SUMMER/FALL 2006

THE BOC Bulletin

A Newsletter for BOC Graduates, Enrollees and their Employers

# Solving Chronic Building System Problems
## with an Effective Five Phase Retro-Commissioning Plan

*By Peter Keithly*

For many of us employed within the building engineering profession, there is nothing more frustrating than dealing with chronic building system complaints. In most cases, these problem building systems have never performed as desired and likely were never adequately commissioned prior to acceptance. And because we often don't have the luxury of dedicating the time and budget necessary to seriously diagnose and correct these problems at the root cause, we too often look for "quick-fixes" that just get us by for the time being.

The building systems that typically plague us the most are those related to heating, ventilation and air conditioning (HVAC). With the advent of modern direct digital control (DDC) systems, and the nearly constant addition of new features, the complexity of your typical HVAC system has increased dramatically over the past twenty years. Add to this the unfortunate fact that many designers, contractors and building operators have not kept pace with the world of technical HVAC advances, and you have a guaranteed recipe for disaster.

For those Building Engineers who end up with the responsibility for operating and maintaining one of these "disaster" building systems, I can offer my sincerest sympathies, and I can also offer a reasonable solution. That solution is called a retro-commissioning (RCx) plan, and it can be applied to any chronically failing building system.

### *Phase I - Planning*

The first phase of any retro-commissioning project needs to be the development of an appropriate and achievable plan. The success of any project is most often dependent on the selection of your project team members and a clear definition of the project objectives. You need to have people familiar with (and supportive of) the retro-commissioning process on your team and you need to know where it is you are going so that you will know when you get there. So start your plan and organize that first meeting!

**Major Planning Phase Elements:**

- Designate the Project Leader (in-house or consultant)
- Designate other desired project team members
- Define the desired scope, objectives and deliverables (work products)
- Develop the RCx Plan with the following components:
    1. Brief Building and Systems Description
    2. Project Scope and Objectives
    3. Team Roles and Responsibilities
    4. Work & Communication Protocols
    5. Documentation Requirements
    6. Schedule
    7. Functional Testing Plan Outlines
    8. List of Expected Deliverables
- Organize and conduct a project "Kick-Off Meeting" with the following purposes:
    1. To discuss and understand the Retro-Commissioning Plan
    2. To impart the owner's objectives for the project
    3. To clarify the key roles and responsibilities of commissioning team members
    4. To establish the desired communication and general work protocols
    5. To identify and agree to a schedule

*Continued on page 2. See* ***Retro-Commissioning.***

***ARTICLES***



### *Reminder:* 2006 BOC Grads

*By March 2007, you will need Continuing Ed credit to renew your Level certification. Level I renewal requires 5 hours annually and Level II requires 10 hours. See page 9 in this newsletter for details.*

***Retro-Commissioning*** *(Continued from page 1).*

*Keithly uses a hand-held digital infrared thermometer to measure discharge air temperature to check for appropriate ranges.*

## *Phase II - System Investigation*

During this phase of the project, the initial goal is to clearly identify all the components of the system you are retro-commissioning and to clearly define the system design intent. By "design intent" we mean: "how was this system intended to work as defined by the original designer?" Operational sequence narratives are often provided as part of the original design documents and seasoned building engineers with experience on similar systems can also provide invaluable assistance with determining how systems were intended to operate. In some cases it will be determined that the original design intent was never appropriate or is no longer appropriate for the current use and/or configuration of the building. In any case, it is important to develop an operational design intent that is endorsed by the project team regardless of whether it is based on the original or revised design intent. This design intent document becomes the standard for all the repairs and improvements that will follow.

In addition to defining the desired system design intent, the system investigation phase must also include a general inspection of the physical condition of each system component and some functional testing to determine where operational issues may exist. Interviews with building occupants and the building maintenance staff can also yield valuable clues regarding chronic issues and previously attempted remedies.

The final step of this phase is to compile a list of recommended repairs and improvements based on the "evidence" you have thus far collected. In most cases it is prudent to prioritize these recommendations, and it may also be helpful to assign some range of anticipated cost impact to each item.

**Major Investigative Phase Elements:**

- Gather and review all pertinent building documentation.
- Define current desired design intent.
- Perform the O&M Physical Condition Assessment.
- Perform limited functional testing to identify performance issues.
- Identify and document critical issues and desired improvements.
- Prioritize list of repairs and improvements.
- Establish budget estimates.
- Review list of proposed repairs and improvements with the RCx team.
- Decide which repairs and improvements to implement.

*Note: If no repairs or improvements are desired, the next phase is skipped and you can go directly to* ***Phase IV - Comprehensive Functional Testing****.*

## *Phase III - Repairs and Improvements*

During this phase the agreed upon repairs and improvements are completed. In some cases, in-house staff will complete these repairs and improvements. In some cases the work is contracted out. In all cases, when the work is complete, the RCx team is notified and at least one team member must be responsible for verifying the work is complete and the systems are ready to be functionally tested.

