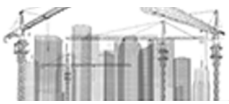


Chapter 3

Commissioning Process Fundamentals





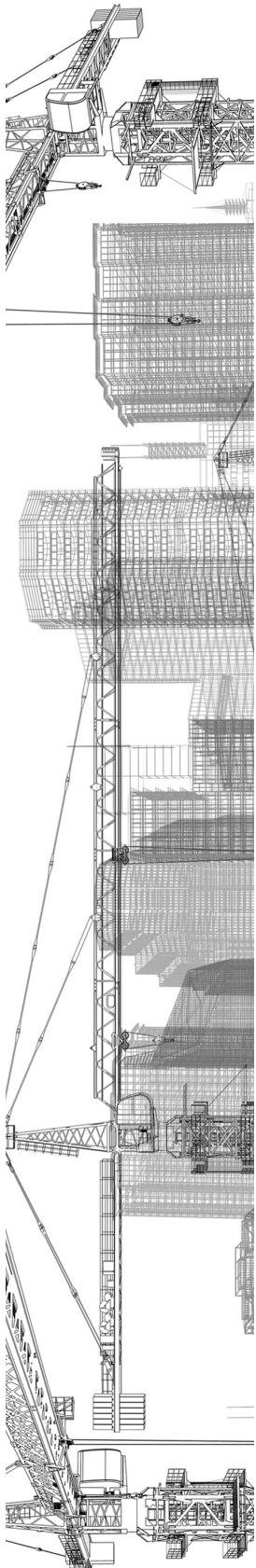
3.1 Standard Process for New Building Commissioning—ASHRAE Standard 202

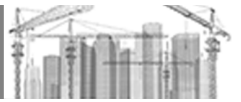
In ASHRAE Standard 202-2013, *Commissioning Process for Buildings and Systems*, that process is described as “A quality-focused process for enhancing the delivery of a project. The process focuses upon verifying and documenting that all of the commissioned systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner’s Project Requirements.”

As a process, commissioning has a series of actions for proper completion with each action having specific deliverables. These deliverables define the building requirements, the commissioning requirements, and the documentation of the process and performance results for the building, systems and assemblies commissioned.

The actions in the commissioning process are as follows:

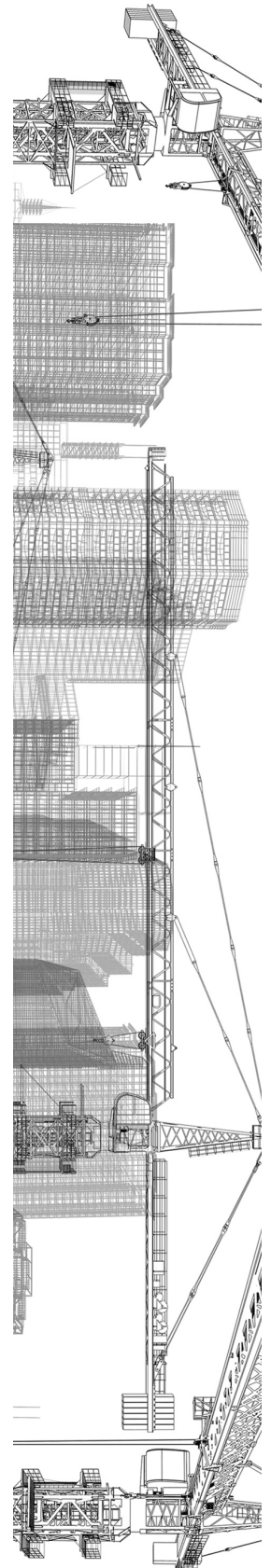
1. **INITIATION:** The owner initiates the Commissioning Process at the beginning of the project, and determines the roles and responsibilities of the project and commissioning teams. Procedures and contracts should be prepared and executed. The Commissioning Provider should be retained at this time.
2. **OWNER’S PROJECT REQUIREMENTS:** Next the project requirements should be determined and documented. This includes not only the building scope and use but also the system performance, training, testing, commissioning and documentation requirements. The deliverable for this action is the Owner’s Project Requirements (OPR) document which is the guiding instruction for the project. The OPR is updated throughout the design and construction of the project.
3. **COMMISSIONING PLAN:** The initial Commissioning Process Plan should be developed, showing the commissioning scope, roles and responsibilities, communication procedures, and design and construction requirements for providing and integrating commissioning into the project. The deliverable is the Commissioning Process Plan that is updated throughout the project with checklists, schedules and documentation details.
4. **BASIS OF DESIGN:** The design team then determines and documents the design approach to meet the Owner’s Project Requirements. The deliverable for this action is the Basis of Design (BoD), which is the guiding technical document the design team will take to accomplish the OPR. The Commissioning Provider reviews the Basis of Design (BOD) for conformance to the OPR.
5. **SPECIFICATIONS:** During the design phase the contractor commissioning requirements should be determined for each system and included in the commissioning specifications for the construction documents package. The Commissioning Provider assists the design team in the development of the commissioning specifications.
6. **DESIGN REVIEW:** In the design phase and at the completion of design the Commissioning Provider reviews the design and documents for conformance to the OPR. These reviews should be assembled in

