

## Commissioning for LEED™

**Joy E. Altwies**  
*Farnsworth Group, Inc.*

### Synopsis

Since the launch of the LEED Green Building Rating System™ Version 2.0, the growth and interest in green building projects has spread rapidly. Of special interest to commissioning providers is the component in LEED™ that requires commissioning of green buildings, and the additional credit available for adding greater depth and more emphasis on the commissioning process. This paper is aimed at commissioning providers and explains the two "levels" of commissioning that LEED™ expects. The intent of the paper is to explain in detail the requirements set forth by LEED™ for meeting both the "fundamental" commissioning prerequisite and the "additional" commissioning credit. By explaining these requirements to commissioning providers, the author hopes to give readers a useful explanation of the LEED™ contents, including a brief explanation of why the commissioning component of LEED™ was designed in its current form. Readers should expect to gain a greater understanding of the LEED™ commissioning requirements and be better prepared to explain them to potential clients. As this is a rapid growth area in the commissioning industry, the paper should be useful to many commissioning providers faced with clients who expect them to be thoroughly versed in the LEED™ system.

### About the Author(s)

After completing her Master's degree in Mechanical Engineering, Joy Altwies joined Farnsworth Group, Inc. to pursue her interest in energy efficiency and environmentally responsible building design and construction. Joy's work has focused on providing commissioning services for a variety of projects with a strong emphasis on green and sustainable building projects. During the past several years, Joy's project work has expanded to include LEED™ assistance and green design opportunity analysis for clients seeking these specialized services. She currently serves on the Board of Directors of the Wisconsin Green Building Alliance and is Farnsworth Group's liaison to the US Green Building Council. She is accredited by the U.S. Green Building Council as a LEED™ 2.0 Professional.

## Introduction

Over the last several years, the launch of the U.S. Green Building Council's LEED Green Building Rating System™ Version 2.0 has created a growing market for commissioning services. This paper introduces the LEED™ system to commissioning providers, so that they can successfully provide services for clients seeking LEED™ recognition.

### What is LEED™?

The LEED Green Building Rating System™ is a benchmarking and design assistance tool for building owners, designers, and construction professionals. The system recognizes and rewards choices that improve the environmental performance of buildings, while serving as a method to compare buildings of different types and locations. LEED™ Version 2.0 is divided into six categories that address different areas of a building's environmental performance: Site Selection, Water Efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation and Design Process. In each category, LEED™ contains credits that a building project can earn. In most categories, LEED™ also includes a few prerequisites, or mandatory features, that the project must include in order to be considered for a LEED™ rating. The current Version 2.0 is applicable to new construction and renovation projects for commercial and industrial buildings in any U.S. location.

In total, there are 69 possible credits that a building project may earn. At a minimum, a project must achieve 26 credits to earn an award from the U.S. Green Building Council. LEED™ awards are divided into four levels, ranging from LEED™ Certified starting at 26 credits, to LEED™ Platinum starting at 52 credits.

### Why LEED™ Includes Commissioning

To achieve a LEED™ rating, a whole-building approach must be used. There are not enough credits in any one category to reach the 26 minimum, so credits must be earned from several categories to be successful. LEED™ addresses a variety of environmental issues, ranging from farmland preservation and storm water runoff in the Site Selection category to energy efficiency and ozone depletion in the Energy and Atmosphere category. In essence, LEED™ offers a blueprint for creating better buildings, and it allows owners and professionals to decide the extent to which they want to apply it to their particular projects. As those in the commissioning industry are aware, the commissioning process is a highly effective method to improve the performance of building systems and equipment. The U.S. Green Building Council recognized the effectiveness and benefits that commissioning would provide in green buildings, and decided to include commissioning in the LEED™ system.

## The LEED™ System and Commissioning

LEED™ not only includes building commissioning as a way to earn a credit, but also requires it. This is accomplished by splitting the commissioning process into two "levels," both located within the Energy and Atmosphere (EA) category.

### A Two-Level Format

Commissioning the LEED™ Version 2.0 system is divided into two "levels" called "Fundamental Building Systems Commissioning" and "Additional Commissioning." Fundamental Building Systems Commissioning is a prerequisite for the system, while Additional Commissioning is one of the 69 optional credits that can be selected to help reach the 26 credit minimum. The Fundamental Building Systems Commissioning prerequisite, as its name implies, requires six tasks that are generally considered more traditional or fundamental commissioning tasks. These six particular tasks were selected because each was considered vital to the success of any commissioning effort, and therefore vital to the success of the building project itself. The Additional Commissioning credit requires an additional five tasks that are more typical of the full commissioning process approach. These tasks were selected for the additional credit due to the enhanced benefits and value they add to projects.

