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DESIGN-PHASE COMMISSIONING PROCESS
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ONLINE TRAINING BY KRISHNAJI PAWAR
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MODULE 3

Design Phase Commissioning Activities

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Learning Objectives

- Design Phase Overview
- Design Phase Objectives
- Commissioning Team
- Design Phase Activities
- Perform commissioning-focused reviews
- Develop commissioning specifications

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INTRODUCTION

- Predesign is followed by the schematic design phase.
- Assuming that the owner's commissioning authority participated fully in predesign, the CxA is well-versed in the owner's project requirements and can assist the design phase.
- Before discussing design details, it is critical to understand the relationship between the commissioning authority and the design professional.
- The role of the CxA is to assist the design professional in achieving the best system design for the project and to ensure that the DP's preferred design concepts meet all performance objectives in the owner's project requirements.
- During the design process, keep the following two main principles in mind for the owner's building commissioning quality assurance process: Quality is ensured by the commissioning authority.

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COMMISSIONING PROCESS

DESIGN PHASE



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Design Phase Overview

During the design phase, the commissioning process verifies that the design documentation (plans, specifications, basis of design (BOD), etc.) is consistent, contains commissioning requirements, and conforms to the owner's project requirements (OPR).

- Systems typically commissioned
- Commissioning plan
- Prepare commissioning specifications
- Design reviews
- Incorporate commissioning into the project schedule.



Commissioning Plan

Commissioning Specifications

Design Reviews

Objectives

1. Share commissioning requirements with project team members.
2. Review the design documentation for OPR and BOD compliance.
3. Commissioning requirements should be in construction documents.
4. Increase project team engagement and cooperation.





Commissioning Team

1. Owner Representative
2. User Representatives
3. Commissioning Provider (CxP)
4. Design Team
5. Construction Team (engaged when known)

Implementation





Design Phase Activities



1. Update the commissioning plan and scope

The CxP creates a pre-design plan detailing the design and construction phases, updates it during design, and completes the CX plan for construction later.



2. Conduct a design phase commissioning kick-off meeting

Conduct a design phase commissioning kickoff meeting with the commissioning team to review the commissioning plan and activities.



3. The design team develops a basis of design (BOD)

The design team develops a basis of design (BOD).



4. Review the OPR and BOD for completeness and clarity (by the CxP)

The CxP will review OPR and BOD for clarity, attaching them to construction documents, but not legally binding, except for requirements outlined in drawings and specifications.



5. Ensure the OPR and BOD documents are updated

Ensure the OPR and BOD documents are updated and in alignment with each other to reflect any owner-approved changes made during the design process



6. The CxP provides focused design checklists for the design team

The design team utilizes CxP's design checklists to identify and implement essential design concepts, promoting better practice and facilitating the successful implementation of these ideas.

Perform commissioning-focused reviews



1. **The CxP, a team of experts, ensures the completeness of design reviews by providing respectful comments.**



2. **summary, design reviews will accomplish the following:**
The OPR ensures the general quality of documents, ensuring compliance with discipline-specific requirements, accurate BOD alignment, feasible commissioning, and adequate O&M documentation and training requirements.



3. **Commissioning reviews ensure the OPR and BOD are met by simplifying the process. This includes HVAC system training, O&M documentation, and ongoing commissioning.**



4. **At minimum for commissioned equipment, OPR and BOD reviews should include general document quality, identifying inconsistent or unclear areas, and identifying areas that don't meet the OPR or represent good practice.**



5. **Thorough reviews produce control logic and control system integration requirements needed to fully implement operation sequences. It's best to finish before late construction documents make changes harder.**



6. **Before construction document phase design packages are submitted for review, the CxP encourages and facilitates integration meetings to coordinate systems and equipment that interact, such as HVAC and electrical M&V monitoring needs.**

Perform commissioning-focused reviews



7. fire alarm and emergency power, lighting and access control with the BAS, and building enclosure integration with the HVAC system.



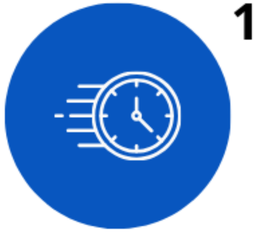
8. Projects' ideal review number and timing vary. Reviews are needed for larger, more complex projects. The owner and CxP should discuss the pros and cons of more review (design schedule, costs, benefits, etc.). Many projects need these back-checks:



9. 100% schematic design (primarily a review of the BOD) 100% design development
50% and 90% of the construction documents



10. Fewer reviews may be needed for simpler projects. Larger or more complex projects may require concept and design development reviews.



