

How to work with the Stakeholders in the Cx process

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Course Description

Building Commissioning is a code requirement. It is a team process that is managed by the Commissioning Provider. The team participants, called Stakeholders, perform specific scheduled functions to accomplish project commissioning. This session outlines the commissioning process along with the functions and duties of the stakeholders including: Owner, building official, architect, engineer, manufacturer, supplier, contractor and commissioning provider. Each stakeholder needs to understand the process and their functions along with the other participants and be trained in those functions.

Learning Objectives

- Identify who the stakeholders are.
- Timeline for inclusion of each stakeholder
- Deliverables from and to stakeholders
- Tools to use – Stakeholders Guide

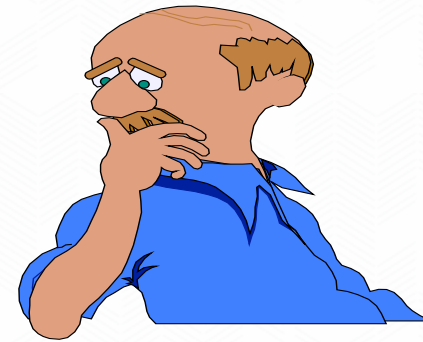
Commissioning Process

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

ASHRAE Standard 202

Commissioning Process Requirements

- Requirements Documented
- Design Meets Requirements
- Construction Meets Design Documents
- Systems Tested to Verify Performance
- Operators Trained
- Documentation and Records



Cx Activities and Deliverables – Design Phase

Activity

- Initiate Cx Process
- Project Requirements
- Develop Cx Plan
- Design Approach to Project Requirements

Deliverable

- Roles and Responsibilities
- Owner's Project Requirements (OPR)
- Cx Process Plan
- Basis of Design (BOD)

Cx Activities and Deliverables – Construction Phase

Activity

- Set Contractor Cx Requirements
- Review Design
- Review Submittals
- Observation & Testing

Deliverable

- Cx Specification Requirement
- Design Review Report
- Submittal Review Report
- Construction Checklist & Reports

Cx Activities & Deliverables – Closeout Phase

Activity

- Issues Resolution
- Assemble Systems Manual
- Conduct Training
- Post Occupancy Operation
- Commissioning Process Report

Deliverable

- Issues Log
- Systems Manual
- Training Plans and Records
- End of Warranty Cx Report
- Cx Process Report

Cx Process Utilization - Standards & Codes Requirements

- ICC Codes – Building Codes
 - IECC –Energy Conservation Code – requires Cx
 - IGCC- Green Construction Code – requires Cx
- Cal Green / Title 24 – requires Cx
- European Documents
- Related ASHRAE Standards
 - 202 The Commissioning Process for Buildings and Systems
 - 189.1 Design of Green Buildings – requires Cx
 - 90.1 Energy Standard - requires Cx
 - 55 Thermal Environmental Conditions for Human Occupancy
 - 62.1 Ventilation for Acceptable IAQ

ASHRAE Commissioning Standards & Guidelines

- STD 202-2018 Commissioning Process for Buildings and Systems
- STD 230-2022 Commissioning Process for Existing Buildings and Systems
- GDL 0-2019 The Commissioning Process
- GDL 1.1-2007 HVAC&R Technical Requirements for the Commissioning Process
- GDL 1.2-2019 Technical Requirements for the Commissioning Process for Existing HVAC&R Systems and Assemblies
- GDL 1.3-2018 Building Operations and Maintenance Training for the HVAC&R Commissioning Process
- GDL 1.4-2019 Procedures for Preparing Facility Systems Manuals
- GDL 1.5-2017 The Commissioning Process for Smoke Control Systems

Cx Process - Other Related Programs

- National Institute of Building Sciences (NIBS)
 - Whole Building Design Guide (WBDG)
 - Guideline 3 –2012 Building Enclosures (Replaced by ASTM Docs)
- ASTM
 - E2813 -12 Standard Practice for Building Enclosure Commissioning
 - E2947-16a Standard Guide for Building Enclosure Commissioning
- Illuminating Engineering Society (IES)
 - Commissioning Guideline, DG-29-11
- National Fire Protection Association
 - Standard 3 and 4-2021 –Commissioning and Integrated Testing
- LEED® and Other Green Building Processes
 - Green Globes, CHPS, WELL Building, FITWEL, Living Building Challenge, 2030 Challenge

