

How to Achieve LEED Certification for Commissioning Projects

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Synopsis

In this paper, we intend to share insights from project experiences and show that the success of a LEED project is directly dependent upon the completion of the 'Fundamental Building Systems Commissioning' prerequisite, and how the 'additional commissioning' credit point can be attained as your building project moves toward LEED Certification.

We will focus on and include examples for the following commissioning issues:

- The importance of the Commissioning Authority achieving the "LEED Accredited Professional" (LEED AP) designation, and how, as a Commissioning Provider it can position your firm in this growing market.
- How the Commissioning effort contributes to energy and maintenance cost avoidance, using financial data from current LEED projects.
- How tracking this financial data will help Commissioning Provider firms market Commissioning Services for the "next" project.
- Typical problems identified during the course of Commissioning LEED projects.
- Securing the Additional Commissioning Credit (Eac3) in the LEED Rating System.
- The need for a comprehensive Commissioning Process to ensure completeness of the Commissioning effort to protect against losing LEED Certification of the project.

About the Authors

Michael Berning PE, LEED AP, is a Principal with Heapy Engineering LLC, a one-hundred and thirty person mechanical/electrical/technological engineering design and commissioning services firm with offices in Dayton and Columbus, Ohio. A graduate of the University of Dayton School of Engineering (BSME, 1980), Michael started at Heapy in 1979, initially specializing in redesigning building systems for energy efficient utilization and assisted clients in developing a Master Plan approach to solving their long-term energy and HVAC problems.

Michael is a ten-year member and past chairman of the Ohio Department Of Development's Energy Conservation Policy Advisory Committee where he assisted in writing the "Minimum

Weatherization Program Standards" for the ODoD's Office of Weatherization. A member of ASHRAE and the Association of Energy Engineers (AEE), Michael is a member of the University of Dayton Department of Mechanical and Aerospace Engineering Advisory Committee. In 2000, the AEE named Michael "Energy Engineer of the Year" for Region III (Illinois, Michigan, Ohio).

Michael has designed HVAC systems for museums, office buildings, churches, educational facilities, industrial facilities, libraries and health care facilities.

In his current position, Michael is responsible for the planning and development activities for the firm, works with the Conceptual Planning/Design Group emphasizing Commissioning issues and Chairs Heapy Engineering's Sustainable Design / LEED Committee.

Bart Grunenwald P.E., LEED AP is a Senior Commissioning Project Manager for Heapy Engineering. Bart is a graduate of the University of Dayton School of Engineering (BSME, 1993) and the UD School of Business with a Masters degree in Business Administration (MBA 1998) and spent several years on the contracting side of the industry before joining Heapy Engineering and moving into design work.

Bart spearheaded the development of Heapy Engineering's Commissioning Services Department and has assisted in leading the development of Commissioning Standards, used by Heapy's Commissioning personnel, which insure a consistently thorough and documented Commissioning Process for our client's projects. Bart also manages several commissioning projects where he is responsible for all acceptance testing and documentation

Having been involved with LEED project design and Commissioning Services since the program's inception, Bart oversees Heapy Engineering's design staff regarding issues relating to Sustainable Design. He is an active member of the Dayton Chapter of the American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE) and of the West Central Ohio Chapter of the Association of Energy Engineers.

Heapy Engineering's involvement with 12 LEED projects and our extensive experience in Commissioning projects provides a knowledgeable and qualified perspective on the Commissioning Prerequisite and Additional Commissioning Credit (Eac3) of the United States Green Building Council's (USGBC) LEED Rating System program. Owners, developers and architects can benefit immensely from understanding the commissioning process as it relates to the USGBC's LEED Rating System program.

Achieving LEED

There are several compelling reasons to require commissioning staff members to be LEED Accredited Professionals (LEED AP). At an ever-growing rate, building owners are requesting that sustainable design concepts be included in the design and construction of their buildings. And, they are becoming increasingly aware that one well accepted method to measure the sustainability outcome of their building project is through achieving Certification via the LEED Rating System. Accredited professional designation for commissioning staff establishes your company's commitment to the new paradigms for building design and construction.

Presently, approximately 3-4% of new building construction is undergoing the LEED 'process.' As of early 2005, there are approximately 1800 LEED Registered projects in various states of design or construction. Conservative projections show that LEED Registrations will surpass 12,000 by 2010. This is a seven-fold increase in LEED projects in only five years. Further projections estimate that nearly 25% of all new building construction in the future will be built using the LEED Rating System as a design and construction guideline.

As stated previously, commissioning all building energy systems is a Prerequisite for every LEED project. These LEED 'market' projections beg for commissioning services providers to become intimately familiar with the overall goals and concepts associated with the sustainable design that the LEED Rating System measures. One of the best ways to accomplish this is for Commissioning Authorities (CA's) to become LEED AP's.