**Repairs and Improvements Phase Elements**

- Designate repairs and improvements as either in-house or contracted.
- (In-house) Assign responsible persons for work and establish completion schedules.
- (Contracted) Establish contracts and completion schedules.
- Verify completion of all work and operational condition of all system components.

## *Phase IV - Comprehensive Functional Testing*

Once all repairs and improvements are verified as complete and functional, it then becomes time to complete a fairly comprehensive functional testing of all system components. The RCx team must develop and conduct documented functional testing routines designed to verify the correct operation of the system through all potential modes of operation. In the case of the HVAC system, this might include tests appropriate to verify the warm-up mode, economizer mode, mechanical cooling mode, mechanical heating mode, etc. All issues identified during these tests are documented and tracked until resolved.

**Comprehensive Functional Testing Phase Elements**

- Develop final versions of testing procedures and expected performance criteria
- Complete and document functional tests
- Document and report on all issues discovered during the FT process

## *Phase V - Final Issues Resolution*

When the functional testing phase is complete, a number of issues will undoubtedly remain unresolved. It is critical that the RCx team meet at this time and reach consensus on who will be responsible for shepherding these issues to resolution. Additional meetings can be scheduled to review progress and at some point the RCx team will hopefully reach an agreement that the process is complete and the system is now functioning reasonably in compliance with the desired design intent.

*You can complete your reading of this article on the Web at*

**http://www.theboc.info/**

## About the Author

*Peter Keithly has over 18 years of experience as a Building Operating Engineer. He is currently a Principal in the Seattle based firm of Keithly Barber Associates Inc. and has been a practicing Commissioning Authority for over nine years. His company has now completed formal building commissioning procedures on over two hundred building projects. Pete was a founding board member of the Building Commissioning Association and he is also a LEED Accredited Professional. You can email Pete at pete@keithlybarber.com.*

# Adding Value to Energy Management by Benchmarking

*By Derek Greenaur*

As the person responsible for the operation of your facility, you know first-hand the role energy consumption plays in its overall performance. Reducing energy costs while improving building performance is a key responsibility for every facility manager and their engineering and maintenance team.

Improving the energy performance in your facility gives you a chance to contribute to the bottom line and ultimately, increase your value within the company. By suggesting cost-effective solutions that improve performance while lowering energy bills you provide a comfortable environment while minimizing costs. Increasing energy efficiency also allows savings to be redeployed – perhaps to a new initiative supporting the company's mission or to update your facility's equipment.

***If you can't measure it, you can't manage it.***

This article will provide you with an overview of free tools and resources through EPA's **ENERGY STAR®** Buildings Program, many of which the BOC program reviews in the Level I class on Energy Conservation, and will help you get started managing energy costs in your organization.

"If you can't measure it, you can't manage it". This adage is gospel in the building community. It is especially relevant to the energy performance of a building. In order to effectively manage your building's energy use, you first need to know ***HOW*** your building is operating and currently using energy.

Knowing your actual energy consumption will enable you to evaluate current maintenance procedures, ensure proper equipment installation, or implement other practices that can save significant amounts of energy. Without this information to serve as a guide, perceived improvements could be rendered ineffective and a waste of capital.

There are many ways to measure energy use within an organization. Energy performance can be measured and expressed in terms that add priority to energy management activities for your organization. Examples include:

- EPA's Energy Performance Rating System
- Energy Utilization Index (Btu/square foot)
- Total energy cost/square foot

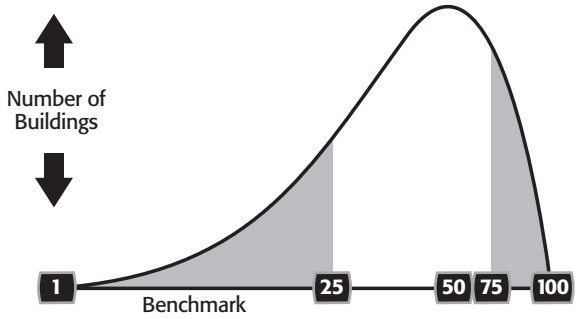
An effective energy management program is not a one-time energy improvement project but rather a continuous process. It allows you to incorporate a set of proven procedures into your business practices that can lead to continuous energy cost reductions while minimizing the time spent on identifying and achieving those reductions.

## *Using ENERGY STAR® To Measure and Reward Building Performance*

**ENERGY STAR®** offers free tools and resources to help facilities managers and engineering staff measure and evaluate building energy performance. **ENERGY STAR® Portfolio Manager** is a nationally recognized benchmarking tool for measuring energy performance. The figure below illustrates how the rating system provides an objective, standardized metric for measuring the efficiency of a building or building portfolio on a scale of 1 to 100. The distribution of performance is a modified bell curve.