Cx Process – Documents and Participants Activities

Phases	Document	Input By	Provided By	Reviewed/ Approved by	Used By
Project Initiation	OPR	Owner, CxP, O&M, Users, Design Team	Owner, CxP, or Design Team	Owner	CxP, Design Team
Enterprise	Initial Cx Plan	Owner, Design Team, CxP	Owner or CxP	Owner	CxP, Owner, Design Team, Construction Team
	Systems Manual Outline	Owner, O&M, CxP	Owner or CxP	Owner	Design Team, Construction Team
	Training Requirements Outline	Owner, O&M Users, CxP, Design Team	Owner or CxP	Owner, CxP	Design Team, Construction Team
	Issues and Resolution Log Format	Owner, CxP	Owner or CxP	Owner	CxP, Design Team
	Cx Report Format	Owner, CxP	CxP	Owner	Design Team, Owner
	OPR Update	Owner, CxP, O&M, Users, Design Team	CxP or Designer	Owner	CxP, Design Team
	Basis of Design	Design Team	Design Team	Owner, CxP	Design Team, CxP
	Construction Specifications for Cx	Design Team, CxP, Owner, O&M	Design Team or CxP	Owner	Contractors, CxP, Design Team
	Systems Manual Outline—Expanded	Design Team, CxP, O&M, Contractor	Design Team or CxP	Owner, CxP	Design Team, Contractor
	Training Requirements	Owner, CxP, O&M, Users	Owner, CxP, or O&M	Owner	Design Team
	Design Review Comments	CxP	CxP	Design Team, Owner	Design Team
	Issues and Resolution Log	CxP	CxP	Design Team, Owner	CxP, Design Team
	Design Cx Report	CxP	CxP	Owner	Owner

Cx Process – Activities and Participants Schedules

Construction	OPR Update	Owner, O&M, Users, Design Team	CxP or Designer	Owner	CxP, Design Team, Contractors, Owner
	BoD Update	Design Team	Design Team	CxP, Owner	Design Team, CxP, Owner
	Cx Plan Update	Project Team	CxP	Owner	Project Team
	Submittal Review Comments	CxP	Design Team	Design Team	Contractor
	System Coordination Plans	Contractor, Design Team, CxP	Contractor	CxP, Design Team	Contractor, CxP
	Evaluation Checklists	CxP, Contractor, Design Team	CxP or Contractor	CxP, Design Team	Contractor
	Cx Progress Reports	CxP, Contractor	CxP	CxP, Owner	Contractor
	Test Procedures	Project Team	CxP	CxP, Design Team	Contractor
	Specified Test Data Submittals	Owner, Design Team, CxP	Contractors, CxP, or Owner	Design Team, CxP	Project Team
	Cx Meeting Agendas and Minutes	CxP	CxP	All	All
	Training Plans	Project Team	Contractor or CxP	Owner, CxP	O&M, Users, Contractor
	Systems Manual	Project Team	Contractor or CxP	Owner, CxP	O&M, Users
	Issues and Resolution Log	CxP	CxP	N/A	Project Team
	Progress Report	CxP	CxP	Owner, Design Team	Project Team
	Preliminary Construction Cx Report	CxP	CxP	Owner	Owner
	Final Construction Cx Report	CxP	CxP	Owner	Owner
Occupancy & Operations	OPR Update	Owner, O&M, Users, Design Team	CxP or Designer	Owner	CxP, Owner

Commissioning Stakeholders

- Owner/Developer
- Cx Provider
- Architects
- Engineers
- Designers
- Code Officials
- Contractor/CM
- Sub-contractors
- Installers
- Manufacturers
- Suppliers
- Program Administrators

Commissioning Coordination Functions

1. Analyze Project for Cx and Participant Requirements
2. Establish Identity and Contact Information for Stakeholders
3. Assure that Necessary Participants Understand the Cx Process
4. Provide Coordination and Completion Checklists for Project Cx Stakeholder's Responsibilities and Specific Equipment
5. Track Completion Status

CxP Assistance to AHJ

- Training on the Commissioning Process
- Checklist for AHJ Functions Related to Commissioning
- Checklists for Use in Permitting and Final Inspection
- Checklists for Commissioning Plan and Reports
 - NOTE: Assistance to other Stakeholders is similar

Stakeholder Functions –*Owner*

Predesign Phase

- Develop and approve the OPR.
- Engage a CxP.
- Review and approve the Cx Plan and commissioning budget for design.

Design Phase

- Include commissioning tasks in Design Team scopes and contracts.
- Review and approve the BoD.
- Ensure Design Team responds to all CxP design review comments.
- Review and approve Cx Plan updates and commissioning specifications
- Review and approve miscellaneous noncommissioning specification language enhancements by CxP.
- Incorporate appropriate attachments to the bid documents for information (e.g., OPR, BoD, Cx Plan)

Stakeholder Functions –*Owner*

Construction Phase

- Furnish a copy of all construction documents, addenda, requests for information, change orders, and approved submittals and shop drawings related to commissioned equipment to the CxP.
- Provide current copies of the OPR and BoD to the CxP.
- Facilitate the coordination of the commissioning work by the CxP.
- Attend commissioning meetings and participate in issue resolution as appropriate.
- With the contractor and CxP, ensure that commissioning activities are being scheduled into the master schedule.
- Arrange for building O&M personnel to attend various field commissioning activities and field training
- Ensure contractor's commissioning responsibilities required prior to substantial completion are completed.

