



**445 – Project Commissioning**

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**Course Description**

When many of our historic buildings were built, the number of drawings were typically less than 20. This was during the era of the Master Builder. Today, buildings are much more complex, use sophisticated control systems and more. "Commissioning" a project is much more than just turning the power on. It is a process that starts before design begins and is a continuous process through design and construction.

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### Learning Objectives

This session will provide a high-level overview of the recommended stapes to commission a project, the timeline involved, the costs, as well as the benefits of project commissioning.

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### What is Commissioning?

"A quality-focused process for enhancing the delivery of a project. The process focuses on 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



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### When does Commissioning Begin?



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### Owner Project Requirements (OPR)

- Commissioning begins at the programming and planning phase of a project
- It starts with the Owner and Project Requirements (OPR)
- This is more than just obtaining sustainability certification (i.e. LEED)
- The Owner should clearly state the functional and operations requirements of the building systems

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### Goals of Commissioning

- Safe and healthy facility
- Improve energy and utility performance
- Reduce operating costs
- Improve the capability of maintenance and operations
- Improved documentation



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### Predesign Phase

- Owner's Project Requirements (OPR)
- Detailed performance criteria, by system
- The more detailed the criteria, the better the designer can select and design the right system(s)
- Best Practice\* Include the OPR documents as an attachment to the Owner-Architect Agreement



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### Developing OPR's

- Typically, in a workshop setting:
- Example:
  - What are the key objectives the university wishes to achieve in these projects?
  - What are the functional requirements of the building?
  - What conditions and features contribute to maintaining safety and security?
  - What are the maintenance and operations parameters?



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### Develop the Commissioning Process

- Budget
- Schedule
  - Plan
  - Team



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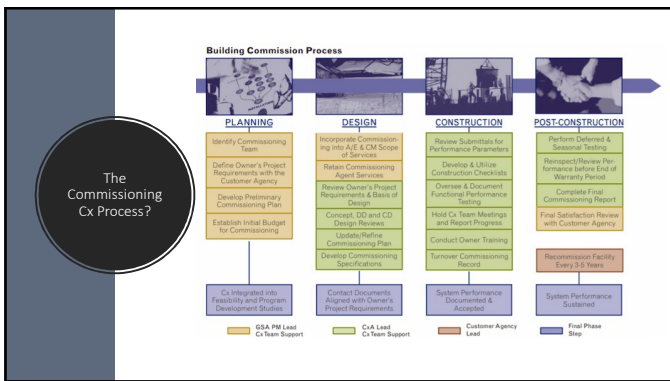
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### Design Phase

- Coordination between the Commissioning Team and the Design Team
- Design Team deliverable:
  - Basis of Design: affirmation of the understanding by the design Team of the Owner's OPR's
- Key elements that are reviewed:
  - Quality of the design documents:
    - legibility, consistency, completeness
  - Coordination between disciplines
  - Discipline-specific review for achieving the OPR
  - Specification completeness for adherence to OPR and Basis of Design



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### Construction Phase

- Prebid Meeting
- Commissioning Schedule
- Submittal Review
- Installation Verification and Commissioning Tests
- Training
- Operation Manuals
- Substantial Completion



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### Occupancy Phase

- Testing
- Seasonal Tests
- Occupancy-Dependent Tests
- Delayed Tests
- On-going Commissioning



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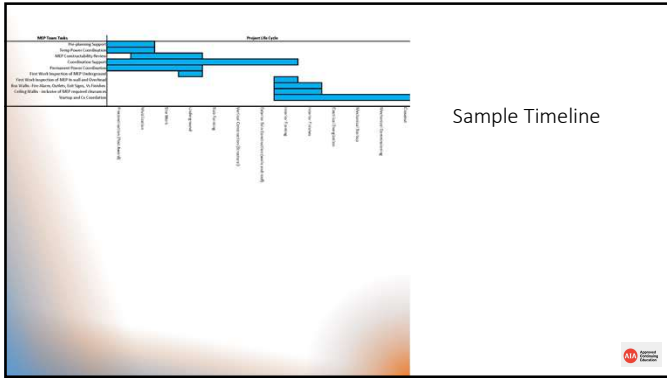
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### Case Study – Silvery Towers

