

Tips, Tricks & Techniques of Commissioning

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 - Presidential Member 2015-16





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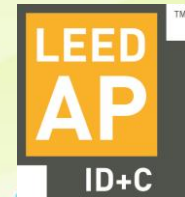
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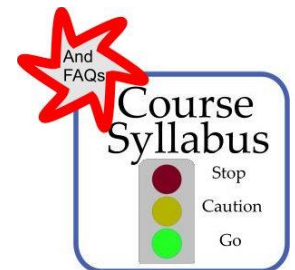
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Course Description

COMMISSIONING TIPS TRICKS AND TECHNIQUES

- Identifying tips, tricks and techniques to successfully commission any project.
- Tips will cover when and how to proceed.
- Tricks will look at how to engage all participants in the project.
- Techniques will look at some methods of performance verification and operator training.



Learning Objectives

- Application of commissioning procedures
- Describing effective commissioning techniques
- Recognizing commissioning issues and discussing effective solutions
- Define roles and responsibilities of parties affected by commissioning procedures

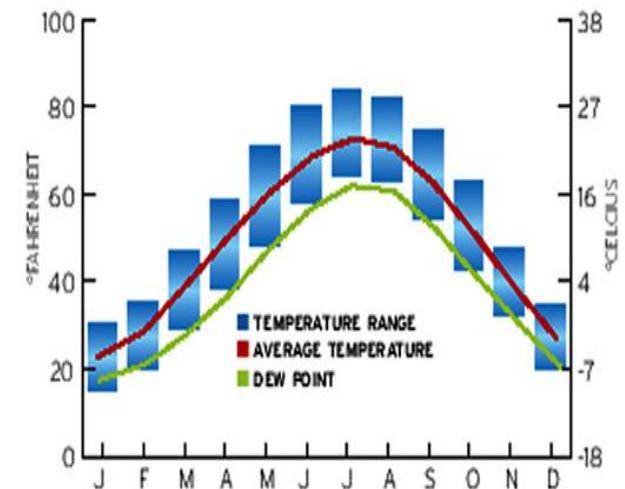


WHAT IS COMMISSIONING?

- A ry of a project
- Verification & documentation that all systems and assemblies are planned, designed and installed, tested and operated and maintained according to the **Owner's Project Requirements**
- Simplified definition:
 - Transfer of designers knowledge to the operators' hands

TEMPERATURES & DEW POINTS

The heat of Chicago summers and cold of the winters suggests a contained building, easily sealed off from the elements.



The Strategic Guide to Commissioning



Report from the ASHRAE Presidential Ad-Hoc Committee
Building Performance Alliance on Commissioning

Presented to ASHRAE Board of Directors
June 24, 2014



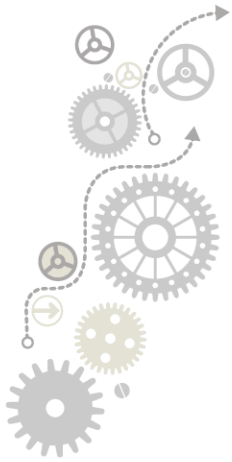
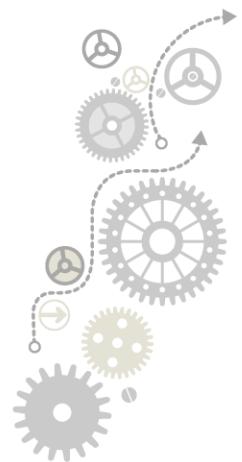


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Logos of Participating Organizations



National Institute of
BUILDING SCIENCES



ARCOM
The leader in specifications



A stylized, blue-tinted image of a city skyline with various skyscrapers and buildings, serving as a background for the title.

How to Approach Commissioning ?

