

BCA Retrocommissioning Summit Albany, NY February 16, 2006

Training and On-line Resources - Website list Presented by Aleisha Khan, Portland Energy Conservation, Inc.

Trainings (* certification offered)

Association of Energy Engineers*, www.aeecenter.org

- "Realtime Distance Learning Seminars"
- Self-paced online training
- 24/7

Building Operator Certification*, www.theBOC.info

BOC 214 - Introduction to Building Commissioning

- Over 1,450 operators trained since 1996
- Recognized by employers in 16 states as certification of value and as a benefit for operators in their organization
- A competency-based training & certification for building operators offered across the country

Pacific Energy Center, http://www.pge.com/education_training/pec

- FREE on-line classes using the Internet
- Topics include renewables, building performance/commissioning, lighting, manufacturing processes(water efficiency, HVAC process)

Univ. of Wisconsin - Madison*, <http://epdweb.engr.wisc.edu/>

- Engineering Professional Development offers 300 continuing education courses (including commissioning) for engineers, architects, contractors, consultants, managers, and other technical professionals
- Certified training for accredited commissioning process provider

Training Listings

Building Commissioning Association*, www.bcxa.org

National Environmental Balancing Bureau*, www.nebb.org
(seminars and exams)

Training Networks

The Building Commissioning Association, www.BCxA.Org

National Conference on Building Commissioning (NCBC),

<http://www.peci.org/ncbc/ncbc.htm>

Guidelines

- American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
ASHRAE Guideline 1-1996: HVAC Cx Process
www.ashrae.org

- US DOE/Federal Environmental Management Program (FEMP)
Continuous Commissioning Guide
www.eere.energy.gov/femp/operations_maintenance/commissioning_guidebook.cfm
- US DOE/Portland Energy Conservation, Inc. (PECI)
Model Commissioning Plan and Guide Commissioning Specifications
www.peci.org/library/mcpgs.htm
- New York State Energy Research and Development Authority (NYSERDA)
Guideline to the Commissioning Process for Existing Buildings, or "Retro-Commissioning"
www.nyserdera.org/programs/commissioning
- Peci/Oak Ridge National Laboratory
A Practical Guide for Commissioning Existing Buildings
<http://eber.ed.ornl.gov/commercialproducts/retrocx.htm>
- US DOE/California Energy Commission - Public Interest Energy Research (PIER) program
Strategies for Improving Persistence of Commissioning Benefits
www.cacx.org/library

Public Programs and Collaborative with RCx Information Available:

- US EPA ENERGY STAR® Buildings Program
www.energystar.gov
- Collaborative for High Performance Schools
www.chps.net
- California Commissioning Collaborative
[Database, Library, Case Studies, Owner Resources]
www.cacx.org
[Sample Documents]
www.cacx.org/resources/samples.html
- Pacific Gas & Electric (PG&E)
Energy Design Resources
www.energydesignresources.com

Technical Resources

- The Functional Testing Guide
www.peci.org/ftguide
- DDC Online
www.ddc-online.org
- Support for Trending with DDC Systems
<http://buildings.lbl.gov/hpcbs/pubs> [*Files prefixed with "E5P22"]
- *Comparative Guide to Emerging Diagnostic Tools for Large Commercial HVAC Systems* (2001)
www.cacx.org
- O&M Report Series/Best Practices Series
http://www.energystar.gov/index.cfm?c=business.bus_om_reports and
www.peci.org/library
- US DOE Best Practices (fact sheets, tip sheets, software tools)
<http://www.eere.energy.gov/industry/bestpractices>

- Data Logging and Trending Resource
PECI Best Practices Series: www.peci.org/library
HPAC Articles: www.cacx.org

Benchmarking and Utility Consumption Analysis

- ENERGY STAR - Portfolio Manager
www.energystar.gov/
- Oak Ridge National Laboratory (ORNL) Energy Utilization Index
<http://eber.ed.ornl.gov/benchmark/bldgtype.htm>

Weather and Climate Sources

- Federal Aviation Administration (FAA) Automated Surface Observation System (ASOS)
www.faa.gov/asos/map/map.htm
- Engineering Weather Data, Department of the Air Force Manual AFM-88-29
www.hnd.usace.army.mil/techinfo/UFC/UFC%203-400-02.pdf

Other

- **Cost-Effectiveness**
Evan Mills, Hannah Friedman, Tehesia Powell, Norman Bourassa, David Claridge, Tudi Haasl, Mary Ann Piette
The Cost-Effectiveness of Commercial-Buildings Commissioning - A Meta-Analysis of Energy and Non-Energy Impacts in Existing Buildings and New Construction in the United States
<http://eetd.lbl.gov/emills/PUBS/Cx-Costs-Benefits.html>
- **Quantifying Non Energy Benefits**
Dennis Pearson, Lisa A. Skumatz
Non-Energy Benefits Including Productivity, Liability, Tenant Satisfaction, and Others: What Participant Surveys Tell Us about Designing and Marketing Commercial Programs
[Published in conference proceedings for American Council for an Energy Efficient Economy (ACEEE) Summer Study on Energy Efficiency in Buildings](2002, expanded 2004)
- **Factors that Increase RCx Costs**
PECI
Establishing Commissioning Costs
www.peci.org/library
- **Envelope Issues**
A Test Procedure for Assessing Envelope Leakage in Commercial Buildings: The Issues, the Process and the Results - NCBC 2004
and
Commissioning and Envelope Leakage; Using HVAC Operating Strategies to Meet Design and Construction Challenges - ACEEE Summer Study 2004
- **Design**
Design Details, a design brief from Energy Design Resources
www.energydesignresources.com/resource/25/
- **Mechanical System Energy Efficiency**
Improving Mechanical System Energy Efficiency from Energy Design Resources
www.energydesignresources.com/resource/185/

- **VAV System Design**
Advanced Variable Air Volume System Design Guide a California PIER funded project
www.newbuildings.org/mechanical.htm

Articles

- *Rightsizing Pumping Systems*, HPAC, March 2005
- *Specifying Pumps*, HPAC, November 2003
- *Right Sizing AHUs*, HPAC, February 2005
- *Troubleshooting and Tweaking AHUs*, HPAC, December 2004
- *Fan and Pump Heat*, HPAC, August and September 2005