Stakeholder Functions –*Owner*

Occupancy Phase

- Ensure contractor's commissioning responsibilities required prior to final completion are completed including addressing remaining open issues in a timely manner
- Facilitate O&M staff attending training
- Provide CxP needed access to the building and building automation system during occupancy
- Support any Ongoing Commissioning (OCx) activities

Stakeholder Functions – *Commissioning Provider*

Predesign Phase

- Assist in developing and review the OPR.

Design Phase

- Review the BoD.
- Write the Cx Plan.
- Review the drawings and specifications including building enclosure.
- Write the commissioning specifications, or at minimum confirm that adequate commissioning specifications are included in the contract documents.

Stakeholder Functions – *Commissioning Provider*

Construction Phase

- Review contractor submittals of commissioned equipment and provide comments.
- Document all issues and manage the commissioning issues and resolutions log.
- Develop the construction checklists, or at minimum confirm that adequate checklists are being used
- Develop functional test procedure (scripts) or confirm that adequate test scripts are written by the contractors.
- Conduct field observations.
- Conduct functional testing and trend log analysis or at minimum manage functional testing with sufficient witnessing and back-checking to offer a reasonable level of confidence in the results agreeable to the Owner.
- Confirm training and O&M manual adequacy.

Stakeholder Functions – *Commissioning Provider*

Occupancy Phase

- Review the complete Systems Manual.
- Conduct an on-site review of the facility well into the first year.
- Assist in initiating an OCx program.

Stakeholder Functions –*Architect*

Predesign Phase

- Assist with development of the OPR.
- Review the initial Cx Plan.
- Design development.

Design Phase

- Develop and maintain the BoD.
- Produce construction documents to meet the OPR.
- Respond to design review comments.
- Review and incorporate Cx requirements in the specifications.

Stakeholder Functions –*Architect*

Construction Phase

- Integrate CxP submittal review comments.
- Respond to Cx related requests for information.
- Review functional test procedures, when in scope.
- Work to resolve design-related issues identified during Cx.
- Attend selected Cx meetings.

Occupancy Phase

- Provide as-built drawings and specifications for Systems Manual.
- Respond to any outstanding design-related issues.

Stakeholder Functions – *Engineer/Designer*

Predesign Phase

- Assist with development of the OPR.
- Review the initial Cx Plan.

Design Phase

- Assist with development of and maintain the engineered sections of the BoD.
- Respond to design review comments.
- Review and incorporate Cx requirements in the specifications.

Stakeholder Functions – *Engineer/Designer*

Construction Phase

- Integrate CxP submittal review comments.
- Respond to Cx related requests for information.
- Review functional test procedures, when in scope.
- Work to resolve design-related issues identified during Cx
- Attend selected Cx meetings.

Occupancy Phase

- Provide as-built drawings and specifications for Systems Manual.
- Respond to any outstanding design-related issues.

Stakeholder Functions – *Code Requirements*

Code Process

- Ensure Cx has been included in design docs.
- Ensure that a Cx Plan is written and based on OPR.
- Review of the Cx Plan documents with a check of the design documents to ensure the project meets code requirements and Cx requirements.
- At the time of permit, the Owner needs to have retained a CxP that has the necessary skills and meets the AHJ's approval.
- At the time of project completion, to the extent necessary to obtain a temporary or final certificate of occupancy, the CxP has submitted a preliminary Cx report that shows the status of the project equipment operation status and related Cx status along with a plan for the completion of Cx.

Stakeholder Functions – *Code Officials*

Code Officials Verify:

- CxP is retained.
- Systems to be commissioned are selected.
- OPR and BoD documents are developed and reviewed.
- Cx Plan is written and Cx specifications are in the construction documents.
- Cx and Reports are completed and reports submitted.