**1 to 100 Benchmark Scale**

*The benchmark overlays a 1 to 100 scale on the energy performance curve which gives relative meaning to energy use.*




*Buildings scoring below 25 are poor performers and typically cost more to operate. Buildings scoring 75 and above are the best performers and have lower energy costs.*

Portfolio Manager provides a rating for your facility based on a 1-100 scale, with 1 representing the poorest performing buildings and 100 representing the best performing buildings. The rating is an indication of how your facility uses energy compared with similar buildings from across the United States. The resulting score can also be used to identify the opportunity to improve energy performance in a building. For example, a building with a rating of 40 is only performing better than 40 percent of similar buildings; therefore, 60 percent are doing better. Buildings that score a 75 or greater on the 1-100 energy performance rating scale and meet current indoor environment standards are eligible for individual recognition through ENERGY STAR.

## *Success Stories*

**ENERGY STAR's** National Energy Performance Rating System has helped a variety of organizations streamline their business systems while using energy performance trends to make budget and investment decisions regarding energy-related projects. Following are just a few examples of how organizations ranging from school districts to cancer centers have successfully used Portfolio Manager to improve their bottom line.

*Continued on page 4. See **Benchmarking.***

## *BOC & ENERGY STAR®*

BOC joined the ENERGY STAR Partner Program in 2004 to bring the many practical free tools and resources it offers to BOC students, graduates, and their facilities. BOC enrollees use the benchmarking tool in their homework assignment for Level I. The benchmark generates an energy use index (EUI in kBtu/sf/yr) for the building which can be used as a baseline for measuring performance changes over time.

Starting this Fall, BOC graduates will have the opportunity to earn continuing education hours for benchmarking their facilities with **ENERGY STAR®** Portfolio Manager and monitoring performance changes on an annual basis. For more information, check out the BOC web site at ***www.theboc.info.***

***Benchmarking*** *(Continued from page 3).*

**Newark Unified School District** (in Alameda County, California) used Portfolio Manager to benchmark 15 district buildings to prioritize investment-grade energy audits. All 15 sites were ranked according to energy performance rating and since some of their buildings were constructed at the same time and from similar plans, district managers were able to compare occupant behavior between sites. Given that behavioral changes usually require less capital investment and planning than efficiency retrofits, they were able to improve efficiency by raising staff awareness of energy use and its impact on the district's budget.

**Hilton Hotels Corporation**, which owns and operates more than 530 properties totaling nearly 160 million square feet, became an ENERGY STAR partner in 1996, and implements an energy management plan for each of its hotels based on the ENERGY STAR strategy. Quarterly benchmarking results are sent to general managers (management staff) and energy audits are conducted on the hotels performing the poorest. Benchmarking reports describe the hotels' performance based on a variety of metrics, including energy cost per square foot, energy cost per room and energy cost as a percent of revenue. Each property has an energy management team responsible for meeting energy-efficiency goals using best practices, new technologies and corporate purchasing guidelines. The company's ultimate goal is to reduce operating costs by decreasing energy use by at least 5 percent and increasing their overall Portfolio Manager benchmarking score by 5 percent.

**The City of Hope National Medical Center** (COHNMC) is a comprehensive cancer center that is saving $490,000 annually on electric bills from increased energy performance. To achieve this success, COHNMC implemented a tiered energy management program incorporating ENERGY STAR's integrated approach to facility upgrades, investment in energy efficient equipment and careful management of how and when energy is needed. Their significant energy savings were a direct result of investments in a campus-wide lighting retrofit, a new central plant with high-efficiency centrifugal chillers, variable-speed drives for fan and pump motors and in a thermal energy storage system. An energy management system properly monitors and controls energy use and their energy management team runs campus-wide education and awareness campaigns to share strategies and educate their local medical community.

Adopting the ENERGY STAR guidelines for energy management distinguishes your organization as an environmental leader while improving your energy and financial performance. For the Portfolio Manager Tour, visit ***www.energystar.gov/istar/pmpam/help/Portfolio%20Manager%20Tour/Portfolio_Manager_Tour.htm*** and start saving today!

Reducing energy use and increasing energy performance provides "the most bang for your buck," often offering high returns on investment. ENERGY STAR, through its Guidelines for Energy Management offers a proven process for minimizing energy waste and maximizing building operations in your facility.

## *Prioritizing Efficiency (Improvement) Projects*

Benchmarking can serve as an important first step towards successful energy management. After establishing a building's energy performance rating, energy managers can prioritize efficiency improvements by examining operational needs and existing equipment to determine where improvements can be made.

