

Commissioning with Success



Agenda

- Why Commission your Projects
- What is Commissioning
- Phases and Benefits of Commissioning
- How to hire a Commissioning Agent
- Questions

What we heard from you...

- Facilities Dept/AE doesn't listen
- Mechanical noise in classrooms
- Hot and cold spots in rooms
 - T-stat location
 - Room use
 - 1 VAV damper serving 5 rooms

What we heard from you...

- Controls too complicated
 - Rooms not addressed properly
 - Automation is abandoned
- Light sensors/controls don't work properly
 - Lights stay on due to air movement in rooms
 - Sensors don't "see" occupants
 - Lights on/off at wrong time
- Are fresh air requirements being met?

What we heard from you...

- Poor workmanship allowed
 - 27 economizer motors burned out
 - Actuators not connected
 - Outside temp sensor mounted indoors
- Poor training
 - Change of season start up problems
 - Preventative maintenance not followed
 - O&M manuals not adequate

Study of 60 Existing Buildings:

- Over 50% suffered from control problems
- 40% had problems with HVAC equipment
- Over 30 % had HVAC sensors that were not operating properly
- 25% had energy management systems, economizers, or variable speed drives that did not run properly
- 15% were missing specified equipment

Source: PECL

No problem, let me get my saw...



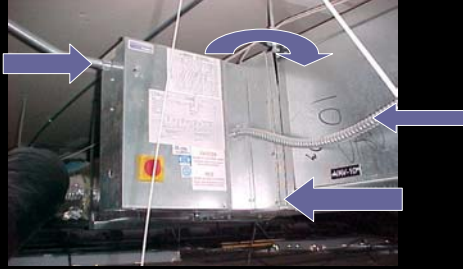
I guess we'll assign old "Slim" to service that unit.



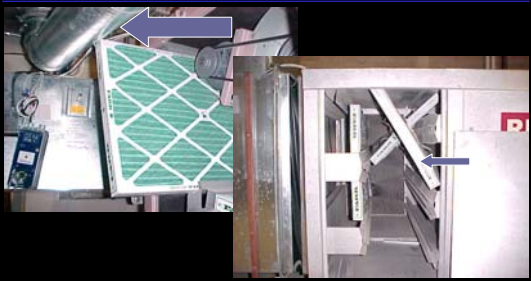
Ductwork collapsed due to improper damper sequencing



Maintenance Access Prevented



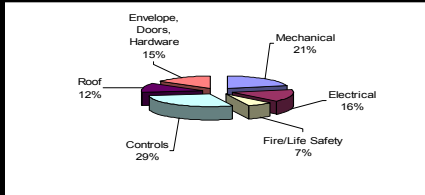
Filter Problems



Actuators Missing or Fallen Off



Typical Project; Breakdown of Contractor Related Commissioning Issues by Trade:



Source: Keithly Barber

What is Building Commissioning?

A fully documented and structured process of review, inspections and testing intended to verify that the design, installation and operation of designated building systems meet the Owner's Project Requirements.

Types of Commissioning

- New Construction Commissioning
- Existing Building – Retro Commissioning
 - Review existing conditions & design docs
 - Determine desired outcome
 - Develop repairs to achieve desired outcome
- Continuous Commissioning
 - Ongoing testing of systems
 - Used primarily in Colleges and Universities

Cx During Design Phase

- Develop Owners Project Requirements (OPR)
- Review design documents
- Develop commissioning spec's
- Attend pre bid conference

Cx During Construction Phase

- Review submittals
- Review of on-site construction
- Verification of construction start up procedures
- Functional performance testing

Cx During Post Construction

- O&M review and training
- 1 year follow-up

1. Owner's Project Requirements (Cx Agent)

- Promotes collaboration
- Project team "Buys" into OPR
- Establish guidelines for testing and verification
- Establish training requirements
- Establish energy usage & "green" criteria

1. Owner's Project Requirements (Designer)

- Understand District standards & capabilities
- Discuss system options – team buy in
- Used to develop Basis of Design
- Allocate space requirements early
- Analyze system prior to design - reduces V.E.

1. Owner's Project Requirements (Contractor)

- Used for early budgeting
- Update and understand existing District Standards, capabilities & requirements
- Settle disputes at the completion of construction

1. Owner's Project Requirements (Owner)

- Better understanding of options
- Improve Facilities & Maintenance relations
- Written record - Living Document

2. Review of Design Documents

- Verify system integration & constructability
- Look for compliance with the OPR
- Define contractor Cx requirements
- Develop functional testing requirements
- One more level of QA without bias
- "Real world" experiences
- Constructability reviews by contractor

3. Develop Commissioning Specs

- Define contractor's responsibilities
- Installation checklists and functional tests
- Engineer assists in developing spec
- Coordination among all disciplines
- Contractor input, can improve spec
- Establish training criteria

4. Attend Pre Bid Conference

- Describe Cx process
- Engineers/Cx agent should attend
- Contractor(s) gains knowledge of Cx Agent
- State owners support of Cx
- Mandatory for all bidders to attend

5. Review Submittals

- Gain familiarity with systems
- Review in parallel with design team
- One more level of QA - Unbiased
- Engineer-of-Record still responsible
- Contractor review is limited
- Review Comments/Answer Questions

6. Review On-site Construction

- Comprehensive final inspection report
- Additional unbiased trained set of eyes
- Catch problems before built repetitively
- Include Maintenance Staff
- Cx provides written report

7. Verify Start-up Procedures

- Review contractors start-up documentation
- Witness start-up procedures – spot check
- Certify systems installed completely
- Maintenance staff should participate

8. Perform Functional Testing

- Validate function & integration of systems
- Use owner's equipment for testing
- Improved system operation
- Improved IEQ (Noise & Air)
- Improved energy efficiency
- Validated sequence of operation
- Less call back and warranty issues
- Less future maintenance issues

8. Perform Functional Testing

- Agent is unbiased - Facilitate Resolutions
- Tests engineering as well as the construction
- Contractors need to be committed to process
- Involve Contractor, Owner, M&O staff

9. O&M Review and Training

- Training Agenda submitted for approval
- Verify compliance with specifications and OPR
- Cx knows what questions to ask trainer
- Assure M&O attendance
- Documentation of training
- Train teaching staff

10. 1-year Follow-up

- Perform seasonal testing
- Discuss lessons learned
- Require Contractor and A/E participation
- Opportunity for M&O staff to ask questions
- Include this scope in your contracts

Hiring a Cx Agent

- Educate yourself about Cx
 - www.peci.org
 - www.bcx.org
 - www.cacx.org
- Determine level of Cx – Scope
- Develop RFQ/P (Qualifications/Proposal)
- Interview
- Negotiate Cost

Hiring Lessons Learned

- Start Early
- Inform/Educate Team
- Get "Buy In" from Team
- Get assistance with RFQ/P
- Involve entire design team in selection

QUESTIONS?



DON'T LET THIS HAPPEN TO YOU