### Rationale for the LEED™ Approach

The flexibility that is inherent to the LEED™ system as a whole is also reflected in its approach to building commissioning. The division of commissioning components into two "levels" is designed to give project teams the maximum flexibility in applying commissioning while still providing at least a basic level of benefits. Project teams may select which level of commissioning they wish to attain, depending on the particular circumstances of their project. The full commissioning process requires a larger initial investment due to the additional tasks included, which could potentially discourage smaller projects from pursuing LEED™ certification if the full process was a prerequisite. In addition, the division of the commissioning tasks into required and optional elements reflects the realities of the current building commissioning industry. Some areas of the country have a more robust and abundant supply of commissioning providers than other areas, and the different providers have different levels of expertise depending on how the commissioning process is commonly executed in their area. The developers of LEED™ wanted to require commissioning of green buildings, but did not want to potentially eliminate a project simply because of regional differences in commissioning providers. Both the prerequisite and the additional commissioning credit were included in the Energy and Atmosphere category simply because commissioning is most commonly associated with energy savings, despite the fact that commissioning will also positively impact many of the other LEED™ categories.

The following sections describe the prerequisite and additional credit commissioning levels contained in the LEED™ rating system.

## **EA Prerequisite 1: "Fundamental Building Systems Commissioning"**

The first prerequisite in the Energy and Atmosphere category of LEED™ Version 2.0 is Fundamental Building Systems Commissioning. This prerequisite describes the commissioning tasks that must be completed on all projects that intend to earn any level of LEED™ certification.

### **Intent**

The official intent of this prerequisite, as stated in the LEED™ Reference Guide, is to “verify and ensure that fundamental building elements and systems are designed, installed and calibrated to operate as intended.”<sup>1</sup>

### **Requirements**

There are six tasks required to meet the Fundamental Building Systems Commissioning prerequisite. These six tasks are:

- Engage a Commissioning Authority – An individual must be selected to lead the commissioning efforts for the project. For this prerequisite, this person may be a third party or a qualified person from the designer’s firm. If a member of the design’s firm is chosen, he or she must not be directly involved in the design or construction management, and must report directly to the owner.
- Review design intent and basis of design documentation – This task requires the commissioning authority to document the owner’s requirements for each commissioned system in the building. LEED™ specifies that in new buildings, all HVAC and controls systems, duct work and piping, renewable and alternative technologies, lighting controls and daylighting, waste heat recovery, and any advanced technologies like thermal storage must be commissioned. Building envelope systems and TAB should also be verified. The owner’s requirements for these systems may include efficiency targets and other performance criteria such as temperature and lighting levels that will define the acceptance criteria for the functional performance testing that takes place at the end of construction. The commissioning authority must also document the basis of design for the commissioned systems, including any primary assumptions, applicable codes and standards, occupancy details, climatic assumptions, and the key concepts used in the design to meet the owner’s requirements stated in the design intent document. These two documents are primary tasks that are commonly accomplished on a commissioned project.
- Include commissioning requirements in the construction documents – LEED™ requires that the scope of commissioning for the project, the systems to be commissioned, and the various requirements related to schedule, submittal reviews, testing, training, O&M manuals, and warranty reviews be clearly listed in the construction documents. The delegation of the various tasks is up to the project team, so long as the responsibilities are clearly stated in the construction documents. Bidding contractors must have a clear understanding of their role in the commissioning effort.

- Develop and utilize a commissioning plan – The LEED™ Reference Guide Version 2.0 lists eight components that must be included in the commissioning plan for the project. These are an overview of the commissioning process for the project, a list of commissioned systems and features, primary commissioning participants and their roles, a communication and management plan, an outline of the scope of commissioning tasks, a list of work products, a schedule, and a description of any commissioning testing activities. This plan should be created as early as possible in the project, and should evolve over time as additional details become available.
- Verify installation, functional performance, training and documentation – For each commissioned system or component, the commissioning authority or contractor must verify proper installation, functional performance in accordance with the design intent, training of owner’s designated operation and maintenance personnel, and completion of useful operation and maintenance manuals. Depending on the division of duties decided upon by the project team and described in the commissioning plan and construction documents, either the contractor will perform the tasks with review or assistance by the commissioning authority, or the commissioning authority may complete the task with or without assistance from the contractors. The LEED™ Reference Guide Version 2.0 gives additional details on each of these tasks, including topics that should be covered during training sessions, formatting and content guidelines for the O&M manuals, guidelines for preparing and executing functional test procedures, and the use of sampling strategies.
- Complete a commissioning report – The commissioning authority must prepare a commissioning report and submit it to the owner once the commissioning plan has been fully executed. If certain functional tests are incomplete due to seasonal delays, then the report can be submitted once all but those tests are finished. To satisfy the LEED™ prerequisite, the commissioning report must contain the commissioning authority’s analysis of whether each commissioned system or component meets the design intent, meets the specifications, was properly installed, passed the functional performance tests, was properly documented in the O&M manuals, and was fully covered in the operator training. Any outstanding commissioning issues must also be included.