Code Commissioning Enforcement - Permit

Commissioning Documentation for Permit

Project Name: _____
Project Address: _____ Permit Number: _____
Commissioning Provider: _____
Company/Entity Address: _____
CxP Phone Number: _____ CxP Email Address: _____
CxP Certification (if required) _____

Commissioning Documentation	Approval
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Project Requirements for Commissioning

Project requirements and design completed, documented, and included in the project documentation, including the list of systems to be commissioned and their performance criteria

Contractor and Construction Instructions

Plans and commissioning specifications, with equipment performance requirements shown, completed and included in contract documents

Design Review

Commissioning design documents review completed with response from design team

Commissioning Plan

Initial Cx plan (for permit) completed with required contents and provided by the CxP for Owner and AHJ review

Commissioning Provider Acknowledgment

I have reviewed the documents and verified that they meet the Owner's project requirements:

Name: _____ Company

Name: _____ Signature:

Date: _____

Owner/Owner's Representative Acknowledgment

The project documents include the items listed in this form and have been approved by the Owner or Owner's representative:

Name: _____

☐ Owner ☐ Owner's Representative

Company Name: _____

Signature: _____ Date: _____

Code Checklist - Certificate of Occupancy

Commissioning Documentation for Final Inspection and Certificate Of Occupancy

Project Name: _____
Project Address: _____ Permit Number: _____
Commissioning Provider: _____
Company/Entity Address: _____
CxP Phone Number: _____ CxP Email Address: _____
CxP Certification (if required): _____

Commissioning Documentation	Approval
Project Requirements	
Project requirements and design of equipment and systems requirements included in project documents	
Commissioning Plan	
Cx plan with checklists completed before start of functional testing and used on project.	
Contractor and Construction Instructions	
Project plans and commissioning specifications were used on the project	
Design and Construction Submittal Review	
Design documents review and construction submittal review and reports completed	
Commissioning Issues and Resolutions Log	
Issues and resolutions logs completed up to time of final inspection with open items shown.	
Commissioning Testing	
Commissioning checklists completed up to time of final inspection	
Systems Manual	
Project documentation and systems manual assembled with available information for use in training program before occupancy	
Training Documents	
Operations, maintenance, and occupant training plan completed for initial training	
Commissioning Report	
Preliminary commissioning report with plans for project completion available (at time of final inspection for certificate of occupancy) and submitted to AHJ if required.	

Commissioning Provider Acknowledgment

I have reviewed the documents and verified that they meet the Owner's project requirements:

Name: _____ Company
Name: _____ Signature:
Date: _____

Owner/Owner's Representative Acknowledgment

The project documents include the items listed in this form and have been approved by the Owner or Owner's representative:

Name: _____
☐ Owner ☐ Owner's Representative
Company Name: _____
Signature: _____ Date: _____

Stakeholder Functions – ***Contractor/Construction Manager***

Construction Phase

- Review the Cx requirements in the construction contract documents.
- Include the cost of participation in the Cx Process.
- Integrate the necessary time for Cx in the construction schedules.
- Assign specific individuals as managers and contact points for Cx activities.
- Submit the required equipment and system submittals for Cx systems.
- Attend the Cx scoping and coordination meetings.
- Communicate and coordinate with the Cx Team, as necessary.
- Develop and complete the installation and testing checklists.

Stakeholder Functions – ***Contractor/Construction Manager***

Construction Phase (cont.)

- Perform the necessary and required testing and documentation.
- Assist the Cx Team and other contractors in equipment and system performance verification.
- Provide documentation and assist in the assembly of the Systems Manual.
- Provide the building operation and maintenance training.

Occupancy Phase

- Perform testing and training requirements.
- Respond to any open Cx issues.

Stakeholder Functions – ***Sub-Contractor/Installer***

Construction Phase

- Schedule Cx activities with the CxP and general contractor.
- Assist in the development of project checklists.
- Ensure installers and manufacturers are executing their Cx responsibilities for the specified systems, including:
 - Construction checklists, start-up and checkout
 - Functional test readiness activities
 - Functional testing
 - Training and O&M documentation
 - Addressing commissioning issues

Stakeholder Functions – ***Sub-Contractor/Installer***

Construction Phase (cont.)

- Review CxP construction checklist and functional test scripts.

Occupancy Phase

- Perform outstanding testing and training.
- Respond to any open Cx issues.

Stakeholder Functions – *Manufacturer/Supplier*

Construction Phase

- Provide requested submittal data, including start-up and checkout instructions. Provide specific responsibilities of the Owner to keep warranties in force for all Cx equipment or assemblies.
- Assist the installing contractor in filling in construction checklists.
- Provide information requested by CxP regarding equipment sequence of operation and testing .
- Submit start-up reports to contractor within two days of start-up.
- Review CxP test procedures for equipment installed by factory.

Stakeholder Functions – *Manufacturer/Supplier*

Construction Phase (cont.)

- Assist in functional testing of equipment as needed according to the specifications, including assisting CxP with execution of the functional tests for equipment with packaged controls, which includes demonstrating all controller setup screens.
- The technician that conducted equipment start-up should be available to the CxP to support the functional and performance testing by the CxP. This includes chillers, boilers, and large air handlers as a minimum.
- Provide expert qualified staff for equipment training.