In order to provide a uniform system of measuring the energy performance of facilities from across the country, the U.S. Environmental Protection Agency (EPA) developed the Energy Performance Rating System or Portfolio Manager (as it has become commonly known). EPA's Energy Performance Rating System provides businesses with a method to compare their energy performance against that of other businesses in the same sector.

To calculate this score, Portfolio Manager requires only 12 months of a facility's utility data and the size of the facility (measured in square feet) to develop an Energy Utilization Index (EUI). The result is a metric of energy use expressed in thousands of British Thermal Units per square foot (kBtu/sq.ft.) of the facility.

Once an EUI is developed, Portfolio Manager then normalizes the data for variables such as climate, occupancy, operating hours and size so that a 10,000 square foot office building in Minneapolis Minnesota can be compared with a 15,000 square foot office building in Phoenix, Arizona.

*You can complete your reading of this article on the Web at*

**http://www.theboc.info/**

### About the Author

*Derek Greenauer is an account manager for D&R International, a consulting firm working on behalf of the U.S. Environmental Protection Agency on ENERGY STAR commercial buildings. Mr. Greenauer has been working with investor-owned and municipal utilities alike to design and implement cost-effective energy efficiency programs targeted at the commercial building market. Mr. Greenauer also monitors policy developments at the state level to better anticipate the direction of energy efficiency efforts and develop strategies for ENERGY STAR to proactively use to engage these states.*

# BOC Grads Making A Difference

*Earl Meldahl*

**Earl Meldahl, Operations Manager for the City of Bellevue, WA,** has been working since November of 2004 on the remodeling of and addition to the former Qwest Communications building, which is now the Bellevue City Hall facility, a project which was completed early this spring. An additional 40,000 square feet of new space was added to the existing 337,136 square feet, and a new parking garage was constructed to complement the existing one, both totaling 270,000 square feet.

The plan was to surpass efficiency requirements of the current Washington State Energy Code (WSEC) by 10% and, in doing so, qualify for funding from the local utility, Puget Sound Energy (PSE). Funding was also sought for a CO exhaust fans sensor control system for the new parking garage, anticipated to save approximately 200,000 kWh/yr in energy usage.

Energy-saving strategies employed to attain the 10% reduction in usage include:

- High-efficiency boilers and chillers
- VFD's on hot water pumps, cooling tower fans, supply and return fans
- Under-floor HVAC systems
- Low e glass
- Increased wall insulation
- Exhaust shaft heat recovery
- Efficient interior and exterior lighting

Particularly exciting is the under-floor HVAC system for the building's concourse. This is a terrazzo floored area 300 feet long, 30 feet wide and 38 feet high, heated and cooled with under-floor coils and an integrated natural ventilation & mechanical shade system controlled through the building's automation system.

While they have not been in the building long enough to assess actual savings, based on energy modeling, annual savings for electricity and natural gas should be 444,000 kWh and 20,364 therms, respectively. This represents a decrease of over $60,000 per year for energy usage for the City of Bellevue.

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The external lighting at **Todd Pacific Shipyard** in Seattle, WA was due for an overhaul since the fixtures were near the end of their expected service life. **Facilities Manager Jim Anderson** took advantage of utility provider Seattle City Light's Energy Smart Services Program for newer, energy-efficient installations, offering incentive payments based on annual kWh savings calculations. Special bonus payments were also associated with sign-up and completion dates, giving an additional 20% incentive.

About 95% of the outside lighting was retrofitted, with 416 fixtures and 210 lighting occupancy sensor control units installed. Energy usage at the shipyard is quite large, but is dynamic year-to-year due to vessel activity and types of work being done. Even so, saving from the installation of energy efficient lighting is projected to be roughly 2.3% of the total electric bill. Anderson estimates a payback of 3.5 years for the lighting fixtures and 5.7 years for the sensors. Not factored into the savings though is the cost of labor. Using a third party for the retrofit freed up Todd's maintenance personnel to be deployed to more critical shipyard asset repair needs. It was a particularly busy time at the shipyard and Todd personnel were already at capacity workload.

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*Zebbs Pascua*

At **Occidental College in Los Angeles, Utilities Supervisor Zebbs Pascua** replaced an old 30 hp dual speed motor with a new, premium efficient motor with VFD. The building runs 24/7 but, like most buildings, has high and low energy-usage periods. The replacement cost close to $15,000, but by Mr. Pascua's calculations, new annual power costs will be just under $6,500 compared to over $19,500 annually with the old system. The payback time of just over thirteen months makes it much easier to justify the economics of a continuous upgrading plan for the college's buildings.

This motor swap out is part of ongoing energy efficiency efforts on the campus. Pascua expects to make the same type of replacement for two motors in another building and anticipates the same, if not better, savings.