- Tips
 - Start as early as possible in the building process
 - Consider using integrated building design
- Tricks
 - Commissioner is project facilitator
 - A human resources management expert
- Techniques
 - Follow ASHRAE Guidelines O, 0.2, 1.1, 1.4, 1.5, 5 and Standard 202

A stylized, blue-tinted silhouette of a city skyline with various skyscrapers and buildings. The title 'ASHRAE Documents' is overlaid on this background in a large, bold, dark blue font.

ASHRAE Documents

- Guideline 0, The Commissioning Process
- Guideline 0.2, Commissioning Process for existing Systems and Assemblies
- Guideline 1.1, HVAC&R Technical Requirements for the Commissioning Process
- Guideline 1.4, Procedures for Preparing Facility Systems Manuals
- Guideline 1.5, The Commissioning Process for Smoke Control Systems



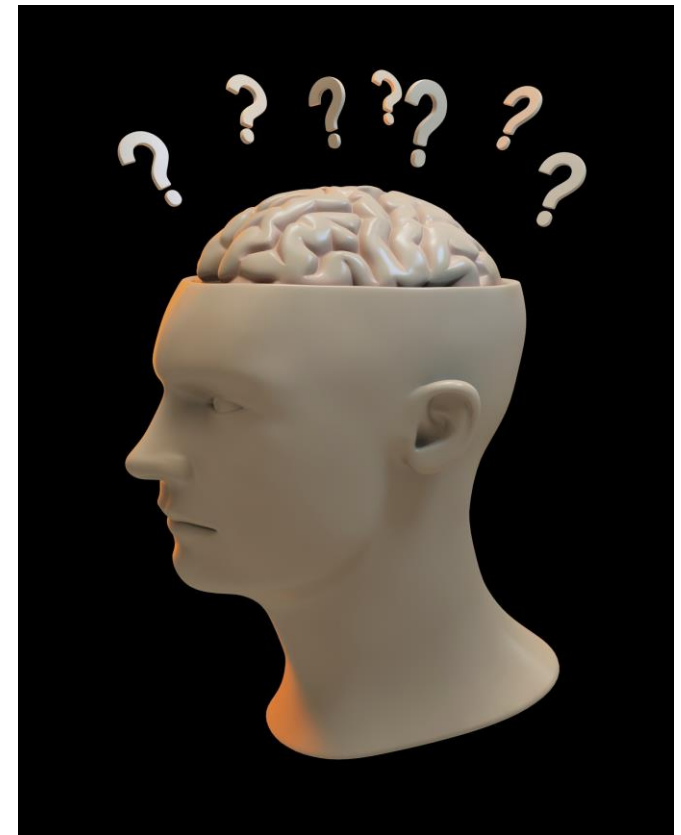
ASHRAE Standard 202

Commissioning Process for Buildings and Systems

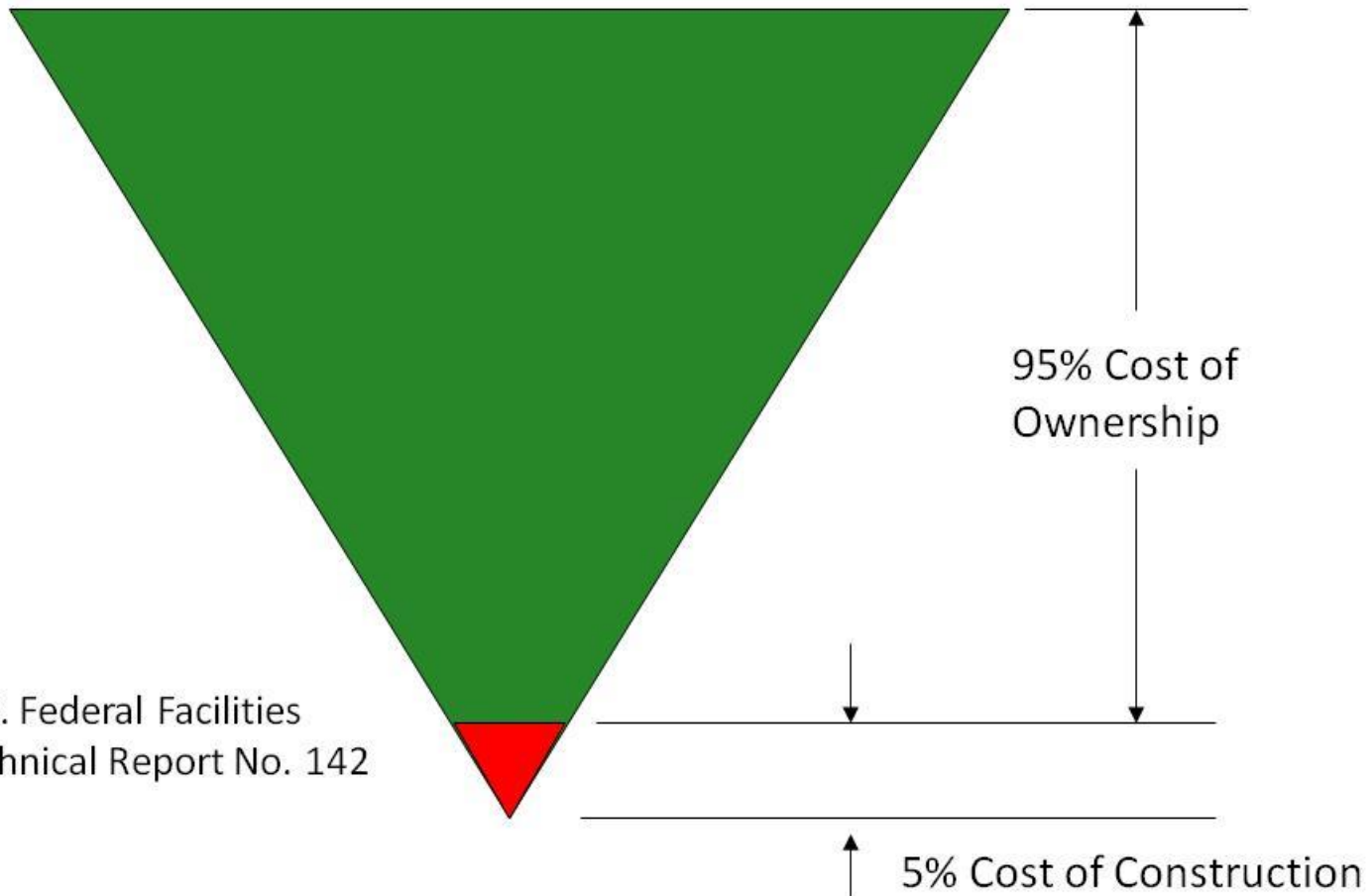
- The purpose is to identify minimum acceptable Commissioning processes for buildings and systems
- Scope details
 - Overview of commissioning activities
 - Minimum steps to be taken for each activity
 - Minimum required documentation
 - Required acceptance requirements

Why commission a project?

- To assure:
 - **Owner's Project Requirements (OPR)** are met
 - Project constructability and sustainability
 - Education and training of operators



Cost of Owning a Building



Source: U.S. Federal Facilities
Council Technical Report No. 142

what is **the** outcome of commissioning

- Commissioning ties together:
 - Owner
 - Designer
 - Constructor
 - Operator and maintenance staff



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Who is the appropriate commissioning authority?

Depends on size, type and complexity of a project

- May require a certified **Commissioning Process Manager (CPMP)**
 - ASHRAE certification
 - Other related professional qualifications
- Commissioning only one or two systems requires a specific Commissioning authority

A stylized, blue-tinted silhouette of a city skyline with various skyscrapers and buildings. The background is a gradient of light blue and yellow.

What is the value for owners?

- Thorough and comprehensive start-up instructions for all project participants
- Detailed operation and maintenance information that is project specific i.e. systems approach
- Seasonal performance checks
- Reduction of call back/warranty problems

What should an owner do?