At Heapy Engineering, incorporating sustainable design concepts (such as energy and water efficient systems) is central to our design philosophy for all projects. We believe our clients should benefit from the positive effects of owning and operating cost efficient buildings that are healthier to work in and are conducive to improved productivity.

Each of our design teams has at least one LEED AP who assists in guiding the team through the process of including practical sustainable design concepts on every project. Our goal is to have over one-third of our design staff attain the LEED AP designation. We are well on our way to achieving this goal. This company philosophy and staff training strategy will ensure that all design teams are well qualified to incorporate sustainable design practices, as well as follow the LEED Rating System for our LEED Registered projects.

We require that the CA on our LEED projects is a LEED AP and has LEED project experience. This is done specifically to position our personnel in a role that assists the Project Team in successfully attaining LEED Certification. As the CA is involved with the project from the design stage through the construction phase, we feel that it is vital to the project's certification outcome that our personnel have more than just a cursory level of knowledge of the goals of the LEED rating system and the Owner's Sustainable Project Requirements.

Since the CA is on site, he or she is also in a position to assist with the management and tracking of the LEED credits associated with the construction phase of the project. He can identify the

progress of LEED credits associated with the construction work and quickly identify and solve problems as they develop. Assumption of these additional responsibilities by the CA can represent significant cost savings for the owner while adding to the services provided by the CA.

In-house capability to provide both LEED Project Management and Commissioning Services allows a firm to “package” services and provide considerable added value to the owner. If the consultants, (CA and LEED PM), are members of the same firm, internally the organization can package a more cost-effective delivery and streamline the overall LEED process (reduce costs) for the owner. For instance, if the CA is already at the construction site, the LEED Management Services costs could be reduced by as much as 10-15% while increasing the cost of the CA’s services typically by less than 5%.

The Requirements and Benefits of LEED Certification

LEED certification requires commissioning which leads to energy and maintenance cost avoidance as well as other benefits.

The Heapy Engineering Headquarters is one of the first LEED projects in Southwest Ohio. The project design realized an annual energy cost reduction of 35% over ASHRAE/IESNA 90.1 standards and avoided an estimated \$17,900 in annual energy costs due to solving construction installation and operational issues found during the Commissioning Process. In building the Heapy headquarters, we found, as an owner, that some benefits of planning for LEED Certification were hard to measure. Cost saving and innovation went beyond the building process. For example: How do you place a value on an intangible, such as the improved health/wellbeing of employees that ultimately leads to better productivity?

Our experience of commissioning numerous buildings, including our own facility, has shown unequivocally that utility bills will be lower over the life of the commissioned building. Also, our maintenance costs are lower, because we specified quality, highly efficient systems, and then ensured, with a thorough commissioning process, that were set up properly from the start.

There are definitely other benefits that are not as easily quantified as the energy and maintenance cost reductions, such as: 1.) Zoned lighting controls for our employees’ comfort 2.) An expanse of windows that give an open feel to the building 3.) Over one-hundred view enhancing trees were planted outside to make Heapy a beautiful place for our employees to work. These are substantial contributing factors to the quality of life in our workplace.

Similar cost savings can apply to all sustainable design / LEED projects. According to a Heapy Engineering analysis of recently designed and built ‘high-performance’ school buildings, we found that the energy cost savings in Commissioned vs. Non-Commissioned facilities is significant:

Approximate per year utility costs:

Commissioned school buildings:	\$1.10/SF
Non-commissioned school buildings:	\$1.90/SF

For one of our local school districts with nearly 3.5 Million square feet of school buildings, this could translate into an *annual* cost avoidance of nearly \$2.8 Million.

The now well quoted Greg Kats study, *The Costs and Financial Benefits of Green Buildings, A Report to California's Sustainable Building Task Force*, October 2003, identified the cost savings resulting from pursuing LEED Certification on 33 projects. His analysis shows a financial benefit of \$50 to \$70 per square foot over a 20-year life of these LEED Certified buildings. This translates into the investment made for the sustainable design concepts incorporated into these buildings producing a ten-to-one payback. Operations and Maintenance savings over the life of these buildings resulting from the Commissioning Process was estimated to be \$8.47 per square foot. This is a significant result considering that the Commissioning Process for a typical building is approximately an upfront investment of only \$0.50 to \$1.25 per square foot.

Financial Data Helps Market Commissioning Services for the Next Job.

Actual experience and good project management practices are convincing to prospective building owners. Heapy exhibits those qualities as the owner of a Commissioned / LEED building. We live and breathe our company philosophy of incorporating practical sustainable design concepts into every project with a building that used sustainable criteria as a basis for its design and construction, by a staff that includes numerous designers and CA's that have achieved the LEED AP designation.

