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## Retro-Commission HVAC Controls

*All ECM content was independently developed and reviewed to be vendor, product and service provider-neutral.*

### Description

Perform retro-commissioning (RCx) of heating, ventilation and air conditioning (HVAC) controls to fine-tune operating conditions and improve performance. RCx, also called existing building commissioning, is a three-stage process:

- Developing a [current facilities requirements \(CFR\) standard](#).
- Testing systems to determine whether they are meeting the CFR.
- Repairing or replacing under-performing systems.

### Project Talking Points

- Prioritize low-capital, quick payback changes, the “low-hanging fruit” in a facility.
- Identify opportunities where repairing or replacing equipment would lead to substantial savings on utility bills.
- Increase reliability and building compliance, while reducing energy cost.
- Increasing the reliability of equipment reduces staff reactive maintenance and allows for better use of FTE resources. It also extends the life and efficiency of HVAC equipment.

### Triple Bottom Line Benefits

- **Cost benefits:** Energy savings results in cost savings. RCx is an inexpensive way to adjust controls with immediate payback. (See case studies for specific examples.) Retro-commissioning will also allow owners to better utilize FTE resources by reducing the amount of reactive maintenance due to system failures.
- **Environmental benefits:** Reducing energy use always has an environmental benefit (see the Benefits Calculator page). Extending the life of equipment also has recognizable environmental benefits, although these are harder to quantify.
- **Social benefits:** Increased equipment and system reliability will increase building occupant comfort. Fixing underlying building issues helps the facility maintain code compliance, ensuring all occupants are in a safe environment of care.



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## How-To

1. Determine who's on the team: health facility commissioning authority (HFCxA), building engineer, HVAC maintenance personnel and building automation system (BAS) manager.
2. Establish an ENERGY STAR® Portfolio Manager account for the health care facility. See the Roadmap performance improvement measure *Establish baseline for current energy consumption* for further details.
3. Perform a walk-through to form the CFR. Identify and record the status of all meters, sensors and other building system controls. A few critical issues to address:
  - Were your sensors and actuators calibrated when originally installed?
  - Have your sensors or actuators been calibrated since installation?
  - Have temperature complaints come from areas that ought to be comfortable?
  - Are any systems performing erratically?
  - Do any areas or equipment repeatedly have comfort or operational problems?
  - Is there a written sequence of operations describing the control logic for air handlers and zone temperature control?
  - How are your buildings currently being used and occupied? Have former health care areas been converted to administrative uses? If so, this may present an opportunity to recommission systems according to the new space type.
  - Have any codes or standards changed since the building was last commissioned?
  - Identify any manual overrides in the control system. Can anything be done to eliminate the need for the override?
  - Develop a BAS trending plan and create a standard for:
    - Points trended and type of trending (interval, change of value etc.)
    - Amount of trend history stored (at least two years is recommended)
4. Document the retro-commissioning changes made via logs and written reports/memos.



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5. Integrate regular equipment recalibration into the facility's preventive maintenance program. Schedule it in accordance with the manufacturer's recommendations.
6. To significantly expedite the RCx effort, use a fault detection and diagnostic (FDD) software that interfaces with the BAS. Such tools can query the massive amounts of data in a BAS and quickly identify problem areas. After the RCx effort is completed, operations and maintenance (O&M) staff can use the tool to continuously monitor HVAC controls and dispatch maintenance personnel to handle problems. The RCx effort should lead toward implementation of a continuous commissioning (CCx) effort. (See Section 6.1.3, Striving for Continuous Commissioning) in the ASHE commissioning books).