- Determine Systems and assemblies to be commissioned
- Commissioning team leader and team selection
- Establish a commissioning budget



Owner specified Commissioning



- Commissioning scope
- Roles and responsibilities
- Review and acceptance

What OPR details to consider?

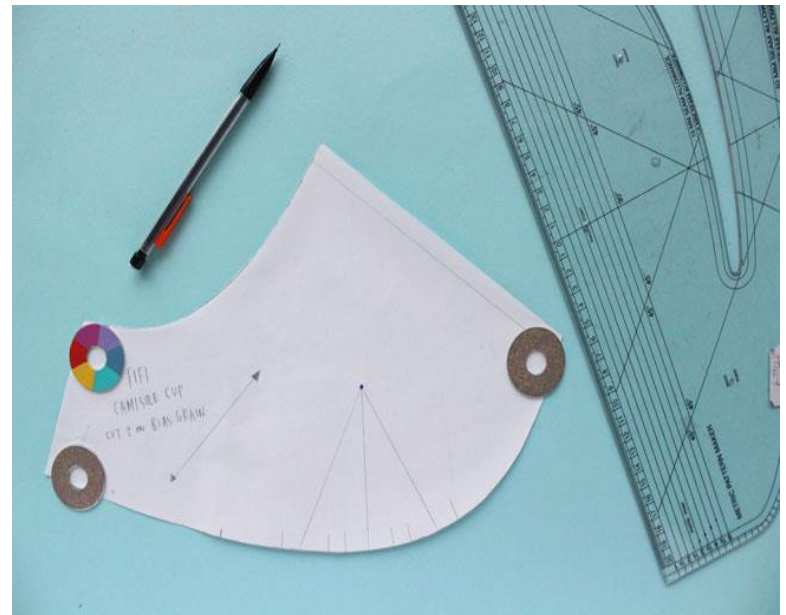
- Operator skill level
- Anticipated building uses
- Appropriate design standards
- Local code requirements
- Project procedure, e.g.
 - Design bid build
 - Integrated design
 - Design-build



What causes OPR details to be adjusted?

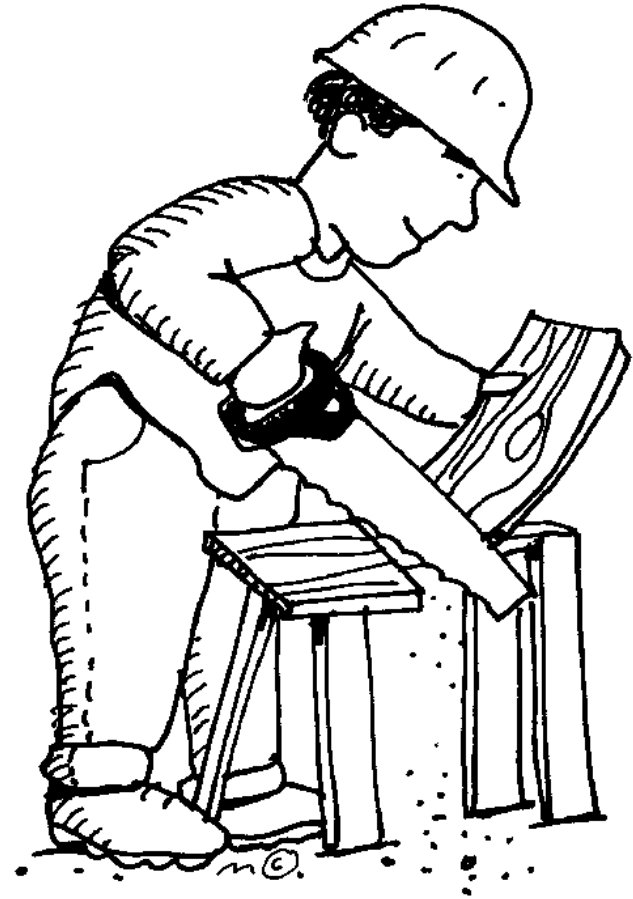
OPR will be adjusted during the life of project based on the following:

- Facility objectives
- Environmental and efficiency goals
- Indoor Environmental Quality Requirements (IEQ)
- Commissioning process and scope
- System and equipment access
- Systems Manual requirements



CxA skill for developing the OPR?