Tracking costs of the commissioning aspect of a LEED project is a major selling point for our prospective clients. We track costs and benefits derived from the beginning to the end of each project. This includes the costs involved in creating the documentation required to be submitted with the LEED Certification submittal, and the costs associated with the various steps we employ along the entire Commissioning Process.

A specific, yet non-LEED project that can be used as an example is the commissioning work we have been performing for a large local school district. This is a \$102 Million upgrade and expansion to thirteen separate school facilities within the district, with only one of the projects involving a completely new (\$8 Million) school building. Heapy is also the design engineer for all of the projects working with 6 different architects. Initially the District and its Owners Representative were adamantly opposed to Commissioning. After many discussions on the benefits of the Commissioning Process, the District cautiously approved a limited Commissioning scope for only the first four buildings. After seeing the results of this initial Commissioning effort, with Heapy's CA's documenting over 200 construction deficiencies on one elementary school project alone, the District approved the go ahead to fully commission the entire project.

We conducted a survey after the initial four buildings were complete to capture everyone's (Superintendent, Business Manager, Construction Manager, Facilities Staff, Owners Representative, etc.) original and current thoughts about Commissioning. This survey showed that the belief level of all of the participants dramatically changed regarding the value of Commissioning. To this day, the CM actually sells their future clients our Commissioning services at the start of the job by telling them that their project will be commissioned to ensure successful building start-up and occupancy at the end of the project.

Typical Commissioning Findings on LEED Projects

Usually many contractor installation / system set-up issues are identified each time a job is commissioned. As these are not unique to LEED projects, they are a compelling reason to include commissioning on all projects. Commissioning has quickly become an important quality assurance process in the building industry. Its 'concept through occupancy' process assures that the building is designed, built, and operates to meet the original design intent. Further, the process continues throughout the ongoing lifecycle of the building. Problems that surface later can usually be traced to the lack of a Commissioning Plan or to the fact that the plan has not been followed properly.

We find that with a well-thought out and well-written Commissioning Plan, the Commissioning Process can be easily managed. The plan defines the goals of the Commissioning Team, the Commissioning Team members, what their specific responsibilities are, and the schedule of commissioning activities.

For a LEED project, there are six Fundamental Commissioning items that must be followed to attain LEED Certification:

- Engage a Commissioning Authority.
- Interview the owner to review design intent and review the basis of design documentation.
- Include commissioning requirements in the construction documents.
- Develop and utilize a Commissioning Plan.
- Verify installation, functional performance, training and documentation.
- Complete a Commissioning Report.

Typical commissioning findings that have been observed by our CA's on LEED projects include the following:

- **The design intent and basis of design were not developed well by the design team and owner.** On the building side, the architect traditionally works with the building owner to understand the owner's needs. On the engineering side, complicated technical aspects of the systems and infrastructure requirements often make communication with the owner difficult. Resolution of these potential communication conflicts at this point of the design process due to the CA's ability to provide an extra set of eyes on the project is extremely valuable to the success of the project.

- **Data documenting the completion of the LEED requirements is not assembled appropriately or in a timely manner by the design team at the end of the design phase.** The architect or whoever is serving as the LEED Program Management consultant doesn't recognize that most of the LEED Credit documentation should be completed at the end of the design phase. They may be under pressure to complete the design, so they put off the LEED documentation until 6 months or more into the construction phase. At that point, it can become a paper chase nightmare to create the required documentation.
- **Contractors don't submit reports—or are reluctant to do so—documenting LEED compliance.** They are under pressure to complete the construction, so they put off the documentation. Scheduling LEED related progress meetings during the construction phase is imperative to keep contractors on target with LEED documentation requirements. In addition, it is recommended that their contract be written to state that their payments are contingent upon LEED reports being submitted with their monthly project billing invoice.
- **The project manager's ability to enforce the requirements is often reduced by the contractor's lack of understanding that this needs to be managed.** Contractors are concerned about building the building - not focusing on documentation for the LEED program. In some instances, the contractors simply do not meet project requirements. Even though project specifications outlining LEED requirements are written into their contracts, often they need a reminder to get them finished. Sometimes a person within the owner's organization can be assigned to provide these reminders. In addition, we are careful about following multiple steps in the Commissioning Process to ensure that these items actually are tracked and are identified to the contractors. We have found that if we manage the job well, communicating the overall project goals to the contractors, we receive excellent cooperation and the contractors are more accepting of what is required of them.

Securing the Additional Commissioning Credit (Eac3) in the LEED Rating System

In addition to Fundamental Building Commissioning being a Prerequisite of the LEED Rating System program, an additional Commissioning related point could be achieved. The Additional Commissioning Credit (Eac3) is gained when you perform extra steps in the Commissioning Process. These include:

- Peer review at the Design Development Phase of the project
- Peer review when the Construction Documents are nearly complete
- Peer review of the shop drawings of the equipment to be Commissioned
- Writing a Re-Commissioning manual
- Conducting a near-end of warranty or post-occupancy project review.