### **Case Studies**

- **Othello Community Hospital, Othello, WA**
  - Retro-commissioning resulted in recalibration of several sensors and controls. For example, an improperly calibrated CO<sub>2</sub> sensor was responsible for introducing 2,000 cfm of unnecessary outdoor air into the facility. An inappropriate control sequence for a short-cycle chiller resulted in continuous cycling at low loads.
- **Peace Health, St Joseph Hospital, Bellingham, WA**
  - Retro-commissioning allowed the hospital to develop an energy management plan for HVAC systems.
  - The first year generated savings of \$100,000 simply from modifying sequence of operations and scheduling.
- **St. Luke's Regional Medical Center, Meridian, ID**
  - Focused the first phase of retro-commissioning on the 10 largest air handlers, rather than retro-commissioning the entire HVAC system.
  - The retro-commissioning process identified potential for \$250,000 annual savings (5% annual energy cost).
- **University of Pittsburgh Medical Center, Pittsburgh, PA**
  - \$2 million in annual gas savings from retuning boilers.

### **Resources**





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- The American Society for Healthcare Engineering (ASHE):
  - [Reducing Operational Costs Through Energy Efficiency](#)
  - [Health Facility Commissioning Guidelines](#)
  - [Health Facility Commissioning Handbook](#)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
  - [Advanced Energy Design Guides for Hospitals](#)
  - [Guideline 14-2014 for Measurement of Energy and Demand Savings](#)
  - [Service Life and Maintenance Cost Database](#)
- California Commissioning Collaborative:
  - [California Commissioning Guide: Existing Buildings](#)
  - [Existing Building Commissioning Toolkit](#)
- LEED for Existing Buildings: Operations + Maintenance
  - Energy and Atmosphere Prerequisite 1: Energy Efficiency Best Management Practices, Planning, Documentation and Opportunity Assessment
  - Energy and Atmosphere Prerequisite 2: Minimum Energy Performance
  - Energy and Atmosphere Credit 1: Optimize Energy Efficiency Performance
  - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Investigation and Analysis
  - Energy and Atmosphere Credit 2.1: Existing Building Commissioning, Implementation
  - Energy & Atmosphere Credit 3.1: Performance Measurement—Building Automation System
  - Energy and Atmosphere Credit 5: Measurement & Verification
  - Indoor Environmental Quality Credit 1.2: Indoor Air Quality Best Management Practices, Outdoor Air Delivery Monitoring
  - Indoor Environmental Quality Credit 2.3: Occupant Comfort, Thermal Comfort Monitoring
- LEED for Healthcare: New Construction and Major Renovations
  - Energy and Atmosphere Prerequisite 1: Fundamental Commissioning of Building Energy Systems
  - Energy and Atmosphere Prerequisite 2: Minimum Energy Efficiency Performance
  - Energy & Atmosphere Credit 1: Optimize Energy Efficiency Performance
  - Energy & Atmosphere Credit 3: Enhanced Commissioning
  - Energy & Atmosphere Credit 5: Measurement and Verification
  - Indoor Environmental Quality Credit 1: Outdoor Air Delivery Monitoring





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- Indoor Environmental Quality Credit 6.2: Controllability of Systems: Thermal Comfort
- Indoor Environmental Quality Credit 7: Thermal Comfort: Design and Verification
- U.S. Department of Energy:
  - [Commissioning Existing Hospital Buildings Aids Peak Energy Performance](#)
  - [Efficient Hospital Boilers Result in Financial, Environmental, and Safety Payoffs](#)
  - [Energy Smart Hospitals: Retrofitting Existing Facilities](#)
  - [Hospitals Benefit by Improving Inefficient Chiller System](#)
  - [Hospitals Realize Fast Paybacks from Retrofits and O&M Solutions](#)
  - [Hospitals Save Energy and Money by Optimizing HVAC Performance](#)

### **Regulations, Codes and Standards, Policies**

- [ASHE](#)
- ASHRAE:
  - [Standard 62.1: Ventilation for Acceptable Indoor Air Quality](#)
  - [Standard 170: Ventilation of Health Care Facilities](#)

### **ECM Descriptors**

Energy Level: Beginner

Category List: N/A

Improvement Type: N/A

ECM Attributes:

- Optimize operations
- Repair or optimize existing systems

Department:

- Engineering/facilities management