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Using utility incentives was also a factor in projects at three of the campuses of the **Providence Everett Medical Center in Everett, WA. Supervisor of Facilities Jim Trader** found that Snohomish County PUD was offering substantial incentives for implementation of energy-efficient products. Two projects involved installation of VSD's (variable speed drives) and one was a lighting project.

At the Pacific Campus of the facility, bypass valves were eliminated on a water pump and a heating loop VSD was installed to control water pressure. Project costs ran at over $10,200, utility incentives paid for over half of this at $5,553, and annual savings are projected to be $2,748, giving the project a payback of 1.7 years.

The lighting project at the Mill Creek Campus had two components, with a new electronic ballast installed and a lamp change from F40T12 to F32T8. The project cost just under $24,000, with utility incentives covering a bit less than half for net costs of $13,335. With annual energy cost savings estimate to be $5,407, payback for this project is only 2.5 years.

The Colby Campus was another VSD installation candidate. Again, bypass valves were removed and another htg loop VSD was installed. Project costs were just under $10,800, with utility incentive at $7,556. Net cost of the installation was $3,238. With annual savings estimated to be $4,466, payback is an impressive nine months.

# Congratulations!

## *BOC Level I & II Students Certified in California, Oregon and Washington January – June 2006*

### *Level I Certified Students*

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**Anderson, Deborah,** South Kitsap School District
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**Anson, Scott,** Children's Hospital of Central CA
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**Berry, Ken,** Fife School District
**Bertram, Martin,** Tacoma Power
**Benjamin, Hugh,** Viejas Enterprises
**Bloom, Larry,** Surf and Sand Resort
**Boesch, Kolumban,** Palo Alto Unified School District
**Bonilla, Luis,** Fremont Marriott Hotel
**Bowland, Dave,** Richland School District
**Calestini, Eileen,** Lawrence Livermore National Lab
**Calhoun, Micheal,** Serrano Hotel (Kimpton Group)
**Calica, Romulo,** CSU Channel Islands
**Carroll, John,** University of San Diego
**Casey, Dan,** Oakdale Joint Unified School Dist
**Cervantes, Carlos,** Arnel Commercial Properties
**Churchill, Lynn,** Chiron Corp
**Costantinou, Michael**, Apex Mechanical Systems
**Cunningham, Patrick,** County of Marin, DPW
**DeJong, Randy,** The Irvine Company
**Do, Tristan,** Raytheon
**Doan, Chuck,** Raytheon
**Donlin, Jeff,** CSU Channel Islands
**Dunham, DuWayne,** Clark Public Utilities
**Elizalde, Paul,** Kaiser Permanente
**Fawver, Douglas,** State of WA, Department of Ecology
**Fleming, Collin,** Sheraton Portland Airport Hotel
**Francis, James,** DCF, Dept of GA
**Friedrichsen, Larry,** Kiona/Benton City School Dist. #52
**Fuller, Daniel,** City of Poulsbo
**Garcia, Jose,** CSULA Facilities Services
**Goin, John,** WA State Employees Credit Union
**Goldsmith, Jeff,** City of Hope National Medical Ctr
**Goss, Joe,** Cond Based Maint/Boeing Shared Svcs
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**Guevara, Juan,** Arnel Commercial Properties-Retail
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**Hall, David,** Imation
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**Lofton, Eric,** Sage Software
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**MacKay, Donald,** Providence Hood River Memorial Hosp
**Malloy, Mike,** City of Hope National Medical Cente
**McCammon, John,** City of Long Beach, Fac Maint Div
**McCann, James,** Palomar Community College
**McGarry, Vince,** Oxnard School District
**Melby, Galen,** Dept of GA/Buildings & Grounds
**Melendrez, Antonio,** Contra Costa Community School Distr
**Mendoza, Christine,** Providence Hood River Memorial Hosp
**Mesa, Salvador,** Palo Alto Unified School District
**Miller, William,** City of Milwaukie
**Mingo, Noel,** Corvallis School District 509J
**Morales, Beverlee,** Lawrence Livermore National Lab
**Morales, Erwin,** Cedars Sinai Medical Center
**Moncada, Daniel,** Genie Industries
**Moore, Christopher,** Marriott
**Nansel, Roy,** Pierce County
**Newport, Mark,** Pierce County Utils, Env Svcs Div
**Oregon, Ruben,** J David Gladstone Institutes
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**Reinhold, Marta,** North Thurston Public Schools #3
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**Sanchez, Jesse,** The Irvine Company
**Sandner, Robert,** Cushman & Wakefield
**Saxon, Floyd,** Continental Rehabilitation Hospital
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**Short, Bill,** Kaiser Permanente
**Sickles, Michael,** Providence Centralia Hospital
**Silveira, Robert,** Providence Centralia Hospital
**Smith, Aaron,** Vancouver School District
**Smith, Donald,** The Irvine Company
**Smith, Ken,** Kennewick School District
**Stricklin, Harry,** City of Long Beach, Fac Maint Div
**Stockton, Chad,** Port of Bremerton
**Story, Stephen,** Bethel School District
**Schwartz, Leslie,** Battell PNNL
**Tang, Long,** Palo Alto Unified School District
**Thompson, Ty,** City of Baldwin Park
**Thomson, Matt,** Gunderson Dettmer, LLP
**Threadgill, Mike,** Cymer, Inc.
**Tice, Rosemary,** Northrop Grumman Fac Engineering
**Tice, Art,** Northrop Grumman Fac Plant Svcs
**Torres, Michael,** Golden Gate University
**Vanoni, Glenn,** North Ranch Country Club
**Vassalle, Anthony,** SMCCD - Skyline College
**Vazquez, Jorge,** The Irvine Company

