

COMMISSIONING: ADDING TO THE BOTTOM LINE AND PROMOTING SUSTAINABILITY



Dynamic testing of heating systems include shutting down a boiler to verify that back-up systems and alarms are fully functional.

Buildings systems are becoming more complex than ever before and despite spending more money on these systems, owners are finding they are not getting the performance they expected.

A study of 60 buildings by the Lawrence Berkeley National Laboratory (LBNL) found that half of building owners surveyed experienced control problems, 40 percent had problems with heating, ventilation and air conditioning (HVAC) equipment and 25 percent had energy management systems, economizers, and/or variable speed drives that were not functioning properly. Fifteen percent of the buildings even had missing equipment.

Building owners and occupants are increasingly conscious of the impact we have on the planet and the planet's resources. Being sustainable,

green, or energy-efficient infers being a good steward of natural resources and now it can translate into dollars that add to your bottom line.

According to the National Institute of Building Sciences, "... owners can achieve savings in operations of \$4 over the first five years of occupancy as a direct result of every \$1 invested in commissioning—an

excellent return on investment. Meanwhile, the cost of not commissioning is equal to the costs of correcting deficiencies plus the costs of inefficient operations. For mission-critical facilities, the cost of not commissioning can be measured by the cost of downtime and lack of appropriate facility use" (<http://www.wbdg.org/project/buildingcomm.php>).

COMMISSIONING

Commissioning is a quality assurance process that verifies a building's equipment, systems and system interactions are operating according to the designer's intent and the owner's operational needs.

The commissioning process for new construction begins during design and continues through construction, occupancy and operations. It may extend to performance testing in different

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BENEFITS OF COMMISSIONING

- **Reduced construction costs**
- **Better coordination between designers, contractors and owner**
- **Fewer contractor callbacks after building turnover**
- **Energy savings**
- **Improved indoor air quality**
- **Problems are identified early and are more economical to fix**

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Functional performance testing for a chiller system includes testing the dynamic operation of the system in various modes of operation and observing the system's response. One such test ensures that chillers are not operating when free cooling is available.



seasonal operations. Areas that do not meet owner project requirements are identified and tracked until they are corrected. This process provides a flow of information and bridges the gap between building design, construction and operation.

COMMISSIONING BENEFITS

- Your commissioning process provider is there to verify that the building is designed, built and operating as you intended.
- Problems are discovered early in design or construction when they can still be fixed economically.
- Fewer change orders.
- Building is fully functional when turned over to the owner.
- Fewer contractor callbacks after construction.
- Improved energy efficiency and lower operating costs.
- Operating personnel are better trained and are provided with better operations and maintenance (O&M) documentation.
- Minimize life cycle costs. Commissioning verifies that equipment is installed and operating properly. Equipment that operates properly lasts longer, works more reliably, needs fewer repairs during its lifetime, uses less energy, and requires fewer service calls.
- Improve a building's asset value. Properly functioning buildings with reliable equipment kept in good condition are worth more than their uncommissioned counterparts.

WHEN SHOULD COMMISSIONING TAKE PLACE?

The commissioning process can begin at any phase, but when started early in the design phase, deficiencies are caught when they are significantly less expensive to fix. Full commissioning helps identify potential design problems, reduce costly change orders and keeps the project on schedule and budget.

COMMISSIONING SERVICES

- **Commissioning.** A process that confirms the building systems are installed and functioning as the owner and designer intended. Deficiencies in design, installation and operation are identified and corrected before the end of the project.
- **Retrocommissioning.** The same basic process of commissioning except that the original contractors and designers are not available or involved. This process may involve a team made up of the owner's representative, a controls contractor, a testing and balancing agent, a design engineer and the commissioning agent. The following steps are typically performed:
 1. Review of the record documents from previous construction projects and available testing and balancing reports.
 2. On-site review of the current conditions to identify undocumented changes and modifications to the original systems.
 3. Review the current owner's functional needs and requirements for the mechanical systems.
 4. Analyze the systems performance through field testing.
 5. Troubleshoot to determine causes for performance deficiencies not meeting owner's requirements and develop recommendation(s) for corrective measures.
- **Recommissioning.** Subsequent repeat commissioning of a system that was once commissioned to reset systems back to original specifications.

