



Greater efficiency supports patient care.

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 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](#)
- Test systems to determine whether they are meeting the CFR plan's requirements
- Repair or replace under-performing systems

Project Talking Points

- Prioritizes low capital, quick payback changes. The “low-hanging fruit” in a facility.
- Identifies opportunities where repairing or replacing equipment would lead to substantial savings on utility bills.
- Increases reliability and building compliance, while reducing energy cost. Increasing reliability of equipment reduces staff reactive maintenance and allows for better use of FTE resources. 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.

Commissioning Connections

- The ASHE [Health Facility Commissioning Guidelines](#) and accompanying [Health Facility Commissioning Handbook](#) are good information sources for undertaking this performance improvement measure.

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 questions to ask:
 - 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 2 years is recommended)
4. Document the retro-commissioning changes made via logs and written reports/memos
5. Integrate regular equipment recalibration into the facility's preventive maintenance program, schedule it in accordance with the manufacturer's recommendations.

To significantly expedite the RCx effort, use a fault detection and diagnostic (FDD) software that interfaces with the building automation system (BAS). Such tools can query the massive amounts of data in a BAS and quickly identify problem areas. After the RCx effort is completed, 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

- Key Point
 - Retro-commissioning resulted in recalibration of several sensors and controls. For example: An improperly calibrated CO2 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

- Key Points
 - Retro-commissioning allowed the hospital to develop an energy management plan for HVAC systems.
 - First year savings of \$100,000 simply from modifying sequence of operations and scheduling.

Saint Francis Care

- Key Points
 - Occupant feedback (e.g., daily resetting temperature controls) led to an investigation of temperature setback controls.
 - Correcting the night setback controls contributed to \$9,100 energy savings per year in a 30,000 sq. ft. area.

St. Luke's Regional Medical Center

- Key Points
 - Focused the first phase of retro-commissioning on the ten largest air handlers, rather than retro-commissioning the entire HVAC system.
 - Retro-commissioning process identified potential for \$250,000 annual savings (5% annual energy cost).

Shriner's Hospital

- Key Points
 - Interviewing staff regarding which operational improvements would be most productive contributed to retro-commissioning success.
 - The data generated through retro-commissioning was used to justify requests for capital-intensive improvements.

University of Pittsburgh Medical Center

- Key Point
 - \$2 million in annual gas savings from retuning boilers.

Regulations, Codes and Standards, Policies

- American Society for Healthcare Engineering (www.ashe.org)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (www.ashrae.org)
 - Standard 62.1: [Ventilation for Acceptable Indoor Air Quality](#)
 - Standard 170: [Ventilation of Health Care Facilities](#)

Cross References: LEED

- LEED for Existing Buildings: Operations + Maintenance
 - Energy & Atmosphere Prerequisite 1: Energy Efficiency Best Management Practices—Planning, Documentation, & Opportunity Assessment
 - Energy & Atmosphere Prerequisite 2: Minimum Energy Performance
 - Energy & Atmosphere Credit 1: Optimize Energy Efficiency Performance
 - Energy & Atmosphere Credit 2.1: Existing Building Commissioning—Investigation & Analysis

- Energy & Atmosphere Credit 2.1: Existing Building Commissioning—Implementation
- Energy & Atmosphere Credit 3.1: Performance Measurement—Building Automation System
- Energy & 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 & Atmosphere Prerequisite 1: Fundamental Commissioning of Building Energy Systems
 - Energy & 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
 - Indoor Environmental Quality Credit 6.2: Controllability of Systems: Thermal Comfort
 - Indoor Environmental Quality Credit 7: Thermal Comfort: Design and Verification

Resources

- American Society for Healthcare Engineering (www.ashe.org)
 - [Reducing Operational Costs Through Energy Efficiency](#)
 - [Health Facility Commissioning Guidelines](#)
 - [Health Facility Commissioning Handbook](#)
 - [Healthcare Energy Guidebook](#)
- American Society of Heating, Refrigerating and Air-Conditioning Engineers (www.ashrae.org)
 - [Advanced Energy Design Guides for Hospitals](#)
 - [Guideline 14-2014 for Measurement of Energy and Demand Savings](#)
 - [Service Life and Maintenance Cost Database](#)
- U.S. Department of Energy, Energy Efficiency & Renewable Energy Building Technologies Program Tools:
 - [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](#)
- California Commissioning Collaborative
 - [California Commissioning Guide: Existing Buildings](#)
 - [Existing Building Commissioning Toolkit](#): Includes a savings calculation tool, energy analysis tool, and relevant guidelines

ECM Descriptors

Energy Level: Beginner

Category List: N/A

Improvement Type: N/A

ECM Attributes:

- Optimize Operations
- Repair or Optimize Existing Systems (fix what you have)

Department:

- Engineering/Facilities Management

©2023 The American Society for Health Care Engineering (ASHE) of the American Hospital Association

Disclaimer: The information provided may not apply to a reader's specific situation and is not a substitute for application of the reader's own independent judgment or the advice of a competent professional. ASHE does not make any guaranty or warranty as to the accuracy or completeness of any information contained in this document. ASHE and the authors disclaim liability for personal injury, property damage, or other damages of any kind, whether special, indirect, consequential, or compensatory, that may result directly or indirectly from use of or reliance on this document.

ALL RIGHTS RESERVED. No part of the presented material may be reproduced or transmitted in any form or by any means, electronic or mechanical, including

photocopying, recording, or by any information storage and retrieval system, without permission in writing from the publisher.