11. The design team should respond to design review comments in writing. The CxP, design team, and owner should understand the agreed-upon path forward for each comment after returning these responses.



12. At the next design submission, the CxP back-checks the comments from the previous review, i.e., confirms that the agreed-upon resolution for each comment from the previous review has been incorporated into the plans and specifications.

The CxP verifies that facility operator training requirements comply with the OPR and are incorporated into the construction documents.

1. Training requirements should be exhaustive, with required training hours for all systems and assemblies summarized in one section for tracking and reference.

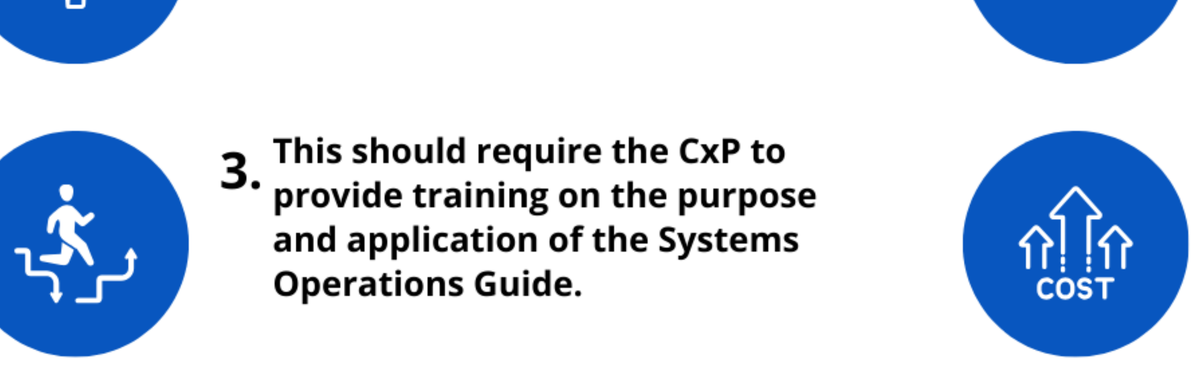
2. The training should utilize the O&M manual.

3. This should require the CxP to provide training on the purpose and application of the Systems Operations Guide.

4. Include verification requirements for training completion and effectiveness.

5. Video recordings of the majority of trainings provided to the owner are regarded as best practice.

6. It should be a requirement that trainees receive equipment-specific instruction at a level of specificity commensurate with their job responsibilities.



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Develop commissioning specifications



1. The specification should clearly outline contractor commissioning duties, including responsibilities for CxP, subconsultants, and non-contractor team members like the CM, Owner, and Design Team.



2. The requirements for submissions, commissioning meetings, and the development of the commissioning schedule are as follows:



3. Specifications for sampling should include allowed or required levels for commissioning tasks like design review, submittal review, field installation observation, construction checklist verification, functional testing, trend log analysis, and O&M manual review. Owners should define sampling level in RFPs.



4. Meeting commissioning process performance goals requires defining and following the testing scope. Each piece needs equipment-specific functional testing with content, format, rigor, sampling, and trending. Commissioning functional testing and contractor quality control are different.



5. Manual testing involves testing operations, modes, capacity, load modulation, interlocks, control strategies, alarms, packaged features, sequences, elements, power loss, and fire alarm events.



6. All larger, more complex, process-critical, and life-safety equipment must be individually tested. Some projects may benefit from testing only a sample of equipment or assemblies that are small, numerous, and not complex or critical for process or life safety.

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Develop commissioning specifications +



7. All larger, more complex, process-critical, and life-safety equipment must be individually tested. Some projects may benefit from testing only a sample



8. Trending is required for building automation-monitored systems during functional testing after manual testing. Trends will verify all major control loops, equipment staging, time of day scheduling, etc.



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10. Discuss how commissioning affects occupancy permits and project closeout.



11. Documenting projects. The CxP works with the owner to determine the scope of the project documentation and ensures the contract documents meet requirements.



12. By explaining the commissioning process and roles, the CxP helps the project team work together.

Near the end of design, the CX plan and design documents should be updated to be consistent with each other.

- Near the conclusion of design, the CX plan and design documents should be revised to ensure consistency.
- The Cx Plan should specify the responsibilities and roles of the contractor, CxP, owner, and designers, which may or may not be specified in the specifications.
- The CX Plan should also include the activities and parties responsible for the occupancy phase.







DESIGN PHASE OVERVIEW +



The commissioning plan, OPR, and BOD should be provided to the contractor during bidding for information, not obligation, as a supplement to the construction documents to augment the commissioning specifications.

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