



Building Commissioning for LEED®

In recent years, building systems have been growing more sophisticated and complex with the promise that those systems will result in improved performance, comfort, indoor air quality and energy efficiency. Unfortunately, these systems' complexity is often their downfall, as they are frequently installed and operated improperly, ultimately failing to meet the high expectations of the building owner and occupants.

This problem is particularly prominent in high-performance buildings where expectations of the building and its systems are very high and well-defined. There must be a process in place during the development of high-performance buildings to ensure that the systems installed are up to the task.

WHAT IS COMMISSIONING?

Commissioning is a quality assurance process that is designed specifically to ensure that the building systems will be designed, installed and operated to meet the Owner's expectations.

An independent Commissioning Authority acts as an advocate for the Owner to facilitate the basic process of commissioning, which includes:

- Formalizing the Owner's expectations for the building and documenting the Owner's Project Requirements (OPR).
- Reviewing the design documents to ensure that the systems are designed to meet the requirements specified in the OPR.
- Performing checks during construction to ensure the systems are installed as designed and specified.
- Ensure that the Owner's staff is trained in the proper operation of the systems.

Benefits of commissioning include reduced energy use, lower operating costs, reduced contractor callbacks, better building documentation, improved occupant productivity, and verification that the systems perform in accordance with the owner's project requirements.¹



A critical component of the process is to ensure that a building actually meets the energy efficiency goals for which it was designed.

WHAT IS LEED®?

The LEED (Leadership in Energy and Environmental Design) Green Building Rating System® developed by the United States Green Building Council (USGBC) is the de facto standard in developing high performance, sustainable buildings. The LEED® system provides a standard framework for assessing building performance and meeting sustainability goals. The system recognizes and rewards choices that improve the environmental performance of buildings in six categories:



- Site Selection
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design Process

Each category contains credits a building project can earn toward LEED® certification. A minimum of 26 out of 69 possible credits earns an award from the U.S. Green Building Council. In most categories, LEED® also outlines a few prerequisites that the project must meet in order to be considered for certification. These awards are divided into four levels, ranging from LEED® Certified starting at 26 credits, to LEED® Platinum starting at 52 credits. It is recommended that a certification goal be set early in the design process in order to incorporate a maximum number of potential credits.

THE LEED® SYSTEM AND COMMISSIONING

A critical component of the LEED® process is to ensure that a building actually meets the energy efficiency goals for which it was designed. Enter commissioning. Under the LEED® rating system Fundamental Commissioning is a prerequisite for certification, while Additional Commissioning, optional enhanced commissioning activities, can earn an additional point toward certification.

Fundamental Commissioning

The first prerequisite in the Energy and Atmosphere category of LEED® is Fundamental Commissioning of the Building Energy Systems. Fundamental Commissioning must be completed on all projects that intend to earn any level of LEED® certification. The tasks outlined by LEED® include:

1. Designate an individual as the Commissioning Authority (CxA) to lead, review and oversee the completion of the commissioning process activities.
 - a) The CxA shall have documented commissioning authority experience in at least two building projects.
 - b) The individual serving as the CxA shall be independent of the project's design and construction teams, though they may be employees of the firms providing those services. The CxA may be a qualified employee or consultant of the Owner.
 - c) The CxA shall report results, findings and recommendations directly to the Owner.
 - d) For projects smaller than 50,000 gross square feet, the CxA may include qualified persons on the design or construction teams who have the required experience.
2. The Owner shall document the Owner's Project Requirements (OPR). The design team shall develop the Basis of Design (BOD). The CxA shall review these documents for clarity and completeness. The Owner and design team shall be responsible for updates to their respective documents.
3. Develop and incorporate commissioning requirements into the construction documents.
4. Develop and implement a commissioning plan.
5. Verify the installation and performance of the systems to be commissioned.
6. Complete a summary commissioning report.²

LEED® requires that commissioning process activities be completed for the following energy-related systems, at a minimum:

- Heating, ventilating, air conditioning and refrigeration (HVAC&R) systems (mechanical and passive) and associated controls.
- Lighting and daylighting controls.
- Domestic hot water systems.
- Renewable energy systems (wind, solar etc.).³

Additional Commissioning

The Additional Commissioning credit provides the opportunity to earn one point toward certification by putting more emphasis on the commissioning process for their project. In addition to the six tasks required by Fundamental Commissioning, the following six tasks must also be completed:

1. Prior to the start of the construction documents phase, designate an independent Commissioning Authority (CxA) to lead, review, and oversee the completion of all commissioning process activities. The CxA shall, at a minimum, perform Tasks 2, 3 and 6. Other team members may perform Tasks 4 and 5. (Note that to meet this requirement, the Commissioning Authority may not be an employee of the design or construction firms or a member of the design or construction team as allowed in the fundamental commissioning requirements.)
2. The CxA shall conduct, at a minimum, one commissioning design review of the Owner's Project Requirements (OPR), Basis of Design (BOD), and design documents prior to mid-construction documents phase and back-check the review comments following design submission.
3. The CxA shall review contractor submittals applicable to systems being commissioned for compliance with the OPR and BOD. This review shall be concurrent with A/E reviews and submitted to the design team and the Owner.
4. Develop a systems manual that provides future operating staff the information needed to understand and optimally operate the commissioned systems.
5. Verify that the requirements for training operating personnel and building occupants are completed.
6. Assure the involvement by the CxA in reviewing building operation within 10 months after substantial completion with O&M staff and occupants. Include a plan for resolution of outstanding commissioning-related issues.⁴

KEYS TO SUCCESS

While LEED® clearly identifies the requirements of commissioning and the tasks that must be completed and documented in order for a project to earn LEED® certification, there are several strategies not defined or required by LEED® that will improve the overall effectiveness of the commissioning process without any additional investment by the Owner.



Engage the Commissioning Authority early in the project.

Commissioning is most effective when it is performed throughout the entire process of building development. Often, a commissioning authority is not engaged until construction documents are well under way, or even completed. At this late stage in the process, any discrepancies between the Owner's Project Requirements and the design documents can be very expensive to reconcile, or the Owner's requirements must be altered significantly for compliance. Getting everyone on board early also goes a long way in effective communication— a key to success in any project.

KEYS TO SUCCESS, continued

The Commissioning Authority should be contracted directly by the Owner.

The commissioning authority should be accountable only to the Owner and should have full support of the Owner as leverage if necessary. If the CxA is an employee of the design or construction firm, it is significantly less likely that the CxA will be willing or able to advocate for the Owner if it means going against his or her own firm.

Critical to the success of any commissioning process is the buy-in of all members of the project team.

Successful commissioning requires the cooperation of the entire commissioning team, which includes the Owner, architect, engineers and contractors. Since the commissioning authority does not have any contractual relationship with the designers or contractors, it is essential that the Owner clearly communicate his or her commitment to the process.

Commissioning a building's systems is one of the best strategies in attaining sustainable buildings. When completed properly, commissioning is a win-win situation for the Owner, the project team and the environment.

1 LEED® for New Construction Version 2.2: Ballot Version, October 2005, p. 30

2 LEED® for New Construction Version 2.2: Ballot Version, October 2005, p. 30

3 LEED® for New Construction Version 2.2: Ballot Version, October 2005, p. 31

4 LEED® for New Construction Version 2.2: Ballot Version, October 2005, pp. 38-39

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