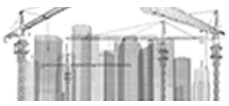




the design review report. The design review by the commissioning provider is not considered a PEER review, or a code review, and does not replace these functions.

7. **SUBMITTAL REVIEW:** Early in the project construction, the commissioning team reviews the materials and equipment submittals for conformance to the OPR and construction documents. This provides familiarity with the building systems for development of testing and commissioning procedures, requirements and checklists. These reviews should be summarized in the submittal review report.
8. **SYSTEM VERIFICATION:** As the project is constructed, the commissioning team observes and verifies the installation and performs or witnesses the equipment start-up and testing. The air conditioning system test and balance process and report should be reviewed and verified by the Commissioning Provider to assure system operation and compliance with the project documents.
9. **FUNCTIONAL AND PERFORMANCE TESTING:** At system completion, functional and performance testing is conducted to verify performance compliance with the OPR and design documents. The results of these verification processes should be recorded in the construction checklists and reports. These reports should be included in the project commissioning report.
10. **ISSUES and RESOLUTIONS LOG:** One of the main functions and benefits of the commissioning process is the identification and resolution of project issues, both design and construction. These actions should be presented in the Issues and Resolutions log facilitating communications, project team collaboration, and the ultimate resolution of the issue. The final issues log should be included in the final commissioning report.
11. **SYSTEMS MANUAL:** During the design and construction of the project, the design and construction documents should be assembled into the systems manual. This assembly of documents provides the details and history of the design and construction of the building and information needed to properly operate the building. The systems manual includes the project final OPR, BOD, construction record documents, submittals, completed startup, verification checklists, functional and performance checklists, verified sequence of operation, facility guide, training records, and commissioning report. The systems manual should be used in the initial and subsequent training of the building operations staff and occupants. The systems manual should be updated throughout the life of the building.
12. **TRAINING:** To operate the building in accordance with the OPR and design capabilities, the building staff must be trained on the installed equipment and systems. The suppliers and contractors will normally conduct the training with the training being observed by the commissioning team. The training plans and records should be retained and updated for use in later training.