- Luxury Condominiums
- 22-story
- 2 Towers
- 1, 2 and 3-bedroom units
- 650 Units
- Amenities include:
  - Swimming Pool
  - Private Parking
  - Fitness Center
  - Ground floor Retail

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### Case Study – Silvery Towers

- Construction Completed over two years ago
- Financial challenges
  - Design and construction firms not being paid
  - Litigation
- 90-units in West Tower sold-to-date
- No sales activity in East Tower

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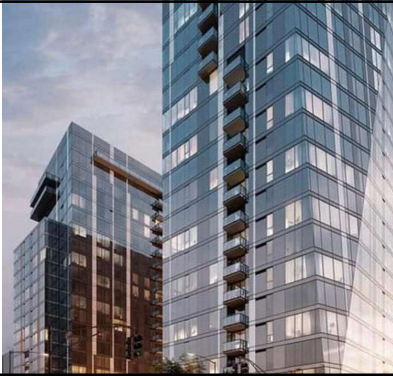
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Case Study –  
Silvery Towers

- No apparent commissioning efforts
- No AS-Built documentation
- No apparent maintenance operations
- Conduct an AS-Built Assessment
- Prepare a Cost-to-Complete Assessment and Schedule



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Case Study –  
Silvery  
Towers

Develop a strategy be to address this situation:

- AS-built Condition
- Systems Functionality/Integrity



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The Cost of  
Commissioning

- On average
- 3% - 4% of the cost of the construction of the mechanical system
- 2% - 4% of the cost of the construction of the electrical system



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### The Benefits of Commissioning

- On average, 0.5% to 2% of the construction costs
- On a well commissioned plan, the cost of commissioning is recovered before completion of construction through:
  - Better coordination of construction documents
  - More competitive bids
  - Fewer system delays at completion
  - Improved maintenance and operations
  - Improved sustainability and energy efficiency



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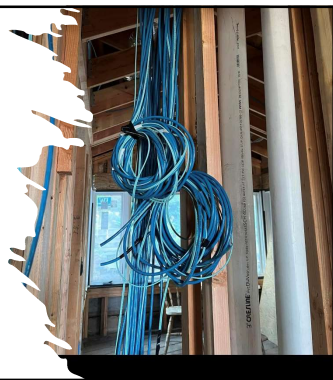
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### The Future of Commissioning

- Increased expectations and requirements for sustainability
  - All-electric buildings
  - Net Zero
- Smart Building Technology
  - Low voltage infrastructure
  - Control Systems
  - Remote Technology



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### Commissioning

- Resources
  - In-House
  - Consultants
- Part of the University's Team
- Start at Planning/Programming
- Develop a Commissioning Plan
- Checklists, more checklists and sign-off

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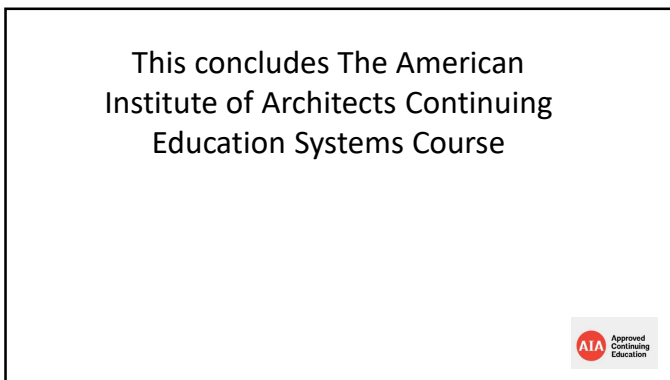
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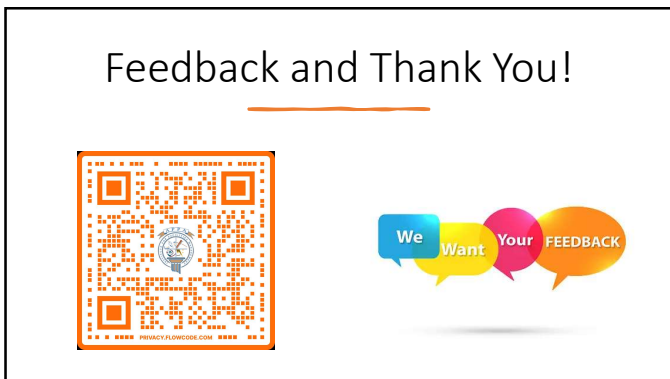
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