



Twenty Reasons Why Commissioning New Buildings Pays for Itself

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Energy Advisory Committee Meeting
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BUILDING PERFORMANCE RIGHT FROM THE START

About Presenters

H. Jay Enck

- Co-Founder and Chief Technical Officer of Commissioning and Green Building Solutions Inc.
- 40 years of experience in building operation, design and construction, and over 20 years investigating the causes of building enclosure problems.
- Holds the certifications of LEED Fellow + AP BD+C, CxAP, HBDP, CPMP, and BEAP.
- Currently serves as secretary of the International Board of the Building Commissioning Association, and on several technical committees including: ASTM Technical Advisory Group developing building envelope commissioning certifications; ASHRAE TC 7.9 Building Commissioning; and past chair of ASHRAE TC 7.6 Building Energy Performance.
- Vice chair of BSR/ASHRAE Standard 202P committee that developed “The Commissioning Process for Buildings and Systems.” He served on the committee to develop BECx’s founding document, NIBS Guideline 3 2006.

What is NC Commissioning

- Quality Process
 - Owners/Using Agency document project goals and objectives that design, construction, O&M, and commissioning teams follow (OPR)
 - Commissioning Design Reviews and Construction Observations and testing identify nonconformance and notify Owner and teams
 - Commissioning team provides assistance to Owner to confirm resolution



What is Existing Building Commissioning

- Quality Process:
 - Owners achieve current project goals and objectives that are followed by O&M and others
 - Phases
 - Planning and data collection
 - Investigation and selection of modifications
 - Implementation of modifications and evaluation of performance (Can include major renovations design and construction)
 - Lessons Learned
 - Ongoing Commissioning

Overview of the financial benefits of building commissioning

Review of financial benefits identified through national research on building commissioning completed by Lawrence Berkley Laboratories.

Top issues identified in projects commissioned by CxGBS

Review of twenty issues identified during both design and construction phase commissioning activities. Design phase issues were identified during commissioning design reviews and construction phase activities were identified during construction site observations and testing activities.

Financial estimates of savings for each issue identified

Estimates of financial savings through reductions in energy consumption, avoided repairs, and avoided risk to O&M staff and building occupants.



14 buildings commissioned within the past 5 years

Located in Georgia, Mississippi, and Washington DC

Residence hall - 61,000 sf

Commercial building renovation - 34,500 sf

Two museums - 93,000 sf total

State crime lab - 92,200 sf

Community college student center - 84,300 sf

University library renovation - 62,000 sf

University classroom and office building - 50,000 sf

Historic academic building renovation - 66,500 sf

Department of public safety complex - 67,800 sf

Historic performance hall - 26,460 sf

Medical center, university school of medicine - 151,570 sf

Small private health clinic - 9,800 sf

Carpet tile production plant - 675,000 sf

Issues Identified

2,000 issues identified during commissioning design reviews

750 issues identified during site observations and testing

Design review comments

Vary substantially from project to project due to design of systems.

Categorized based upon severity.

Only included comments that substantially impact

Project quality, cost, and schedule

Some issues log items listed as pervasive, not every instance counted.



Average number of instances in our sample are applied to a 50k sf sample classroom and offices building.

Current industry costs were used to determine savings of avoided or remediated issues that were identified through commissioning.

All costs in today's dollars, costs in the future will escalate.

Minimal costs included for project delay - \$100 per day.

No costs included for reduced risk, but reduced risk can pay huge dividends.

Very often, the issues we identify are straightforward to correct, but go uncorrected without commissioning involvement.