**Vose, Robert,** Palos Verdes Library District
**Wallake, Joe,** San Diego Rescue Mission
**Waters, Kyle,** Hollywood Entertainment
**Wattenberg, Walter,** Dept of GA/Div Capitol Facilities
**Westbrook, David,** Sanyo North America Corporation
**Wiges, Gene,** SMS Technologies
**Williams, George,** City of Gig Harbor
**Wilson, Craig,** County of Humboldt - Building Maint
**Wilson, Luke,** Boston Scientific
**Wilson, Thomas,** Pierce County Library System
**Witzenburg, Brittin,** Olympia School District
**Woods, Stevie,** Delphi Connection Systems
**Wright Jr., Lamarr,** Port of Bremerton
**Yee, Alan,** VA Palo Alto Health Care System
**Yount, Dan,** Intel Corporation
**Zertuche, Mario,** Kaiser Permanente

### *Level II Certified Students – January - June 2006*

**Alboucq, Terry,** Providence St. Peter Hospital
**Chung, Tommy,** Safeco Insurance Co., Safeco Plaza
**Dryden, Ken,** Quidel Corporation
**Gorokhovskiy, Peter,** Safeco Insurance Co., Safeco Plaza
**Hansen, Chris,** Yelm Community Schools No. 2
**Helmick, Paul,** Private Consultant
**Hubbeling, James,** Puget Sound Naval Shipyard
**Hults, Eric,** City of Beaverton
**Hurdle, Donald,** Mt. San Antonio College
**Jensen, Richard,** State of WA GA/DCF
**Kincaid, Brian,** City of Beaverton
**Knight, Dennis,** Capital Medical Center
**Lane, John,** World Vision
**Lockbaum, Tim,** Pierce County Facilities Maint
**Lozier, Michael,** Port of Bremerton
**Lupo, Rod,** Providence St. Peter Hospital
**Monroe, Jeff,** Jefferson County
**Montonye, David,** GA State of WA
**O'Dell, Thomas,** Tacoma-Pierce County Health Dept
**Olson, Mark,** WA State Dept of Ecology
**Parker, Ray,** ABM Engineering
**Quinteros, Rene,** Medarex, Inc.
**Rodgers, Teresa,** ID Biomedical Corp of WA DBA Glaxo
**Saclolo, Dante,** Hyperion Waste Wtr Treat Pl/CityLA
**Swanson, Carolyn,** City of Redmond
**Swindle Jr., Clarence,** Tacoma-Pierce Cty Health Dept
**Washington, David,** Naval Station Kitsap

# Five Quick Tips
## for Optimum AC Operational Efficiency

*HVAC consultant and professor at Wenatchee Valley College in Washington, BOC Instructor Greg Jourdan has the following simple, but crucial, tips to offer to increase efficiency and reduce costs for your air conditioning systems:*

**TIP #1** Keep all heat exchanger coil surfaces clean and free of lint and debris.

**TIP #2** Change air filters only as needed or as recommended by your supplier.

**TIP #3** Check to be sure that Outside Air Dampers are closed to a minimum position during peak cooling periods.

**TIP #4** Clean and maintain cooling towers as needed, including water treatment.

**TIP #5** Unplug and remove all space heaters under people's desks or work areas.

*(Also, space heaters typically draw 1,500 watts per hour of use. Consider replacing with 130 watt radiant leg warmers for occupants who need the extra warmth. – Publisher's note)*

# ANNOUNCEMENTS

## Employment Opportunities

The Washington and California web sites now have a new Employment Opportunities feature, with job postings for BOC grads. Check for updated listings at **www.theboc.info/wa/jobs_wa.html** or **www.theboc.info/ca/jobs_ca.html.**

## BOC honored with Power Player Award

BOC was honored at a Seattle Seahawks home football game late last year with a 2005 Power Player Award from Puget Sound Energy. The award, sponsored in conjunction with Seattle City Light and the Seahawks, recognizes endeavors which further energy conservation and environmental stewardship in the Puget Sound region. BOC was nominated by Puget Sound Energy for training and certifying over 3,000 building operators in efficient operation and maintenance practices that save each facility an average of $12,000 and 172,000 kWh annually.

