About Commissioning

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WORLD ENERGY CONSUMPTION PROJECTIONS

+62% (276 QBtu by 2030)
U.S. ELECTRICITY CONSUMPTION

BUILDINGS (operations) 71%

INDUSTRY 27%
Life-cycle perspective

- Soft Costs: 7%
- Design Costs: 1%
- Financing Costs: 26%
- Construction Costs: 16%
- Post-Occupancy Operations and Maintenance Cost: 50%

Total cost of Building Ownership over 40 Years
**Commissioning:** Technical systematic process of investigating, analyzing, verifying and testing the performance of building systems.

**Continuous Commissioning:** A continuation of the commissioning process well into occupancy to verify that a project continues to meet current and evolving owner requirements.

**Recommissioning:** An application of commissioning to a project that has been previously commissioned.

**Retro-Commissioning:** The commissioning process applied to an existing facility that was not previously commissioned to meet the owner’s requirements, improve comfort and environment and to optimize energy and resource conservation.
Commissioning process

Pre-Design Phase
- Select Cx Administrator
- Cx Plan

Design Phase
- OPR Review
- BOD Review
- Design Review
- Cx Specs

Construction Phase
- Submittal Review
- Cx Plan
- Field Observe
- Verify Install
- Equip Startup

Acceptance Phase
- Functional Tests
- O&M Manual
- Training Verification
- Cx Report
- Differed Tests
- Warranty Visit
Retro-Cx Process

Discovery Phase
- Control systems
- Data loggers
- Air and water flow instruments
- Temp, Humidity and CO2 instruments
- Infrared thermography
- Energy modeling

Evaluation Phase
- Make Quick Fixes

Implementation Phase
- Prioritize by reward, cost

Documentation Phase
- Track results
- Develop Systems Manual
- Conduct Training
Certification Bodies

NEBB

PECI

BCA

ASHRAE Certified Professional Program

SMACNA

University of Wisconsin - Madison College of Engineering
Why is commissioning needed?

- More complex systems in modern buildings
- Standard construction methodology is punch list oriented vs function oriented
- Building owners are ill-prepared to operate/maintain their building systems.
Why is commissioning needed?

How the owner explained it.
How the architect understood it.
How the designer designed it.
How the drafter drew it.
How the consultant described it.

How the project was documented.
What the contractor installed.
How the owner was billed.
How it was supported.
What the owner really wanted.
Building Cx scope
2009 LBNL STUDY

- 643 buildings
  - 562 existing
  - 82 new
- 99 million square feet
- $43 million investment
- 26 states
- 33 Cx Providers
Most Frequently Implemented

- Optimize airside economizer
- Reduce equipment runtime
- Reduce / reset DSP setpoint
- Revise control sequence
- Add / optimize SAT reset
- Add VFD to pump
- Other
- Reduce lighting schedule
- Replace/repair/calibrate sensor
- Add/Optimize Condenser Water Supply Temperature Reset
- Add/Optimize Chilled Water Supply Temperature Reset
- Add/Optimize Start/Stop
- Add Variable Frequency Drive to Fan

* Data from Lawrence Berkeley National Laboratory 2009 Study
Top Savings / sq ft

- Tune/Upgrade Controls
- Add/Optimize Heating Water Supply Temperature
- Relocate/Shield temp sensor
- Add/Optimize Boiler Lockout
- Add Small A/C Unit
- Add variable Frequency Drive to Chiller
- Add/Optimize Chiller Staging
- Lower/Reset Variable Air Volume Box Flow
- Optimize Waterside Economizer

* Data from Lawrence Berkeley National Laboratory 2009 Study
Energy Savings

New Construction:
- 13% Median Energy Savings
- Less than 10 year Payback

Existing Buildings:
- 16% Median Energy Savings
- Less than 2.5 year Payback

Observations…
- More savings on larger buildings
- More savings on energy intensive buildings
- Higher Cx rigor equals more savings
- Despite the notion that savings erode over time, a five year study on 33 buildings suggests it remains constant or actually improves.

* Data from Lawrence Berkeley National Laboratory 2009 Study
Savings vary by building type

2009 Study by Lawrence Berkeley National Laboratory
Non-Energy Benefits

- Prevent premature equipment failure
- Improved user comfort
- Increased competence of staff
Cost of Commissioning

Median Costs:
- $1.16 for New Construction
- $0.30 for Existing Construction
- More economical for larger buildings

* Data from Lawrence Berkeley National Laboratory 2009 Study
Allied Study

- New Construction Projects
- 9 Buildings
- Education and Office Space
- 171,000 SQ FT
- Median Project Cost = $0.67 / sq ft
- 330 Issues Found
California survey indicated that less than 5% of new construction and .03% of existing buildings receive Cx

- How much have you wasted due to systems that operate inefficiently?
- What impact does a poorly performing building have on your productivity?
- If you could reduce your consumption and recover the cost in 5 years, would you?
Barriers To Commissioning

- Uncertainty about cost and effectiveness
- Lack of awareness
- Energy policy makers are behind the curve.
- Competition among certification programs has splintered efforts to educate and promote.
Thank you for your time!

Questions?
Condensation
Safety Issue
Wall Support?
Duct Tape
Can’t Drain