contractor’s involvement in the Cx tests must be clearly defined. The extent of this testing is determined by the CxP Team during the Design Phase, based upon the OPR, and is clearly communicated in the contract documents.
- 07.3.4** During design, the CxP Team verifies that contractor activities, such as installation and start-up, testing, demonstration and training of the Owner’s O&M personnel, and Systems Manual, achieve the OPR and that these activities are included in the contract documents. In addition, the CxP Team works closely with the Design Team to evaluate the specific testing and reporting requirements for materials, products, and equipment, and identifies non-conformance with the OPR as part of the Cx Design Review process.
- 07.3.5** During the Construction Phase, the CxP Team participates in preinstallation meetings facilitated by the general contractor along with relevant Design Team members, the Owner, and relevant trade contractors to review contract document requirements, installation procedures, and lessons learned from previous projects relative to the systems being commissioned.
 - 07.3.5.1** During construction, the CxP Team verifies that the contractor installation activities, start-up procedures, testing, demonstration and training of the Owner’s O&M personnel, and Systems Manual content deliverables comply with contract documents in accordance with the OPR. Coordinating activities by the contractor in support of the CxP should be specified within the section where the component is specified, if special requirements are necessary. The following are examples of requirements to include in individual sections.
 - 07.3.5.1.1** Installation of components in an assembly forming a building enclosure system: Include a factory authorized representative to (a) conduct specified materials tests to determine compatibility of materials and appropriate performance, and (b) conduct progressive completion of installation checks and testing as work progresses prior to façade installation.
 - 07.3.5.1.2** Installation and start-up: Include requirements for involvement of a factory-authorized service representative in individual sections and for the completion of construction checklists.
 - 07.3.5.1.3** Testing: Include requirements in contract documents that support the CxP in whether commissioned systems are installed and operating as required by the contract documents.
 - 07.3.5.1.4** Demonstration and Training: Include special requirements unique to the component within its own section.
 - 07.3.5.1.5** Operations and Maintenance Data: Include unique requirements for the type of information required (e.g., specific requirements about parts lists, service schedules, preventive maintenance lists, and emergency operations) for long-term maintenance of the OPR.



- 07.3.5.2** In each section, include an article under “General” that refers to Division 1 for Cx activities for system or assembly requirements.