Occupancy Phase

- Perform outstanding testing and training.
- Respond to any open Cx issues

Stakeholder Functions – *LEED/Code Program Administrator*

Review and/or Verify Required Project Performance

Predesign and Design Phase

- Review the OPR, BoD, and the Cx Plan to ensure compliance with program
- Ensure an approved CxP is retained for the project
- Review the drawings and specifications for inclusion of Cx requirements

Construction Phase

- Ensure the CxP and Cx Team are performing the required functions and completing the required documentation.
- Issues Documented.
- Review the completion of the construction Cx documentation.
- Confirm training and Systems Manual inclusion if doing enhanced Cx.

Occupancy Phase

- Completion of the required Systems Manual and Cx reports.

Stakeholder Functions – Owner's - Checklist

Table 3.3 Owner's Roles and Responsibilities Checklist

Project: _____
 Address: _____
 Owner: _____ Email/ _____
 Phone: _____
 Owner's Project Manager: _____ Email/ _____
 Phone: _____
 Date Initiated: _____ Date Revised: _____

Step	Required? Y/N	Activity	Document	Completed	Notes
1		Select and retain CxP	Contract		
2		Assemble Owner's Cx team and develop OPR	OPR		
3		Approve initial Cx plan	Cx plan		
4		Approve format and contents of systems manual, training plan, issues log and Cx plans. Include the requirements in OPR.	Systems manual, training plan, issues log		
5		Approve BOD	BOD		
6		Review and approve updates to previous items during design phase			
7		Review and approve updates to previous items during construction phase			
8		Review and respond to issues and resolutions log	Issues log		
9		Review and accept commissioning reports	Cx report		

This checklist can also be used to develop the contracts and purchase orders for the various commissioning team members.

The approval section that follows can be used if applicable to the planning process.

I have reviewed the required items and plans and verified that they meet the Owner's project requirements:

Name: _____

Company Name: _____

Signature: _____

Date: _____

Stakeholder Functions – *CxP- Checklist*

Table 3.9 Commissioning Provider Roles and Responsibilities Checklist

Project: _____		Address: _____			
Owner: _____		Email/Phone: _____			
Owner's Project Manager: _____		Email/Phone: _____			
Date Initiated: _____		Date Revised: _____			
Step	Required? Y/N	Activity	Document	Completed	Notes
1.		Assist in the development of the OPR	OPR		
2.		Develop the initial Cx Plan	Cx Plan		
3.		Review the BoD	BoD		
4.		Review and approve updates to above items during design phase			
5.		Review and approve updates to above items during construction phase			
6.		With Commissioning Team and contractors, develop the construction checklists	Checklists		
7.		Conduct the initial scoping meeting and other commissioning meetings			
8.		Develop and maintain the issues and resolutions log	Issues and resolutions log		
9.		Witness and manage equipment and system testing with contractors			
10.		Review Systems Manual	Systems Manual		
11.		Review training plan and witnesses operations and maintenance training	Training plan		
12.		Produce commissioning reports	Cx report		
		Additional tasks may be required			

The approval section that follows can be used if applicable to the planning process.

I have reviewed the required items and plans and verified that they meet the OPR:

Name: _____

Company Name: _____

Signature: _____ Date: _____

Commissioning Documentation – New Construction Projects

- Owner's Project Requirements
- Commissioning Plans
- Basis of Design
- Project Specifications
- Design Review
- Submittal Review
- Checklists
- Issue Logs
- Systems Manual
- Training Plan
- Commissioning Reports
 - Preliminary
 - Final
- Ongoing Commissioning Plan
(@End of Project)

Cx Documentation –*Owner's Project Requirements*

- Facility objectives, size, location, user requirements, and Owner directives
- Environmental, sustainability, and efficiency goals and benchmarks
- Indoor environment requirements, including temperature, humidity, and ventilation
- Space usage, occupancy, and operation schedules
- Commissioning Process scope and requirements and a listing of equipment, systems, and assemblies requiring commissioning
- Equipment, systems and assemblies' requirements, expectations, and warranty provisions
- Maintainability, access, and operational performance requirements
- Installation evaluation and testing requirements

Cx Documentation –*Owner's Project Requirements*

- Project documentation and Systems Manual requirements and formats
- Training requirements for Owner's O&M personnel and occupants
- Applicable codes and standards in addition to local building codes
- Project schedules
- Special project requirements
- The content, organization, and milestones of Basis of Design (BoD) submittals for the design and construction process
- The number, format, and scheduling of design and submittal reviews
- Sampling procedures, if permitted, for all reviews, evaluations, and testing
- Commissioning Progress Report formats and distribution intervals