Design Phase Commissioning Issues

1 - Mechanical equipment sequences of operation	\$ 7,025 / yr
2 - Electrical distribution design	\$ 6,420
3 - Electrical panels and devices not shown in design	\$ 9,002
4 - Building enclosure design allows moisture intrusion	\$ 18,892
5 - Missing mechanical equipment in design	\$ 9,840
6 - Incorrect or missing lighting fixtures in design	\$ 5,190
7 - Electrical circuit not sized properly for load	\$ 1,360
8 - Life safety components not included in design	\$ 1,320
9 - Electrical equipment size or configuration unclear	\$ 4,920
10 - Plumbing piping or valves not shown	\$ 2,704

Construction Phase Commissioning Issues

11 - Poor access to above ceiling components	\$ 10,950
12 - Insufficient access panels provided	\$ 710
13 - Duct insulation vapor barrier missing / damaged	\$ 9,550
14 - Insufficient thickness of duct insulation	\$ 1,910
15 - Duct insulation not continuous	\$ 2,660
16 - Piping not insulated	\$ 5,730
17 - Mechanical controls issues	\$ 14,050 / yr
18 - Lighting controls tuning	\$ 640 / yr
19 - Moisture intrusion through windows	\$ 1,316
20 - Moisture intrusion through roof	\$ 8,362

Design phase commissioning savings	\$ 66,673
Construction phase commissioning savings	<u>\$ 55,878</u>
Grand total*	\$ 122,551

**Includes only one year of “per-year” energy savings items*

Cost of commissioning for the sample building	\$ 120,000
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Simple payback	0.98 yrs
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Case Study-EBCx



- Completed in 1997
- 123,053 Sq Ft
- Selected for LEED-EB
 - “Good Building”
 - “Has Many Green Features”
- Only 13 work orders recorded – no significant issues reported
- No known occupant complaints
- Energy usage monitored since completion
- Considered one of university’s “Best”

Case Study-EBCx



- Estimated HVAC System Consuming +50% More Energy Than Required
 - Negatively Pressurized
 - Make-up Air Restricted
 - VFD Fans Operating at Higher Than Necessary Static Pressure
- Overall Utility Consumption Estimated 35% to 40% More Than Required
 - Operating 24/7/365
- Savings \$120,000
- Cost of EBCx \$104,000

Case Study - EBCx



- Owner's Objectives
 - Reduce utility consumption
 - Maintain occupant satisfaction
 - Implement no-cost and low-cost improvements

Recommendations

- Low hanging fruit 46% reduction in utility usage
 - Optimize existing systems performance
 - Repair Cooling Tower and VAV controls
 - Install temperature resets on chillers and boilers
 - Change Sequences of Operation
 - Install CO₂ Sensors in Courtrooms and Change Two Position Damper Motors to Modulating + Insert Demand Based Ventilation Control Sequence
- \$ 180,000/year savings
- Cost of Retro-Cx \$156,000

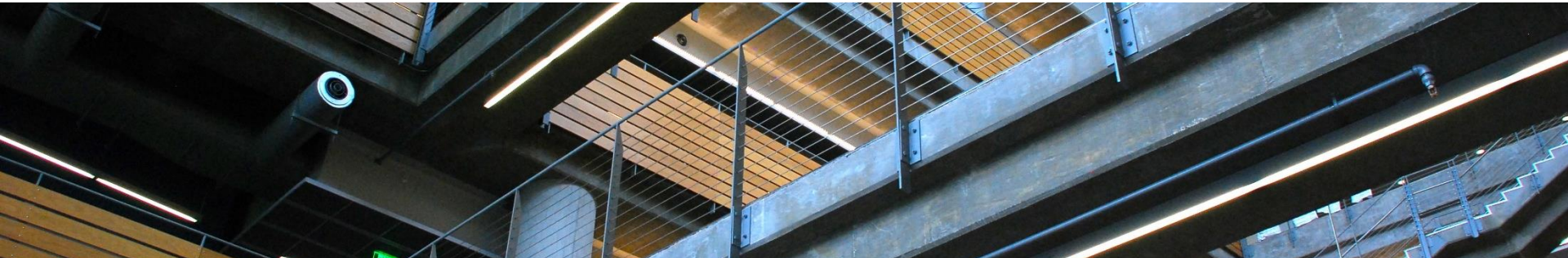
Questions?

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Building Performance Right From The Start