Retrocommissioning Process

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Retrocommissioning Experience:

- Working in Facilities Since 1975.
- Began Developing Current Retrocommissioning Process in Late 70’s Early 80’s.
- Served On NEBB, ASHRAE and ASHE Committees Relating To Commissioning.
Retrocommissioning
what is it?

- Comparison to New Building Commissioning
- Retrocommissioning Verses Energy Audits
New Building Commissioning

- Two Basic Approaches:
  - Process Manager - Above work, management/development only
  - Technical – Team Leader
    - Process is skeleton that the flesh and blood of commissioning is held together.
    - Commissioning Authority leads team and is involved at all levels of the process.
New Building Commissioning

- Retrocommissioning Is NOT Applying New Building Process To Existing Buildings.
  - Typically No Design Team
  - Typically No Contractor
  - According To Age Of Facility, May Not Have Any Plans Or Documentation
  - Retrocommissioning Is a Process Of Optimization, Not Estimation
  - Immediate Feedback And Payback
Retrocommissioning

- Two Basic Approaches:
  - Energy Audit/+ limited testing
    - Generally advocates believe true retrocommissioning is too expensive.
  - Retrocommissioning
    - Detailed testing of all scoped systems.
When and Why:

1. Facility does not meet CFR.
   a. HVAC Issues
   b. Electrical Issues
   c. Plumbing Issues
   d. Lighting Issues
   e. Vertical Transportation Issues
   f. Envelope Issues
   g. Space Allocation Issues
   h. Specialty System Issues
   i. High Energy Consumption
   j. Change of Use/Function
Environmental Impact of Buildings*

- 65.2% of total U.S. electricity consumption ¹
- > 36% of total U.S. primary energy use ²
- 30% of total U.S. greenhouse gas emissions ³
- 136 million tons of construction and demolition waste in the U.S. (approx. 2.8 lbs/person/day) ⁴
- 12% of potable water in the U.S. ⁵
- 40% (3 billion tons annually) of raw materials use globally ⁶

* Commercial and residential (From USGBC)
Energy Consumption Reduction

- Most Facilities “Fail” In a High Energy Consumption State
- Typical Energy Consumption Reduction Varies From 10 – 30%
- Most Properly Executed Retrocommissioning Projects Payback In Less Than 2 Years.
Productivity Benefits

Greatest Impact Of Retrocommissioning is Productivity
Productivity Benefits

Improve occupant performance

- Estimated $29 – $168 billion in national productivity losses per year
  \(^1\)
- Student performance is better in daylit schools. \(^2, 3\)

Reduce absenteeism and turnover

- Providing a healthy workplace improves employee satisfaction

  \(^{•}\) From USGBC

Footnotes:

Productivity

“Some simple math shows why productivity savings routinely exceed direct energy cost returns: In a typical building, energy costs average $1.50 ($16.50 per Sq Meter) to $2.50 per square foot ($26.91 per Sq Meter), while salaries exceed $200 per square foot ($2,152 per Sq Meter). Cutting energy use in half typically saves $1 per square foot ($10.76 per Sq Meter) per year, while boosting productivity just 5 percent saves more than $10 a square foot ($107.64 per Sq Meter) per year.”

http://www.cool-companies.org/profits/
Retrocommissioning Cost

- Energy Audit approach averages $.25 per Sq Foot ($2.70 per Sq Meter)
- Retrocommissioning averages $1.60 per Sq Foot ($17.33 per Sq Meter)
- Current project:
  - 4 Military Bases
  - 758,560 square feet (70,472 Sq Meters) of Buildings
  - Largest Building 101,000 Sq Feet (9,383 Sq Meters) Cost $1.04 per Sq Foot ($11.19 per Sq Meter)
  - Smallest Building 7,161 Sq Feet (665 Sq Meters) Cost $4.41 per Sq Foot ($47.47 per Sq Meter)
When and Why:

- Anytime Facility Does Not Meet CFR
- Must Have a CFR To Evaluate a Facility’s Performance
- Fix the ‘Unfixable’
- Improved Occupant
- Productivity and Comfort
- Improved Energy Efficiency
• Poor Performance (Unhappy Tenants)
• Energy Savings / Energy Optimization
• LEED-EB
Developing A CFR
What is my facility suppose to be?