Commissioning Documentation –***Commissioning Plan***

Overview of the Commissioning Process developed specifically for the project

- Roles and responsibilities for the Cx Team throughout the project
- Documentation of general communication channels, including the distribution of the Cx Plan during the design and construction process
- Detailed description of Cx Process activities and a schedule of activities along with a list of project commissioned systems and assemblies and a description of evaluation procedures
- Project design and submittal documentation evaluation procedures

Commissioning Documentation –***Commissioning Plan***

- Guidelines and format used to develop the Cx Process documentation
- Listing and format for Cx Process evaluation checklists and testing forms, issues and resolutions log, and Cx Progress Reports that will be used during the project to communicate and track progress
- The framework for procedures to follow whenever Cx Process evaluation does not meet the OPR
- Documentation and reporting requirements

Commissioning Documentation –***Basis of Design***

Basis of Design

- Describes in detail the Design Team's technical approach to each of the Owner's requirements
- Provides a platform for the review of the design and changes as the project progresses, and coordinate applicable technical standards and code requirements

Commissioning Documentation –*Basis of Design (BoD)*

The Owner and CxP should evaluate the BoD for the following:

- Design and design assumptions that agree with the OPR
- Requirements for updating of the BoD
- Requirements for sustainable design certification when required
- Consideration of design alternatives at each phase as appropriate
- Requirements that systems, assemblies, and equipment be located and installed to be commissionable and maintainable
- Opportunities for improved *performance*

Commissioning Documentation –*Specifications*

1 General Project Specification Information

- Commissioning specifications developed for all systems and assemblies being commissioned and included in the construction documents.

2 Commissioning Roles and Responsibilities

- Roles and responsibilities, communication requirements, issue resolution, and meetings and schedules.

3 Systems to be Commissioned and Documentation Process

- Documentation development and application and control requirements, including commissioning checklists and Systems Manual production and use.

4 Commissioning Team Contract Requirements

- Applicable Commissioning Process specifications and requirements that should be included in all contracts with contractors, subcontractors, suppliers, service providers, and manufacturers for systems and assemblies being commissioned.

5 Contractor-Provided Documentation

- Requirements for contractors, subcontractors, suppliers, service providers, and manufacturers to provide the required documentation as defined in the contract documents and Cx Plan.

Commissioning Documentation –*Design Review*

Review the OPR.

Document the General Review Criteria.

- Labeling, including correct room numbering
- Details corresponding to actual components
- Schedules of equipment specific to the project, including coordinated tag identification, location, system(s) served, capacities, electrical characteristics coordinated with electrical drawings, and additional pertinent data (accessories, special options, weight, etc.)
- All information shown on drawings legible (not hidden by crossing lines or text)
- Design professional's BoD narrative
- OPR information included on documents

Accomplish Quick General Review

Commissioning Documentation –*Issue Logs*

- Project title
- Project location
- Name of CxP managing issues and resolutions log, with email address and phone #
- Issue number, usually sequential
- Issue description sufficient to describe item for all to understand
- Picture(s) of item if available and appropriate
- Date issue discovered
- Issue found by name
- Effects of issue on project or building operation to relate importance of issue
- Possible cause of issue or problem
- Recommendation for resolution if available
- Person(s) assigned to resolve issue
- Actions taken
- Item Disposition
- Approval of issue resolution

Commissioning Documentation –*Systems Manual*

Project Requirements - OPR and BoD available for the project.

Construction Documents - Construction record documents including record plans, specifications, and approved submittals.

Systems and Assemblies Information - Facility, systems, and assembly's information including:

- Manufacturer's operation and maintenance data for installed equipment systems and assemblies, including wiring diagrams and schematics
- Warranties and certificate of occupancy
- Contractor, supplier, or service agency listing and contact information

Commissioning Documentation –*Systems Manual*

Operation Information - A Facility Guide, including:

- operating plan
- building and equipment operating schedules
- set points and ranges
- verified sequences of operation
- system and equipment limitations
- emergency procedures

Training - Training plans, materials, and records should be provided

Commissioning Reports - Final commissioning reports

Commissioning Documentation –*Training Plan*

General Training Information

- Outline of topics related to the systems, subsystems, equipment, and assemblies.
- These topics address the design, construction, operation, and maintenance of Cx systems, assemblies, and equipment. A review and utilization of the Systems Manual should be included.

Objectives and Methods

- Learning objectives and training delivery methods, locations and duration for each instructional topic in conformance to the OPR and Commissioning Plan.

Materials and Records

- Training materials and instructor requirements to be employed.
- Training report, records, and recording requirements.

Commissioning Documentation –*Commissioning Reports*

Project Requirements

- Project requirements and design of equipment and systems requirements included in project documents.

Cx Plan

- Cx Plan with checklists completed before start of functional testing and used on project.

Contractor and Construction Instructions

- Project plans and commissioning specifications were used on the project.

