

# Architects Leading the Commissioning Process in New Construction

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Many architects have incorporated energy efficient design principles into their work, and these efforts continue to expand within the profession. With the 2030 target for carbon-neutral buildings, the AIA seeks to dramatically increase the number of high-performance buildings constructed in the coming decades.

With the introduction of the Integrated Project Delivery (IPD) in November 2007, the AIA in collaboration with the AIA California Council provided the architect, owner and contractor a project delivery approach to more clearly and comprehensively define and measure project outcomes. One of the key areas of IPD is to set more aggressive goals for sustainability.

The next logical step is for the architect, owner and contractor to confirm the construction and post occupancy meets the energy efficient design goals. The International Green Construction Code (IgCC) requires construction and post occupancy confirmation through the Building Commissioning (Cx) Process. The architect has an opportunity to lead the Cx process, the same way the architect leads the design process.

Building Commissioning is a team effort. Like IPD everyone involved in the project; owner, architect, consultants, contractors, subcontractors and suppliers need to be involved in building commissioning, working as a team in the best interest of the project.

Building design requires consultants, lead by the Architect. A Commissioning Agency or Agent (CxA) should be one of the consultants on the team. A qualified CxA brings valuable technical knowledge and experience in the Design, Construction and Occupancy Phases of a project.

During the Design Phase the CxA can assist the Architect with the Owner's Project

Requirements (OPR), Basis of Design (BOD), Design Review and Commissioning Plan. During the Construction and Occupancy Phases, the CxA can assist the Architect with the observation, testing, training and documentation.

## **Design Phase**

### **Owner's Project Requirements (OPR)**

The design begins with the Architectural Program (AP). The Commissioning (Cx) Process begins in design with the Owner's Project Requirements (OPR). The OPR does not replace the need for the AP.

There are similarities and differences between the AP and the OPR. Understanding the differences and similarities will enable the Architect to lead the team in producing the AP and the OPR. For example the OPR and AP establish goals. The OPR identifies the Owner's end goals by establishing high level goals, while the AP defines the design problem by determining the details on achieving the goals.

The OPR goals would include: minimizing environmental impact, define energy savings requirements, defined efficiency for HVAC & water usage, defined Indoor Air Quality (IAQ) requirements, maintenance & operations requirements and sustainable operation. Sustainable Operation includes; reducing waste removal through recycling and benchmarking energy usage by systems.

AP goals would include: design considerations, square foot needs, adjacencies, circulation, personal forecasts, user characteristics, organizational structure, budget & costs and project schedule.

### Basis of Design (BOD)

During the design phase the design team develops the Basis of Design (BOD) to describe how the building systems meet the OPR and why the systems were selected. The BOD documents the concepts, calculations, decisions, and product selections used to meet the OPR. The objective of the BOD is to provide information to the team during each phase of a project and document the thought process and approach as the design evolves.

If the Architect leads the team in the development of the OPR and understands how the goals and decisions were made, the design, through the development of the BOD, should meet the OPR.

### Commissioning Design Review

The commissioning process confirms the design documents (plans, sections, specifications, BOD, etc.) are consistent with each other, include commissioning requirements and meet the OPR. The Architect or Engineer of Record is ultimately responsible for the project design and makes the final decisions regarding the design. A CxA should only make recommendations, suggestions and observations during design review. When the Architect leads the design review design decisions can be expedited.

The design review should also include operability & maintainability, (O&M), functionality, training, energy efficiency, control systems, sequence of operation, commissioning specifications and the ability to functionally test the systems.

### Commissioning Plan (Cx Plan)

The Cx Plan documents how the project will be commissioned to ensure the OPR and BOD are met, the roles & responsibilities of the project team, communication procedures, guidelines for the Systems Manual and a detailed description of the Cx process.

The Cx Plan includes the systems to be commissioned with the type of tests for the equipment & systems and measurable & acceptable performances, the Functional Performance Testing (FTP) documentation, O&M training requirements and Cx construction schedule.

### Construction Phase

During construction of the project there are many tasks associated with Cx. The

commissioning team works to ensure that equipment, system and assemblies are properly installed, integrated and operating in a manner that meets the OPR. Functional testing and documentation provide valuable performance benchmarks, acceptance criteria and a baseline for the future operation

Construction meetings should include Cx on the agenda. As the acceptance testing begins, depending on the size of the project, separate Cx meetings might be required. It is very important to review the construction schedule, generally with a two-week look-ahead, to determine when specific Cx disciplines are needed. For example; while the building enclosure is being installed the Building Enclosure Commissioning provider (BeCx) should be on site to spot check the installation and maintain a deficiencies issues log for the Cx team to follow. As each Cx specialist; HVAC, controls, electrical, plumbing, fire alarm, etc. is required based on the construction schedule, their on-site presence will be required. The construction schedule is a tool to maintain efficient use of the members of the Cx team. The architect, being the design team representative has the opportunity to manage the Cx team, similar to the manner the architect managed the design consultants during the design phase.

### Operation & Maintenance Training

The Architect can verify that the training for the operating & maintenance staff is conducted in accordance with the project documents, review the contractors submittals of the training content, materials and instructor qualifications to verify that the training will meet the requirements of the Cx Plan and contract documents. This includes an understanding of the OPR and BOD as well as training on the purpose and use of the Systems Manual.

The Systems Manual is a document organized by system containing information necessary to optimally operate the building systems. The Systems Manual includes the OPR, BOD, contract documents, Record Documents, testing information with updates & corrections, building & equipment specifications & submittals, manufacturer's operation & maintenance data, warranties and supplier/contractor listing with contact information.

### **Occupancy Phase**

The International Green Construction Code has a requirement that all cx activities be repeated 18-24 months after issuance of the Certificate of Occupancy. A post-occupancy Commissioning Report is required to be provided to the Owner within 30 months after the Certificate of Occupancy is issued.

### **Conclusion**

Many architects have incorporated energy efficient design principles into their work and recognize that commissioning provides an opportunity to understand how their design performs. With the 2030 target for carbon-neutral buildings, the AIA seeks to dramatically increase the number of high-performance buildings constructed in the coming decades. Evaluation and monitoring of the operations, maintenance and use of a building, through commissioning provides an architect the opportunity to lead the design through occupancy.

### **Reference Documents:**

AIA Integrated Project Delivery: A Guide

Building Commissioning Association's "New Construction Building Commissioning Best Practice"

International Code Council (ICC) - ICC G4-2012 "Guideline for Commissioning"

International Code Council (ICC) – International Green Construction Code

ASHRAE Guideline 0 – 2005 "The Commissioning Process"

### **FEEDBACK**

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### **References**

- ASHRAE Guideline 0-2005 - The Commissioning Process [**ASHRAE 0**]
- NIBS Guideline 3-2012 - Building Enclosure Commissioning Process BECx [**NIBS 3**]
- ASTM E2813-12 - Standard Practice for Building Enclosure Commissioning [**ASTM E2813**]
- U.S. Green Building Council LEED Reference Guide for Green Building Design and Construction, 2009 Edition - Energy and Atmosphere Credit 3 - Enhanced Commissioning (Updated June 2010) [**LEED EA3**]
- 2012 Draft (renamed v.4) EA Credit: Fundamental commissioning and verification, EAp1 and Enhanced Commissioning, Option 2, EA1; Envelope Commissioning (2 points) [**LEED EA BECx**]
- International Green Construction Code - 2012 [**IgCC**]

### **Keywords**

- Commissioning
- Building Enclosure
- Building Envelope
- Owner's Project Requirements
- Basis of Design