

Sector: Commercial

Category/Practice: Commissioning - Operations & Maintenance / Commissioning

Proposed GB practice

Description

New buildings and additions with a gross floor area of more than 15,000 sq. ft. must be “commissioned” to ensure that the building construction project and its components and systems comply with the construction documents.

The following activities/documents are required:

- Approved third party commissioning authority
- Commissioning plan to include all required forms and procedures for complete testing of equipment, systems and controls
- Owner’s project requirements
- Basis of Design
- Installation verification
- Performance verification
- Final commissioning report

Applicability

New construction: Applies to all buildings 15,000 square feet and greater

Additions: Applies to all additions 15,000 square feet and greater

Alterations: No

Intent

To verify that the project’s energy-related systems are installed, and calibrated to perform according to the owner’s project requirements, basis of design and construction documents.

Benefits and Costs

Triple Bottom Line Benefits

People:

- For building occupants/owners, improved:
 - building environment, including thermal comfort, resulting in improved worker productivity.
 - facility and systems because all parties involved in the life cycle are focused on the end users’ needs as the primary goal of the facility.
 - understanding of the purpose of the facility and the reason for its existence to serve the end user.

- o maintenance and reduced maintenance man-hours because of available documentation and training.
 - o ability to correct problems with equipment.
- For design/construction team, improved:
 - o coordination between the owner, engineer, and contractor resulting in appropriate costs, schedule, system operation and reduced change orders.
 - o Reduced call-backs, and reduced claims and litigation because thorough acceptance tests were conducted, all systems were brought up to operate per design and performance was optimized.

Economic:

- 10% savings on electrical and natural gas usage. [For 15,000 square foot commercial office building, approximately \$1,000 savings per year.]
- Reduced maintenance costs because of improved equipment life and reliability.
- Allows building owner/occupant to better quantify operating costs including identifying utility errors, problems with equipment, and peak demand monitoring.

Environment:

- Reduced energy consumption - 10% savings on electrical and natural gas usage – and associated greenhouse gas reductions.
- For 15,000 square foot commercial office building, savings are approximately:
 - o 9,000-10,000 kWh per year
 - o 400 – 500 therms per year
 - o 7-8 tons of CO₂ per year

Costs Passed to Owner

- For new construction:
 - o \$1.16/SF is general number for new construction reported by Evan Mills' 2009 report for LBNL (Lawrence Berkley National Laboratory). However, this is across many different building types and sizes. Simple buildings (offices) that have energy management systems are on the low end. More complex buildings such as data centers are more costly, but have greater potential for savings. The economy of scale lowers the per square foot cost for larger buildings. [For 15,000 square foot commercial office building, \$15,000 – 20,000]
 - o \$1.00 - \$5.00/SF is the cost range for commissioning for new construction. Some studies quote lower values. However, to achieve the level of commissioning that would suffice for "Fundamental Commissioning" as defined by LEED, would cost at least \$1.00/SF.
 - o Note: Recent, local evidence suggests that even small buildings can achieve fundamental commissioning for about \$1.00/SF, especially if they have energy management systems (Sieving, 2010).
 - o \$1.00 - \$2.00/SF - Ron Major, Resource Conservation Manager with the General Administration of Washington State

Lost Opportunity

Buildings can be commissioned after occupancy, but it is much easier to do prior to occupancy and can avoid many comfort complaints and increased energy cost.

Implementation

Availability of products and/or services

While services are available across the Front Range, the number of Northern Colorado firms that offer them are limited.

Practicality

Commissioning is a common practice done on many local buildings.

Certification Issues

Need to have qualification criteria for commissioning agents.

Enforcement Procedures

Permit application/plan review: Commissioning documentation to be submitted

Field inspection: Performed by approved third party provider

Certificate of Occupancy: Final commissioning report to be provided.

Support Materials Needs

City to develop guidelines on the commissioning process

Training Needs – Industry

Training opportunity to expand number of service providers in Northern Colorado.
Contractor training needed on how to effectively manage commissioning on a project.

Training Needs - Staff

Training on what commissioning is and isn't (e.g. compared to test and balance) and how to assess commissioning reports. Set up documentation procedures.

Background

Current practice

No current requirement.

Context

ASHRAE definition; **Commissioning** is the process of ensuring that systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the design intent.

Washington State Department of General Administration's definition; **Building Commissioning** is a systematic and documented process of ensuring that the owner's operational needs are met, building systems perform efficiently, and building operators are properly trained.

Currently, the Fort Collins building code requires that building mechanical systems go through a test and balance process. That process is different from commissioning in several ways. Test and balance contractors work on air and water systems, measuring the quantities of air flow or water flow and setting them to where they should be. They are not as concerned with whether or not the equipment is performing optimally or the integrated controls of the equipment.

When should building commissioning start? Early involvement by the commissioning agent may not carry a cost premium. It will reduce project design problems and will introduce building commissioning expectations early.

Building systems commissioning is becoming a well-accepted practice on many projects. It is a standard for City of Fort Collins and Poudre School District building projects.

Related GB practices

- Building envelope: air barrier, electrically heated buildings, installed insulation standards

Known objections

- Increased construction cost.

Sources

"Building Commissioning: A Golden Opportunity for Reducing Energy Costs and Greenhouse Gas Emissions" 2009 by Evan Mills at LBNL (summary at <http://cx.lbl.gov/2009-assessment.html>)

www.totalbuildingcommissioning.com (Dodd article)

Personal Communication with Julie Sieving of Brendle Group. She is working with Boulder on a commissioning project and has researched cost and savings potential.

Ron Major, Resource Conservation Manager with the General Administration of Washington State. www.energy.wsu.edu/Documents/whatisinforyou.ppt