## IFMA Grants the BOC Program Approved Provider Status

The International Facility Management Association (IFMA) granted the BOC program "Approved Provider" status in June 2006. The designation means that NEEC's Building Operator Certification (BOC) Level I program is approved training for Area 2 of IFMA's Facility Management Professional (FMP) credential. Area 2's topic focus is Managing the Facility. BOC graduates interested in pursuing the FMP credential can satisfy FMP Area 2 requirements with their coursework.

"We are delighted to partner with IFMA to provide quality education to facilities professionals," said Stan Price, NEEC executive director. Over 500 IFMA member companies send facilities personnel to BOC training for professional development. BOC classes cover the O&M competency area, with a strong focus on energy efficient operational strategies for controlling utility costs. Training is offered in locations throughout the U.S., giving FMP candidates the opportunity to attend training close to home.

## BOC Goes to North Carolina

NEEC and the North Carolina Community College System entered an agreement in July 2006 to offer BOC training in North Carolina. The program will be administered by the college system with sponsorship from the North Carolina State Energy Office. The first course series will be offered in Asheville this Fall. With the addition of North Carolina, BOC training is now available in 19 states nationally.

## FYI

For an excellent review of the Energy Tax Incentives in EPAct, check out this online article from Energy and Power Management:
**www.energyandpowermanagement.com/CDA/Archives/fb828920ea62c010VgnVCM100000f932a8c0**

# Continuing Education Opportunities
## For Certification Renewal Credit

*Below you will find listings of various organizations that offer continuing education courses that are applicable to annual BOC certification renewal. Check out the Education and Events Calendars at these sites or call for information regarding upcoming training opportunities.*

**BetterBricks Professional Training Program**
***Website:*** www.BetterBricks.com

**BOMI – Building Owners & Managers Institute**
***Class Information:*** www.bomi-edu.org

**BOMA – Greater Los Angeles**
***Class Information:*** www.bomagla.org

**CASBO – California Association of School Business Officials**
***Class Information:*** www.casbo.org

**California Society for Healthcare Engineering**
***Class Information:*** www.cshe.org

**California Utility Collaboration – Energy Efficiency Center**
***Class Information:*** www.energyefficiencycenter.com/index.html

*Contact specific utilities through the "Contact Us" links on this website. Sponsored by PG&E, San Diego Gas & Electric, Edison, and the Gas Company.*

**Energy Services**
***Class Information:*** www.energyexperts.org/calendar/

**FEMP – Federal Energy Management Program Workshops & Conferences**
***Website:*** www.eere.energy.gov/sro/
For WA, OR & CA, you can also try www.eere.energy.gov/regions/western/events.html

**FSTC – Food Service Technology Center**
***Website:*** www.fishnick.com/education/seminars/list.php

**HVACR Education: On-Line Learning for the HVACR Industry**
***Website:*** www.hvacreducation.net/

**IFMA International Facility Management Association**
***Website:*** www.ifma.org

The International Facilities Management Association has several regional chapters, all of which can be accessed from the association's main web site address above. Be sure to check out the site for the variety of learning options available both online and via seminar.

**NEEI - Northwest Energy Education Institute**
***Website:*** www.nweei.org
***Contact:*** Erik Westerholm at 541-463-3154 or
***E-mail:*** westerholme@lanecc.edu

**Northwest Lighting Design Lab & Portland Daylighting Lab**
***Class Information:*** www.lightingdesignlab.com/calendar/index.html
***Registration Questions:*** 206-325-9711 x0 or 800-354-3864 x0

**Sacramento Municipal Utility District**
***Class Information:*** www.smud.com/education/index.html

**University of Washington Engineering Professional Programs**
***Phone:*** 866-791-1275
***E-mail:*** west@engr.washington.edu
***Website:*** www.engr.washington.edu/epp

**WAMOA – Washington Association of Maintenance & Operations Administrators**
***Website:*** www.wamoa.org

**Washington State Society for Health Care Engineering**
***Website:*** www.wsshe.org

**WSU Energy Program – Continuing Education Calendar**
***Website:*** www.energyideas.org

# BOC Certification Renewal

To retain BOC certification, graduates must accumulate continuing education (CE) hours each year, following a full calendar year after their graduation. Level I certification renewal requires 5 CE hours each year, and Level II renewal requires 10 CE hours each year. The hours may be earned in any of the following ways:

| BOC Certification Renewal Activities | CE Hours Equivalency |
|---|---|
| • Continued employment in building operations | 2 hours/year |
| • Continuing education in building operations | Actual hours of classroom time |
| • Energy efficiency projects completed at your facility | Up to 11 hours per year |
| • Membership in a building operations membership association | 1 hour/year |
| • Offices held in membership associations | 2 hours/year |
| • Awards received for efficient building operations | 2 hours/award |
| • BOC Newsletter quiz (see below) | 1 hour/passed quiz |