- Knowledge regarding systems development
- Extensive construction experience
- Information on skill level required of operations staff
- Human relations capability



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What affects OPR Details?

- Applicable codes and standards relevant to the project
- Specific project requirements
- Training for operations personnel & tenants
- Project schedules

What are the essential documents?

- Owners Project Requirements (OPR)
- Basis of Design (BOD)
- Issues Log
- Commissioning Process Report
- Systems Manual



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How does the owner get started on a Commissioning Plan?

- Engage the Commissioning authority prior to other design professionals
- Owner develops a commissioning plan
- Identify what systems and assemblies are to be commissioned
- Define performance and acceptance criteria

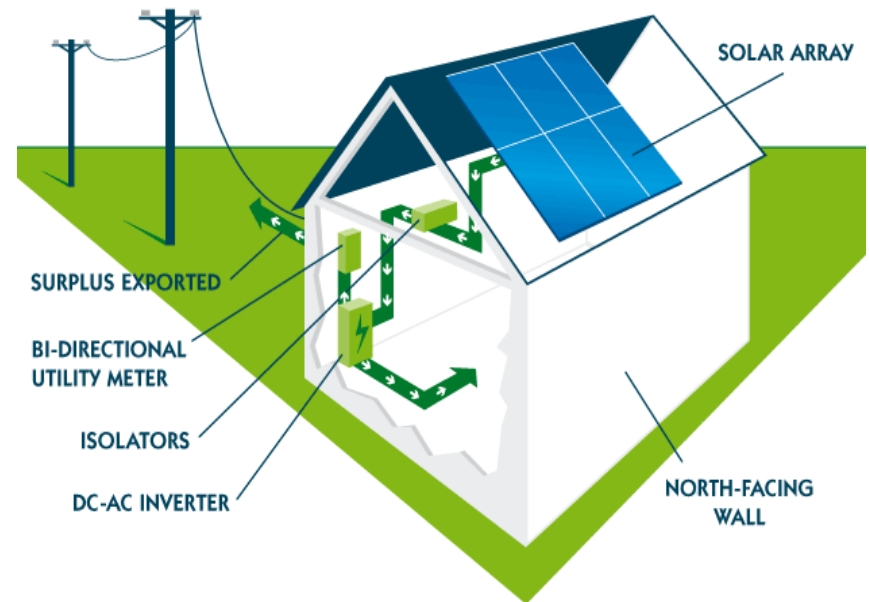
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What is documented in the Commissioning Plan?

- Roles and responsibilities of the CxA
- Commissioning process and schedule
- Project design
- Verification procedures
- How to address OPR deviations

What is the Basis of Design (BOD) document?

- Details of design procedures & processes to meet the OPR
- Details of design issues that deviate from the original OPR
- Owner's approval of design



What are the critical elements of the BOD?

- Defines milestones of BOD submittals
- Describes in detail the design approach to meet OPR
- Provides details for review as the design evolves
- Coordinates technical & code requirements
- Logs all design changes affecting the OPR

**UNDER NO CIRCUMSTANCES DOES
THE COMMISSIONING AUTHORITY (Cx)
MAKE DESIGN DECISIONS**

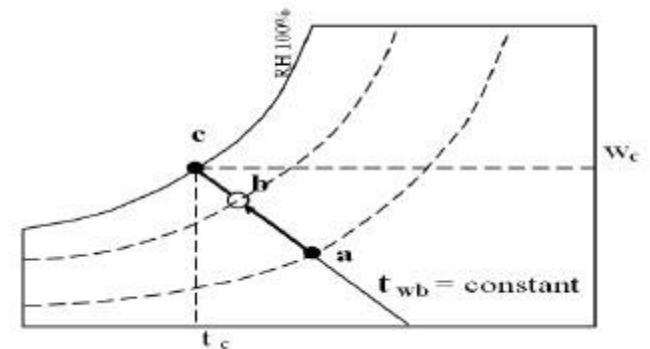
Who verifies that BoD meets OPR?