### **Documentation**

Once all the requirements for satisfying the LEED™ prerequisite have been met, the team must provide documentation to the U.S. Green Building Council as evidence that the tasks were completed. The team must provide a copy of the commissioning plan, with the six tasks listed above highlighted. The commissioning authority must also provide a letter certifying that the plan was successfully executed and the design intent for the building was met.

## EA Credit 3: "Additional Commissioning"

The Additional Commissioning credit in LEED™ Version 2.0 gives project teams the opportunity to earn a credit toward their total score by putting more emphasis on the commissioning process for their project.

### Intent

The official intent of the Additional Commissioning credit is to “verify and ensure that the entire building is designed, constructed, and calibrated to operate as intended.”<sup>ii</sup>

### Requirements

To achieve the credit for Additional Commissioning, the following five tasks must be completed in addition to the six required for the Fundamental Building Systems Commissioning prerequisite:

- Complete a focused design review prior to the construction documents phase – For this task, a third party (non-design firm) commissioning authority must be used. The LEED™ Reference Guide Version 2.0 gives several guidelines for the qualifications necessary for an independent commissioning authority. The commissioning authority must review the designs for the project prior to the construction documents phase, providing feedback to the team on each commissioned system or feature. The review should concentrate on whether the design will or will not meet the owner’s goals for the building systems as stated in the design intent, such as energy efficiency, water efficiency, indoor environmental quality, etc.
- Complete a focused design review of the construction documents – Like the previous task, this review must be completed by a third party commissioning authority. The review of construction documents takes place before completion of the construction documents, so that the commissioning authority can provide feedback on whether the commissioning requirements have been adequately included in the drawings and specifications. This is also the last opportunity for the commissioning authority to check that the previous review comments have been incorporated to ensure the designs will meet the owner’s requirements.
- Complete a selective submittal review for commissioned equipment – During the construction phase, an independent third party commissioning authority must review contractor submittals for commissioned systems and equipment. Like the design reviews, the purpose of this review is to ensure that the selected equipment meets the owner’s requirements stated in the design intent. This may include not just the functionality of the equipment, but also its environmental characteristics.
- Create a recommissioning management manual – In addition to the traditional O&M manual, the Additional Commissioning credit requires the commissioning authority to create a recommissioning management manual. The LEED™ Reference Guide Version 2.0 lists the components that must be included in this manual, such as as-built sequences of operation for all equipment, descriptions of energy and water saving features, seasonal start-up and shut-

down procedures, a list of diagnostic tools, etc. This manual is intended to provide the owner with in-depth tools and strategies for keeping the building running in optimal condition.

- Contract for a warranty or post occupancy review – At the end of the construction phase, the commissioning authority must be under contract to return to the building at the 10-month point to review its operation for warranty issues. This task must include both a review of current operation to identify any potential warranty related problems before the typical 12 month warranty expiration, and an interview with building operating staff to identify their concerns.

## Documentation

LEED™ requires three documents to prove compliance with the conditions described in the Additional Commissioning credit. A portion of the commissioning plan showing the five additional tasks must be submitted, along with a letter of certification from a third party commissioning authority stating that the first three tasks were completed successfully. A written report must also be included showing evidence of the design review results. If the third party commissioning authority also completed tasks four and five, then certification of their successful completion can be included in the letter. Otherwise, the person responsible for the completion of tasks four and five should submit a separate letter indicating the successful completion of those tasks.

## Conclusion

The LEED Green Building Rating System™ Version 2.0 is rapidly creating opportunities for commissioning providers to provide services to clients in the sustainable construction market. Becoming knowledgeable on the requirements of the system is vital for those commissioning providers who wish to be successful in entering this rapid growth area.

## How to Get Started

Learning the requirements of LEED™ related to commissioning is a good first step. In order to be successful, it is also helpful to understand the larger issues behind the LEED™ rating system as a whole. Understanding the other prerequisites and credits contained in LEED™ makes developing the owner's design intent and reviewing designs and submittals easier. The U.S. Green Building Council currently offers professionals the opportunity to become accredited in the LEED™ rating system, and this may be a helpful way to differentiate the services of those who are knowledgeable in green building issues.

## References and Resources

The most vital resource for any professional involved in a LEED™ project is the LEED™ Reference Guide Version 2.0. This book was specifically written to help professionals

understand the details of each prerequisite and credit, and is a must for anyone working on a LEED™ project. The Reference Guide is available for purchase through the U.S. Green Building Council's web site, at [www.usgbc.org](http://www.usgbc.org). The web site itself is also a valuable resource, as it contains lists of Council members by location, accredited professionals, case studies, upcoming events in the industry, and in-depth information on the current and future versions of LEED™.

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<sup>i</sup> LEED™ Reference Guide Version 2.0, Paladino Consulting LLC, June 2001, pg. 95.

<sup>ii</sup> LEED™ Reference Guide Version 2.0, Paladino Consulting LLC, June 2001, pg. 145.