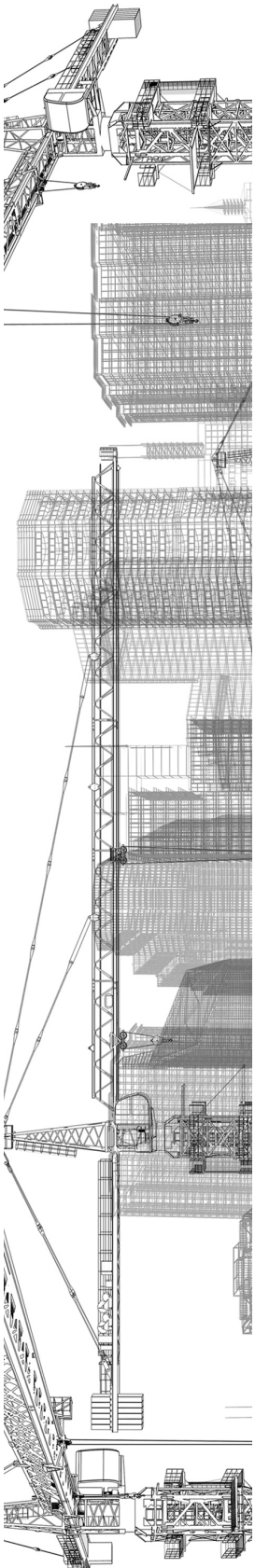
13. OPERATION PHASE: Commissioning that was not performed due to climatic conditions or equipment availability before initial certificate of occupancy should be conducted during post occupancy. The end of warranty commissioning report documents these activities. The final testing results should be included in the final commissioning report and systems manual.
14. COMMISSIONING REPORT: Commissioning plans and interim reports should be collected and distributed throughout the project as required by the commissioning plan. A preliminary commissioning report should be prepared that shows the commissioning progress and equipment performance to date at the time the Certificate of Occupancy is issued. At the completion of the project the final commissioning report should be assembled and provided to the owner and others as required by the OPR and local jurisdiction requirements. This report includes the final commissioning plan, copy of design and submittal review reports, all startup, inspection, verification, functional and performance test forms and reports, the verified sequence of operation, the final Issues and Resolutions log, and summary of the performance of commissioned systems.

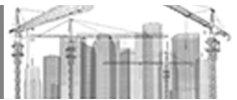
3.2 New Building Commissioning Process Activity, Deliverables, and Responsibilities

The application of the commissioning process can be for the delivery of all or selected systems and assemblies in a project. The commissioning scope will depend on how the project will be designed, built, and operated. The scope is defined in the Owner's Project Requirements and the Commissioning Plan, and based on the extent of commissioning effort. The process described in the following sections and appendices is written for a generic project and must be adapted to each project. The Commissioning Process can be supplemented by companion technical documents and guidelines to describe the specific details and to properly implement the Commissioning Process relative to a specific facility, system, or assembly. This process can be applied to both new and renovation projects. Commissioning of existing buildings, unless covered in a renovation, is not included in this guideline for two reasons. First, the focus of this guideline is on code-required commissioning on new projects. Second, the commissioning process on an ongoing building operation is much more variable and dependent on specific building operation and project requirements, and may not be code required.

The requirements of the commissioning process are to:

- a. Provide the activities for the application of the Commissioning Process in the design, development, construction, operation and modification of physical buildings, systems and assemblies.
- b. Establish the commissioning process activities and sequence of activities.
- c. Establish commissioning deliverables and documentation for the process application.

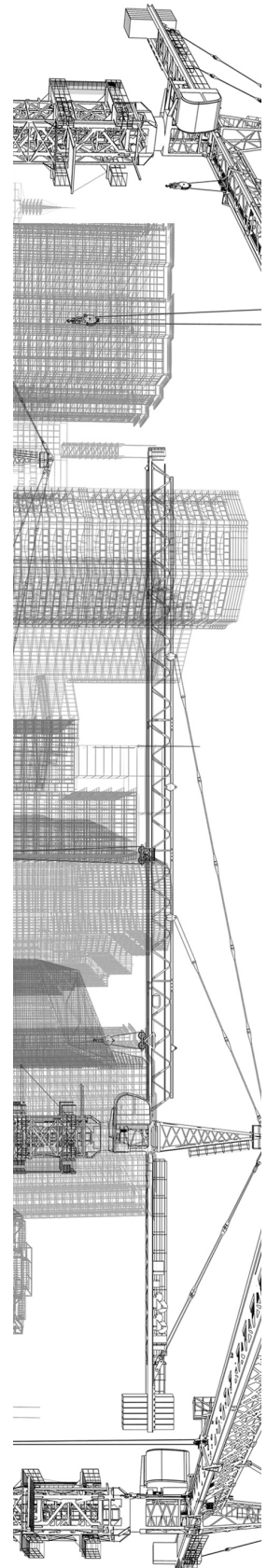




- d. Establish an acceptance procedure for commissioned systems and project completion

