



BUILDING ENVELOPE CEM REFRESHER
ONLINE TRAINING COURSE

KRISHNAJI PAWAR, LEED AP BD+C, GSAS CGP, ISO 14001:2015, GCP
ENERGY SPECIALIST CURRICULUM





BUILDING ENVELOPE COMMISSIONING
FOR ENERGY PROFESSIONALS

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WHAT SHOULD YOU LEARN





What is Building Envelope Commissioning?

WHAT IS BUILDING ENVELOPE COMMISSIONING?

BECx (sometimes referred to as building enclosure commissioning) is a quality-based process for evaluating the performance of a facility envelope to determine if a project is meeting the defined objectives, standards, and requirements of the owner.

BECx is especially critical when it comes to measuring energy performance. LEED v4 allows 2 points when the building envelope is included in the commissioning process activities and follows NIBS Guideline 3-2006 used in conjunction with ASHRAE Guideline 0-2005.

One persistent myth is that BECx is solely for new construction, but it can be applied to existing buildings as well. By reviewing the original design and submittal documentation, an owner can evaluate the current performance of an existing building.



WHAT IS BUILDING ENVELOPE COMMISSIONING?

Envelope evaluation may include thermal scanning as well as water and air intrusion testing. If results show the envelope is not performing to the owner's standards, they can implement solutions as part of an improvement plan.

The building envelope is critical to the performance of any building. So it's important not to overlook it. While BECx may be a new concept to some owners, it plays a vital role in the overall commissioning plan of a building.

Some of the most common and costliest sources of building failure involve building envelopes. Building Envelope Commissioning (BECx) can significantly reduce the primary sources of these failures – air and moisture infiltration. It can also significantly reduce the operating costs associated with poor or ineffective thermal breaks and insulation. Owners should perform BECx as part of an overall commissioning plan.



BUILDING ENVELOPE COMMISSIONING (BECX)

The major components of the commissioning process include:

- ✓ Developing the owner's project requirements (OPR)
- ✓ Developing the commissioning plan
- ✓ Reviewing plans, specifications and submittal documents
- ✓ Conducting pre-installation meetings and site inspections
- ✓ Conducting testing of systems
- ✓ Developing systems manuals
- ✓ Conducting training for staff

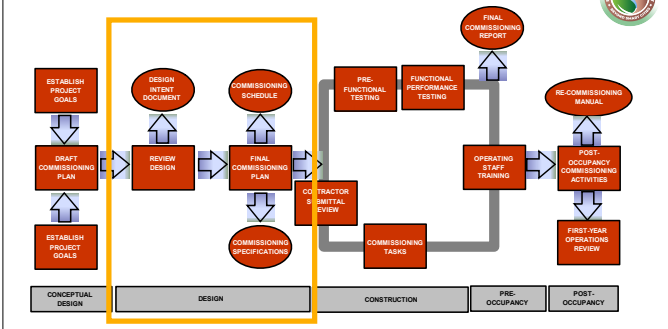


DESIGN PHASE

- ✓ Assemble Proposal Team to create, coordinate, review, and select
- ✓ Prioritize and set the objectives
- ✓ Provides opportunity to ensure all issues in design are outlined in the RFP -Request for Proposal
- ✓ Provides metrics for facility performance
 - ➔ Develop how performance will be analyzed
- ✓ Develop construction observation checklist with timeframes
- ✓ Develop training plan for staff employees
- ✓ Start process of development of operational manuals



TYPICAL COMMISSIONING PROCESS



DESIGN PHASE COMMISSIONING

- ✓ Design-phase commissioning allows for early identification and application of the building owner's requests and requirements.
- ✓ Owner's vision for the building: This describes how the owner sees the building in conjunction with the community around it.
- ✓ The economic factors that will influence the actual construction must be considered, such as project budget, construction schedule, sources of funding, and procedures for handling cost or schedule overruns.
- ✓ The OPR must address how green, or energy efficient and sustainable, the building must be.
- ✓ Limitations and constraints: Design work must also take into consideration any limitations or required factors of the building's design.
- ✓ Design-phase commissioning should be detailed enough to identify potential future expansion needs





DESIGN PHASE CXA OBJECTIVES



Communicate the commissioning requirements to other project team members.

Verify, through review, that the design documentation is consistent with the OPR and BOD.

Ensure that commissioning requirements are included in the construction documents

Build Engagement and cooperation among the project team members.