- Cx authority assesses BoD compliance to OPR
- Owner accepts and/or changes the OPR during design process
- Owner approves the CxA review report and the design team's response before start of construction



Commissioning Process Specifications

- Cx process activities
 - Contractor to perform these activities
 - Cx to verify validity of system performance testing
- General conditions define roles of all parties to the process
- Describe testing for systems and assemblies
 - Based on OPR and BOD



A stylized, semi-transparent blue and yellow city skyline graphic serves as the background for the top portion of the slide. The buildings are silhouetted against a bright yellow sky, and the overall color palette is dominated by blue and yellow tones.

Role of the Commissioning Authority

- Uses skills to sell the Cx particularly if it has not been used before
 - This is where interpersonal skill really helps

What is the Value Added of Commissioning ?

?



What does CxA include in submittal?

1. Date of review
2. Specification reference
3. Contract drawing reference
4. Summary of equipment/systems not in compliance with OPR

**However this review DOES NOT REPLACE THE
ENGINEER'S DESIGN REVIEW
OF EQUIPMENT FOR COMPLIANCE
WITH CONTRACT DOCUMENTS**

What does CxA observe & test?

- Job specific protocols for systems and assemblies including long term data collected
- Test reports
 - Failed tests are repeated as per Cx specification



How are test protocols reported?

- A summary of test results are presented to the Owner
- All verification reports are included in the final commissioning process report



Who prepares Issues & Resolutions document?

- CxA and Cx team develop a project specific form
- Issues are noted
 - With supporting documentation indicating parties responsible for resolution
- Owner reviews and accepts the Issues & Resolution report (included in the Cx process report)



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What is the value in developing an Issues & Resolutions report?

- Helps CxA keep track of construction difficulties
- Gives contractor a road map to reducing final “punch list” developed by the design team
- Reduced “punch list” results in earlier **Substantial Completion** and **Final Project Payment**
- Reduces call back and warranty problems for contractors

What is the Value of a Systems Manual?

It provides project specific documentation :

- how the commissioned systems operate
- how to appropriately maintain them



After the OPR, the systems manual is probably the most valuable document prepared under the commissioning process.

A stylized, semi-transparent image of a city skyline with various skyscrapers and buildings, overlaid on a light blue and yellow background. The text is centered over this image.

What are objectives of Systems Manual?

- Provide necessary information to the facility operating staff to understand how to operate the building
- Assemble all building design, construction and testing results in one document
- Provide document source to be used in training materials
- Provide information for performance improvement during on going commissioning

What is in the Systems Manual?

- **Section 1 - Executive Summary**
- **Section 2 - Facility Design and Construction**
- **Section 3 - Building System & Assembly Information**
- **Section 4 - Facility Operations**
- **Section 5 - Training**
- **Section 6 - Commissioning Process Report**
- Details for these sections may be found in the Guideline documents



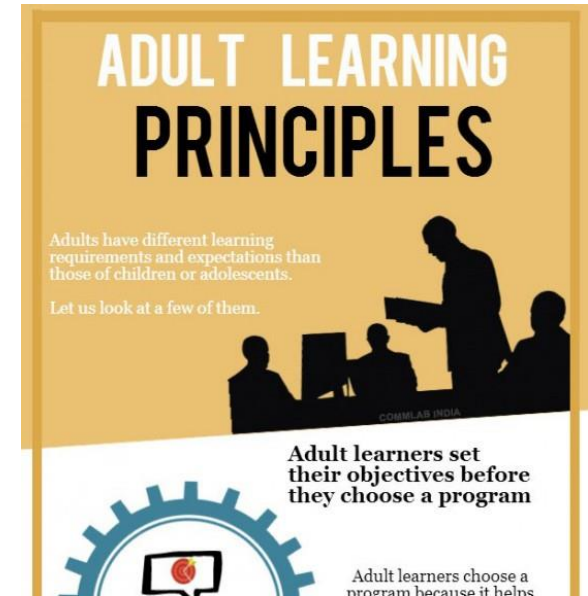
Training operation and maintenance personnel

- Learning objectives
- Instructor's qualifications for Owner's approval
- Training materials
- Methods to be employed
- Training location, duration of training & total hours
- Reports & records



How does one train operation and maintenance personnel?