- Must Identify Critical Aspects of the Facility Environment
- Must describe the form and the function of the facility.
- Is the facility a 25, 50 or 100 year building?
  - Speaks to how much money should we invest.
- How long will you own it.
- Participants must include the facility occupants, maintenance team and owner.
CFR

WHAT WE WANTED........
CFR
WHAT WE GOT!!!!!!!
Retro-Cx Definition

- Retro-Commissioning (RCx) is the systematic process by which the Owner ensures that the building and systems are optimized to perform interactively to meet the Current Facility Requirements (CFR) as closely as possible. The amount of investment will vary drastically from building to building. There is an economic sliding scale that determines how much to invest in any given facility. This may include remedial design and construction to accomplish this goal. The RCx process is drastically different than new building commissioning. (NEBB)
Retro-Cx Definition

- What Retro-CX is **NOT**:  
  - The Commissioning Process applied to an existing building.  
  - An Energy Audit (Level I, Level II or Level III)  
  - A Facility Condition Assessment (FCA)  
  - A Systems Performance Study
Retro Commissioning Purpose

Deliver Solutions that are Meaningful to the Owner and Occupants of the Facility
Proper Solutions Will:

- Result in an improvement in the Owner’s Business Operation;
  - Employee Productivity
  - Lower Maintenance Costs
  - Risk Management
  - Lower Energy Consumption
Sliding Scale Of Economics

Commissioning

RetroCommissioning
Beyond HVAC: Understanding All Elements of the Retro-Cx process
Retro-Commissioning
Retro-Commissioning

- Existing Buildings
- Contract between RC$_X$ and Owner
- C$_X$ performs tests and documents results
- Must Include ‘Quick Fixes’ For Immediate Results
- May include:
  - Remedial Design
  - Remedial Construction
  - Commissioning of the Remedial Construction
Retro-Commissioning

- Systematic Process
- Identify AND CORRECT ALL THE PROBLEMS, Not The Symptoms!
- Solutions Are Holistic In Nature
- Maintenance Staff Training
Systems Retro-Commissioned:

- HVAC
- Controls
- Electrical
- Elevators
- Plumbing
- Roofs
- Envelope
RCx Team

- Retrocommissioning Professional
- Specialty Members
  - Experts in each disciplines
  - Must understand process
RCx Process

- NEBB Retro-Commissioning Matrix $\Phi$
RCx Process

- Professional Services Contract
- Planning Phase
- Discovery Phase
- Corrective Action Phase
**RCx Process**

- Professional Services Contract
  - Building Walk-thru
    - May not be able to walk facility, what do you do?
  - Assemble Team
  - Proposal
RCx Process

- Planning Phase
  - RCx Plan Development
  - RCx Kickoff Meeting
  - Document Procurement & Review
    - Drawings & Specifications
    - O&M Manuals
    - TAB Reports
    - Utility Bills
    - Maintenance, Repair & Replacement Orders
- Interviews
  - Management
  - Maintenance Personnel
  - Occupants
**RCx Process**

- Site Investigation Phase
  - Systems Review
  - HVAC Equipment & System Assessment
  - Building Envelope
  - Controls Systems
  - TAB
  - IAQ
  - Electrical Equipment & Systems
  - Plumbing Equipment & Systems
RCx Process

- Analysis & Synthesis
  - Problem Analysis – Identification of the issues
  - Problem Synthesis – Resolution of issues
  - Recommendations
    - Report Preparation
    - Presentation of Corrective Action Report
RCx Process

- Corrective Action Phase
  - Remedial Design
  - Construction
  - Commissioning
- Follow Up
  - Lessons Learned
  - Performance Verification
Building Performance After RCx

- First Questions Does It Meet The CFR?
- Improved Facility Function
- Improved Productivity
- Proper Expenditure of Energy
Retro-Commissioning

Questions????