The intent of the Additional Commissioning Credit is to spend additional time focusing on the review of the design and the review of equipment submittals prior to their approval for purchase.

If something is found to be incorrect, it is much easier to correct at this point in the project's progress, which will reduce costly change orders during the construction phase of the project. Therefore, the investment an owner makes in pursuing the Additional Commissioning Credit pays for itself very quickly.

How to Ensure the Completeness of the Commissioning Effort to Protect Against Jeopardizing the Project's LEED Certification.

With Fundamental Building Commissioning a Prerequisite in the LEED rating program, it is vitally important that CA's understand what is required and establish ways to ensure that they are contributing members of the LEED project team.

Experience and real-life data from several Heapy Engineering LEED projects offer valuable insight into the LEED certification process. For example, organizing information for the documentation of each of the LEED Rating System Credits and Prerequisites was important for the design team, project team and construction team. With the LEED Rating System so new just a few years ago, it required that everyone contend with a "steep" learning curve. As a result, some communication and coordination "disconnects" occurred during the design and construction phases of the early LEED projects.

The Commissioning Process Heapy now uses, continually proves to be an effective internal management tool. We developed this tool through the "lessons learned" debriefings of our projects and the feedback we have received from our clients. We created a 14-tab reference binder of flow charts, tracking and cost information for our CA's to have a consistent project delivery process for successfully commissioning LEED as well as non-LEED projects.

Heapy Engineering designed, and is commissioning, several projects for the University of Cincinnati – including the \$21 Million Student Life Center and the \$71 Million Student Recreation Center. These early LEED projects have served as great laboratories for us and the University to learn from and to develop our LEED Program Management Process as well as our Commissioning Process for LEED projects.

Our engineering design team used the LEED Rating System as a design guideline on these projects. However, when Contractors came on board, most of them did not know much about the LEED program or the requirements of the LEED Credits affecting their work. Since there are important LEED Credit points to be attained during the construction phase, and with relatively little buy-in from the contractors, our CA's started to observe a potential for deviation from the project's sustainability and LEED Credit points goal. Immediately our CA's began to hold regular progress meetings to assist the contractors in meeting the project goal. This adaptation, although not rocket science, will be necessary for these initial years of LEED projects until a majority of contractors possess the management and technical skills to construct successful LEED projects.

Another modification we made in our approach to Commissioning LEED projects included the assignment of project responsibility. For these initial University LEED projects, although our CA was involved in the design and construction phases, he was also serving as the project leader on all LEED-related activities. Ideally, we determined that the CA should not be the primary point person for a project's LEED process. A project specific LEED Program Manager should be assigned to oversee the entire LEED documentation and Certification process. This keeps the CA (and designers, etc.) from being distracted from the primary role they are serving on the project. The CA would then be in a better position to provide the Commissioning Services required for the project in an active supporting role.

Since only a few LEED Credits impact the construction effort, the LEED documentation process tends to bog down once construction begins. The solution was regular progress meetings with the CA and contractors. Our internal LEED team worked closely with the construction team to come up with 'best practices' that could facilitate the reporting process. In addition, the University requested that the construction manager include an agenda item on the weekly job-progress agenda.

Summary

Commissioning for LEED Certified projects is a fast growing market segment for the foreseeable future in the design and construction industries. The LEED Rating System, with its Prerequisite for the Fundamental Building Commissioning of all energy using systems in buildings, provides a great opportunity for Commissioning Services firms.

The LEED Rating System implicitly requires the use of an integrated design approach (bringing together the entire design, commissioning and construction team at the start of the project) to successfully design and construct a building that can attain LEED Certification. This truly holistic approach to building design and construction is further assured success when coupled with CA involvement in the project. The role of the CA is vital in this process since the CA is the extra set of eyes during the design phase and functionally tests the building systems to ensure that they operate at their designed high performance levels.

Heapy Engineering is very much on the leading edge of this new market that emphasizes energy conservation and high-performance building design. We have developed specific Design and Commissioning processes that are consistently repeatable and are based on the philosophy of using an integrated design approach to building better (sustainable) buildings.

However, developing and using good Design and Commissioning Processes to construct high-performance and Sustainable buildings will not guarantee success for all sustainable design/LEED projects. If the project partners involved (designers, contractors and CA's) do not carry with them the understanding of the goals and concepts behind what the LEED Rating System is measuring, then carrying out the "processes" can become more of a distraction to the primary role of each project partner.

By possessing basic knowledge of the LEED Rating System, especially by becoming a LEED, AP will certainly enhance each project partner's ability to contribute to the successful completion and Certification of LEED projects.