Design and Construction Submittal Review

- Design documents review and construction submittal review and reports completed.

Commissioning Issues and Resolutions Log

- Issues and resolutions log completed up to time of final inspection with open items shown.

Commissioning Documentation –*Commissioning Reports*

Commissioning Testing

- Commissioning checklists completed up to time of final inspection.

Systems Manual

- Project documentation - Systems Manual assembled with information for use in training program before occupancy.

Training Documents

- Operations, maintenance, and occupant training plans completed for initial training.

Commissioning Report

- Preliminary commissioning report with plans for project completion available (at time of final inspection for certificate of occupancy) and submitted to authority having jurisdiction if required.

Commissioning Documentation Checklist

Checklist 1 Commissioning Documentation

Project Name: _____ Project
Address: _____ Permit
Number: _____ Commissioning
Provider: _____

Item No.	Commissioning Documentation	Assigned To	Date Completed
1	Owner's Project Requirements		
a	Initial OPR		
b	Final revised OPR		
2	Commissioning Plan		
a	Preliminary Cx plan (for permit)		
b	Final Cx plan (before start of functional testing)		
3	Design Base Data		
	Basis of design (by design team)		
4	Contractor and Construction Instructions		
	Plans and commissioning specifications		
5	Design Review		
	Commissioning design documents review, report and response		
6	Construction Submittal Review		
	Construction submittal review and report		
7	Commissioning Issues and Resolutions Log		
	Completed issues and resolutions logs		
8	Commissioning Testing		
	Completed commissioning checklists and reports		
9	Systems Manual		
	Project documentation and systems manual		
10	Training Documents		
	Operations, maintenance, and occupant training plan and records		
11	Commissioning Report		
a	Preliminary commissioning report (at time of final inspection for certificate of occupancy)		
b	Final commissioning report (project commissioning completion)		

Commissioning Provider Acknowledgment

I have reviewed the documents and verified that they meet the Owner's project requirements:

Name: _____ Company
Name: _____ Signature:
Date: _____

Owner/Owner's Representative Acknowledgment

The project documents include the items listed in this form and have been approved by the Owner or Owner's representative:

Name: ☐ Owner ☐ Owner's Representative

Company Name: _____ Signature: _____
Date: _____

Commissioning Plan Checklist

Preliminary Commissioning Plan

Project Name: _____ Project
Address: _____ Permit
Number: _____ Commissioning
Provider: _____

Item No.	Preliminary Commissioning Plan Items	Included
1	General Project Information Overview of the commissioning process and goals developed specifically for each phase of the project, from design through occupancy and operations.	
2	Roles and Responsibilities General roles and responsibilities for the commissioning and construction teams throughout the project. The responsibilities will delineate the duties of the commissioning providers, commissioning specialists, inspectors, contractors, suppliers, and other agencies. The details and specific assignments will be updated in the final Cx plan.	
3	Communication Channels Documentation of general communication channels including the distribution of the Cx plan and documentation during the design and construction processes. This includes the development and use of the issues and resolutions logs and a preliminary listing of required reports including format, reviews and approvals.	
4	Documentation and Submittal Review Project construction design documentation review and submittal evaluation procedures and reports in accordance with the OPR.	
5	Commissioning Process Activities General description of commissioning process activities, and a preliminary schedule of activities.	
6	Commissioned Systems and Assemblies The list of operations, systems, and assemblies that will be commissioned and/or inspected. Performance criteria should be included when available and where not shown on the construction documents.	
7	Checklists, Forms, Logs and Reports Preliminary format for commissioning checklists and testing forms, and commissioning progress reports that will be used during the project to communicate and track commissioning information.	
8	Systems Manual, Training Plans, and Final Commissioning Report Guidelines and formats that will be used to develop the systems manual, training plans, and final commissioning report.	
9	Resolution Process The framework for procedures to follow whenever commissioning process evaluation results do not meet the OPR or the construction document requirements.	

Commissioning Provider Acknowledgment

I have reviewed the documents and verified that they meet the Owner's project requirements:

Name: _____ Company
Name: _____ Signature:
Date: _____

Owner/Owner's Representative Acknowledgment

The project documents include the items listed in this form and have been approved by the Owner or Owner's representative:

Name: _____
☐ Owner ☐ Owner's Representative

Company Name: _____
Signature: _____ Date: _____

This checklist is intended for plan verification for preconstruction and permit application where required.