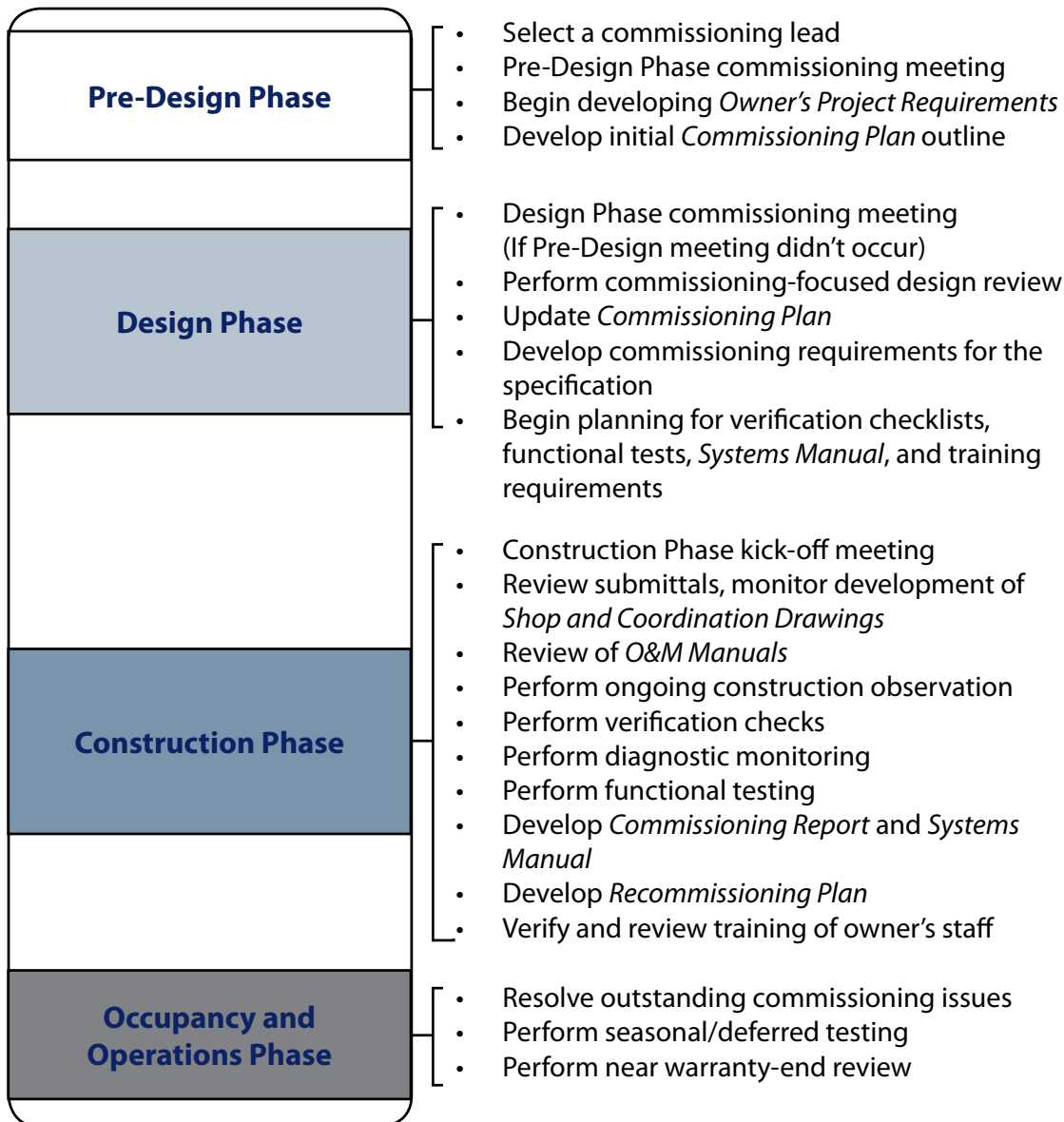
- **Continuous Commissioning.** A continuation of the commissioning process well after construction to verify systems continue to meet owner’s requirements or to adjust in response to evolving requirements.

Some are examples are:

- Prefunctional checklists: Verifies that a piece of equipment has been properly installed in preparation for start up and functional performance testing.
- Functional Performance Tests: Evaluates the function and dynamic operation of equipment and systems to assure that systems are functioning as designed and meet the owner’s project requirements.

Tasks typically performed in commissioning are shown in the Commissioning Process Overview diagram below. Commissioning also involves on-site verification of building equipment, systems and interactions between different systems before a building is turned over to the owner.

Commissioning Process Overview



Courtesy of Evan Mills, Ph.D., “Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions,” Lawrence Berkeley National Laboratory, 2009.

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LEED v3.0 CERTIFICATION CRITERIA	
PREREQUISITE Fundamental Commissioning	ADDITIONAL LEED CREDIT Enhanced Commissioning
Intent: Verify the building's energy using systems are installed, calibrated and performing to the owner's project requirements, design intent and construction documents. At a minimum, HVAC, lighting, domestic water, renewable energy systems and their associated controls must be commissioned.	Intent: Verify the entire building is designed, constructed and calibrated to operate according to the owner's project requirements, design intent and construction documents.
The following must be completed by an individual independent of the design and construction team:	The following must be completed by an individual, independent third party:
1. Designate a commissioning authority to lead commissioning process activities.	1. Designate a commissioning authority to lead commissioning process activities.
2. Review owner's project requirements and basis of design.	2. Document owner's project requirements and develop basis of design.
3. Incorporate commissioning requirements in construction documents.	3. Review owner's project requirements and basis of design.
4. Develop a commissioning plan to be followed throughout construction.	4. Develop a commissioning plan to be followed throughout design and construction.
5. Verify installation, functional performance, training and documentation.	5. Incorporate commissioning requirements in constructions documents.
6. Submit a commissioning report.	6. Conduct design review prior to 50% construction documents.
	7. Review contractor submittals of the systems being commissioned.
	8. Verify installation and functional performance of systems being commissioned.
	9. Develop a systems manual for system being commissioned.
	10. Verify owner training is complete.
	11. Submit a commissioning report.
	12. Review building operation 10 months after substantial completion.

COMMISSIONING FOR LEED CERTIFICATION
Buildings seeking to become LEED certified for new construction must undergo a fundamental commissioning process. Additional credits are considered for enhanced commissioning.

Shive-Hattery's Qualified Commissioning Process Providers (QCxP) are committed to helping you learn how to incorporate this cost-effective strategy for improving energy efficiency.



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