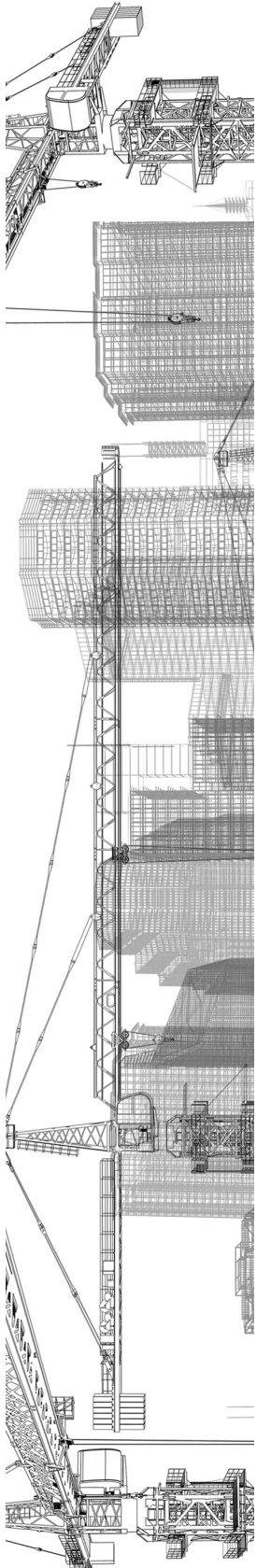
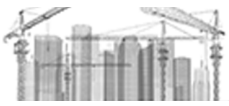
Acceptance. The process for each activity and deliverable shall include an acceptance step as defined in the OPR and Commissioning Plan. This step shall formalize the acceptance of the commissioning deliverable by the owner or client, and/or the Authority Having Jurisdiction if required. Under common practice, the Commissioning Provider is not required to accept designers' or contractors' work on behalf of the owner or jurisdiction.

The following chart outlines normal activities, documentation, and responsibility included in the Commissioning Process:



COMMISSIONING PROCESS ACTIVITIES, DELIVERABLES AND RESPONSIBILITIES (reference ASHRAE Standard 202 and ASHRAE Guideline 0)					
Item #	Activity	Deliverable	Normally Provided By	Normally Approved By	For Use By
1.	Project commissioning initiation	Contract and work orders: roles and responsibilities	Owner	Owner	Owner
2.	Owner's project requirements	OPR document	Owner with assistance from design and Cx teams	Owner	Owner, design team, Cx team
3.	Basis of Design	BoD document	Design team	Owner with review by CxP	Owner, design team, Cx team
4.	Commissioning Plan	Cx Plan	Cx provider with input from owner, design team, and contractor	Owner with reviews by design team and contractor team	Cx team, construction team, AHJ
5.	Contractor Cx requirements	Project specifications	Design team and Cx provider	CxP with owner review	Contractors and suppliers
6.	Design review	Design review report	Cx provider	CxP with design team response	Owner, design team
7.	Submittal review	Submittal review report	Cx provider	CxP with owner review and contractor response	Design team, contractors, suppliers
8.	Cx designated systems inspections, functional and performance testing	Installation, inspection, functional test reports, performance test reports	Contractors, manufacturers, Cx provider and team	CxP with owner review	Contractors and suppliers

(continued)



COMMISSIONING PROCESS ACTIVITIES, DELIVERABLES AND RESPONSIBILITIES (reference ASHRAE Standard 202 and ASHRAE Guideline 0)					
9.	Issues and resolutions Log	Issues and resolutions logs	Cx provider with input from design and construction team	CxP with owner, design team and contractor response.	Owner, design and Cx teams, contractors
10.	Develop Systems Manual	Systems Manual	Contractors with review by Cx provider	CxP with review by owner, operators and design team	Owner, building operators
11.	Training	Training plan and reports	Contractors and manufacturers with review by Cx provider	Owner with CxP review	Building operators
12.	Preliminary Cx report	Preliminary Cx report	Cx provider	CxP, owner and if required, AHJ	Owner, contractors, AHJ
13.	Post-occupancy operation	Additional information, testing, and updates to reports	Cx provider and building operations	Owner	Owner, building operators
14.	Commissioning reports	Preliminary and final Cx reports	Cx provider	CxP, owner and if required, AHJ	Owner, operators, AHJ