Facility System Commissioning Selection

- Office Buildings
- Medical & Hospitals
- Educational Facilities
- Universities
- Municipal
- Federal
- Industrial
- Residential-High Rise
- Retail
- Justice

Facility System Commissioning Selection

Commercial and Office Buildings—Systems to Commission

Project: _____ Address: _____
Owner: _____ Email/Phone: _____
Owner's Project Manager: _____ Email/Phone: _____
Cx Provider: _____ Email/Phone: _____
Date Initiated: _____ Date Revised: _____

Item	Equipment/System	System Commissioning Required— Y/N	Integrated System Commissioning Required— Y/N	Commissioning Completed— Date
1.	Air-conditioning and ventilation systems			
2.	Domestic hot-water systems			
3.	Plumbing systems			
4.	Lighting and control systems			
5.	Electrical power systems			
6.	Energy monitoring and management systems			
7.	Outdoor air and energy recovery systems			
8.	Landscape irrigation systems			
9.	Fire protection and fire sprinkler systems			
10.	Fire alarm systems			
11.	Vertical transportation, elevators, escalators			
12.	Building enclosures			
13.	Roofing systems			
14.	Computer and data rooms systems			
15.	Security systems			
16.	Telephone and communication systems			
17.	Renewable energy systems			

The approval section that follows can be used if applicable to the planning process.

I have reviewed the required items and plans and verified that they meet the project requirements:

Owner or Owner's Representative Name: _____

Company Name: _____

Signature: _____ Date: _____

Building Sub-System Task Selection

- HVAC
- Plumbing
- Lighting & Controls
- Power & Generation
- Energy Control
- Building Enclosures

- Indoor Environments
- Landscape
- Fire Protection
- Fire Alarm
- Conveyance
- Communications

Building System Task Selection

Building Enclosure Commissioning

Project: _____ Address: _____ Owner: _____
Email/Phone: _____ Owner's Project Manager: _____ Email/Phone: _____
Cx Provider: _____ Email/Phone: _____

Date Initiated: _____ Date Revised: _____

Item	Equipment/System	System Commissioning Required— Y/N	Integrated System Commissioning Required— Y/N	Commissioning Completed— Date
1.	Air infiltration			
	Air pressurization and depressurization			
	Continuous air barrier application			
2.	Thermal performance and condensation resistance			
3.	Water penetration			
4.	Durability and appearance			
5.	Structural performance			
6.	Rain screen pressure equalization			
7.	Solar optical performance			
8.	Moisture control			
9.	Acoustic performance			
10.	Security			

The approval section that follows can be used if applicable to the planning process. Approval can be granted by the Owner/representative, design team, or CxP depending on the Owner's requirements.

I have reviewed the required items and plans and verified that they meet the project requirements:

Owner or Owner's Representative Name: _____

Company Name: _____

Signature: _____

Date: _____

Commissioning Process Management

1. Owner uses **building checklist** to select systems to be commissioned and **commissioning providers checklist** to select and hire CxP.
2. Owner uses **OPR checklist** to develop OPR.
3. Design team uses **OPR and BOD checklists** to produce Basis Of Design.
4. Design team uses **equipment checklists** to specify system commissioning requirements.
5. CxP uses **Cx plan checklist** to develop Cx plan and **equipment checklists**
6. CxP performs design and documents reviews to **review checklist**

Commissioning Process Management

7. CxP and project team use Cx **building permit checklist** to document completion for permit.
8. Contractors, subs, manufacturers and suppliers use **project and equipment checklists** to complete installation, testing, systems manuals, and commissioning.
9. CxP verifies system performance and assembles project and equipment documentation
10. CxP and teams use **Cx report checklists** to summarize documentation for certificate of occupancy and on-going Cx process.

Stakeholder Checklists - and Training Resource



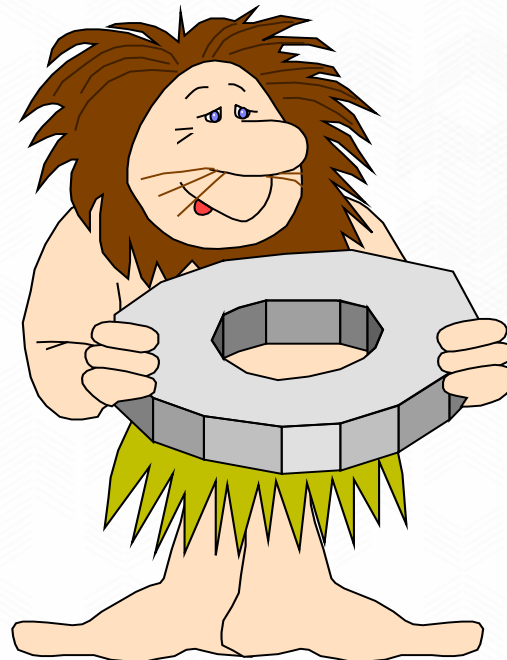
COMMISSIONING SUMMARY

YOU DO NOT GET WHAT YOU
EXPECT

YOU GET WHAT YOU
INSPECT

QUESTIONS

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