- Use principles of adult learning
- Develop a lesson plan
- Provide the Systems Manual as a basic tool for developing the plan
- Record the lesson procedures including lecture and hands on activity for future reference
- Schedule refresher courses



What occurs post occupancy

Beginning at substantial completion, CxA:

- Conducts seasonal performance activities, with responsible parties
- Assures on going training for operations and maintenance personnel
- Observes warranty actions directed by the GC



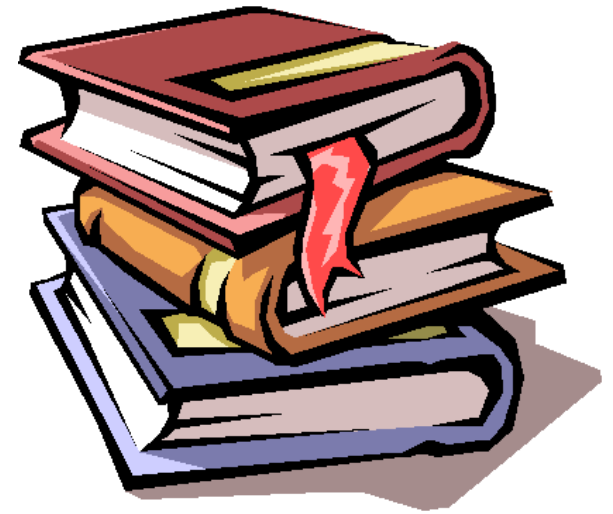
A stylized, blue-tinted silhouette of a city skyline with various skyscrapers and buildings, set against a light blue background. The skyline is positioned at the top of the slide, above the main title.

COMMISSIONING REPORT

- 1. Executive summary.
- 2. The final Cx Process plans.
- 3. Design and submittals review reports.
- 4. Approved CxA Evaluations, and Cx start-up and test forms
- 5. Cx Process Reports.
- 6. Issue and resolution logs
- 7. For all incomplete issues identify responsible parties and completion of resolution

What occurs at the end Project Commissioning activity

- CxA submits all documents to the Owner:
 - OPR
 - BOD
 - Issues and Resolutions log
 - Commissioning process report
 - Systems manual



In Conclusion Who Benefits?



A silhouette of a city skyline with various skyscrapers and buildings, set against a light blue background with a subtle sunburst pattern. The word "Question" is overlaid in a large, bold, black font.

Question

Will Commissioning a Project Satisfy an Owner's desire for a project?

A silhouette of a city skyline with various skyscrapers and buildings, set against a light blue background with a subtle sunburst pattern. The word "Question" is centered over this image.

Question

Will effective communication skill assist in coordinating commissioning of a project?

A stylized, semi-transparent image of a city skyline with various skyscrapers and buildings, set against a light blue background. The word "Question" is overlaid in the center in a bold, dark blue font.

Question

An Issues and Resolutions report will:

- a. Reduce warranty costs
- b. Shift responsibility of problems to other parties or
- c. Make operation and maintenance better



Question

Shop Drawing review by the Commissioning Authority is to:

- a. Check for constructability
- b. Check for service access
- c. Review system capacity

A silhouette of a city skyline with various skyscrapers and buildings, set against a light blue background with a subtle grid pattern. The word "Question" is overlaid in the center in a bold, dark blue font.

Question

Is ongoing training of maintenance personnel a necessity

Questions and Discussion