DESIGN PHASE CXA ACTIVITIES



- ✓ Update the commissioning plan and scope. If a plan has not been developed, the CxP creates one as described in the pre-design phase covering the Design Phase in final detail and summarily the Construction Phase.
- ✓ Conduct a design phase commissioning kick-off meeting to review the commissioning plan and activities with the commissioning team.
- ✓ The Design Team develops a Basis of Design (BOD)
- ✓ Review the OPR and BOD for completeness and clarity (by the CxP).
- ✓ 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.
- ✓ The CxP provides focused design checklists for the design team



DESIGN PHASE CXA ACTIVITIES +



- ✓ The CxP confirms that facility operator training requirements are in compliance with the OPR and are included in the construction documents.
- ✓ Develop commissioning specifications to ensure that commissioning requirements are included in the construction documents.
- ✓ The Cx Plan should include the details of the responsibilities and roles of the Contractor as well as those of the CxP, Owner and Designers which may or may not be articulated in detail in the specifications.
- ✓ 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.



DESIGN PHASE COMMISSIONING PLAN



The Design Team and the results of a Team-Building Meeting where roles and responsibilities of each member of the Design team is specified,

Develop Design Options and list those results,

Develop the Basis of Design, which is defined as a document containing all of the information needed to carry out the Design Intent, including environmental information (weather and interior), budget and financial goals, design needs, and lists of any applicable codes, regulations, etc., and

Create a Communication Plan where lines of communication are described; the Communication Plan is actually a section of the Commission Plan that states in word or diagram form how communication among the Team will be managed.



DESIGN REVIEW PROCESS

The Design Review Process is vital to the purpose of the Commissioning Authority, and occurs throughout the project at scheduled and unscheduled (audit) times.

- ☑ General Design Review Process : To generally review the design, the reviewer should start with the Design Intent Document (DID), also known as the owner's project requirements (OPR).
- ☑ The Basis of Design Document (BOD) should be reviewed third in line after first reviewing the Owner's Project Requirements and then the general drawing review.
- ☑ The Discipline-Specific Design review process looks at each system drawing and evaluates it for understandability, flow-down of Basis of Design document requirements and the Owner's Project Requirements, and its place in Commissioning the facility as a whole.

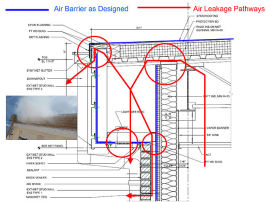


DESIGN REVIEW PROCESS +

- ☑ The reviewer should check the Specifications to make certain they are clear. Since general specifications or specifications from other projects are sometimes used, the reviewer should also ascertain that the specification sections cover only the current project.
- ☑ The most critical system to commission is the life safety systems. The second most critical system to commission is the building automation system. The building automation system, or BAS, is extremely sensitive, and often not well understood by the design team and Commissioning Authority alike, since the software that runs the BAS is almost always project-specific.
- ☑ In reality, BAS documentation should be specific and should usually include control logic diagrams or a series of "if-then" statements that completely outline the sequence of control including the identification of the equipment, the required operating conditions, and the criteria for resulting performance.



BUILDING ENVELOPE COMMISSIONING (BECX) +



Owners can apply commissioning protocols to any building system, and one often overlooked element is the building envelope system. A building envelope's increasingly complex design and construction, often involving multiple contractors and material suppliers, requires a well coordinated systematic approach.

WHAT IS IT, AND WHY IS IT IMPORTANT?



Building envelope commissioning (sometimes called Building Enclosure Commissioning or BECx) has become an integral part of the building process

But what exactly is it, and why is it a critical part of the larger building commission plan? This lecture will describe what building envelope commissioning is, why it's crucial to get right, and provide some tips on how to pick a qualified service provider.

The envelope consists of the materials, systems, and assemblies that make up the building exterior. This might include exterior walls, fenestrations (openings), roofing, waterproofing, or slab on grade improvements.

The process is carried out by licensed and qualified consultants, engineers, architects, and similar specialists in conjunction with the project owner and project manager behind the entire building project.

WHY IS THE BECX PROCESS NECESSARY?



Owners need building envelopes to meet ever-more specific energy and performance requirements and to have all the highly technical systems in place to work together to meet those requirements.

Besides, there are a large number of building codes and industry standards that influence the process. Some applicable industry standards that any sound building envelope engineer, architect, or consultant should know include the following:

- ✓ ASTM E2813, Standard Practice for Building Enclosure Commissioning
- ✓ ASTM E2947, Standard Guide for Building Enclosure Commissioning
- ✓ NIBS Guideline 3-2006 and ASHRAE Standard 202, Commissioning Process for Buildings and Systems.