You will be notified by mail when your certification is up for renewal (your renewal date appears on your wallet card). Once you have received a renewal notice, complete the short application, provide a list of your certification renewal activities from the past year and return the information to NEEC. For 2006, the renewal fee is $45 for each of Level I and Level II, or $75 for a "combo" renewal of both Level I and Level II.

### Easy Certification Renewal Credit

Another easy way to get some continuing education credits for your yearly certification renewal requirement is right here in the BOC Bulletin. Just read the featured technical articles (pages 1-4 and continued online), then take the short quiz provided on page 11 of the newsletter. Send or fax it back to us for one CEU credit hour per quiz passed.

# Conferences & Symposiums

National and Regional – Fall 2006

## *NATIONAL*

**IFMA World Workplace 2006 Conference & Expo**
San Diego, CA • October 8 - 10, 2006

***More info:*** www.worldworkplace.org

**Solar Power 2006**
San Jose Convention Center
San Jose, CA • October 16 - 19, 2006
***Sponsor:*** The Solar Electric Power Association (SEPA) and The Solar Energy Industries Association (SEIA)

***More info:*** www.solarpowerconference.com

**Labs 21 2006 Conference**
Henry B. Gonzales Convention Center
San Antonio, TX • October 17 - 19, 2006
***Sponsor:*** The Department of Energy & The Federal Energy Management Program

***More info:*** www.labs21century.gov/conf/upcoming

*The three-day international conference has dozens of technical sessions highlighting new and innovative products designed to usher in the next generation of laboratories.*

**Power Quality Conference**
Long Beach Convention Center
Long Beach, CA • October 22 - 26, 2006
***More info:*** http://home.powerquality.com/conference/

**Inland Empire Facility Engineering Show**
Ontario Convention Center
Ontario, CA • November 1 - 2, 2006
***Sponsor:*** The Association for Facilities Engineering
***More info:*** www.iefeonline.com

## *CALIFORNIA*

**Northern California Plant Engineering & Facilities Maintenance Show** *(NCPE)*
Santa Clara Convention Center
Santa Clara, CA • September 20 - 21, 2006

***More info:*** www.biztradeshows.com/trade-events/north-california-facilities-expo.html

**Pacific Coast Association of Physical Plant Admistrators** *(PCAPPA)*
San Jose State University
San Jose, CA • September 20 – October 4, 2006
***More info:*** www.pcappa.org/

**16th Annual CSHE Mid-Year Seminar**
Monterey Hill Steak House & Banquet and Golf Course
Monterey Park, CA • September 28, 2006
***Sponsor:*** California Society for Healthcare Engineering, Inc – Los Angeles Chapter

***More info:*** www.cshe.org/

## *OREGON*

**Northwest Solar Expo**
Oregon Convention Center
Portland, OR • September 29 - October 1, 2006
***Sponsor:*** The Oregon Solar Energy Industries Association (OSEIA)

***More info:*** www.nwsolarexpo.com

## *WASHINGTON*

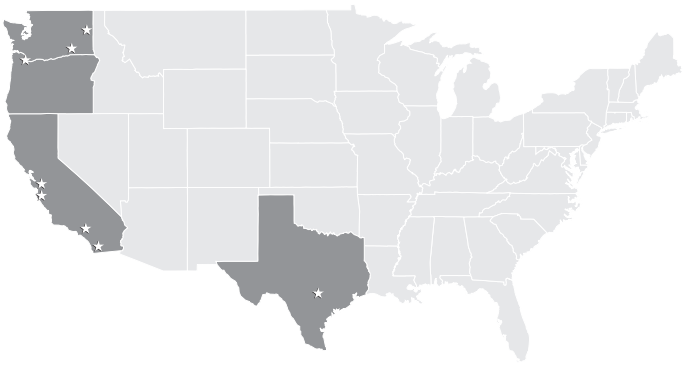
**WAMOA's Annual Fall Conference**
Red Lion Hotel at the Park
Spokane, WA • October 4 - 6, 2006
***Sponsor:*** Washington Association of Maintenance & Operations Administrators

***More info:*** www.wamoa.org/Conference.html

*This annual three-day conference provides workshops, speakers, and roundtable discussions, along with trade show presentations and networking opportunities for industry professionals.*

**WSSHE Semi-annual Conference**
Hilton Garden Inn
Kennewick, WA • October 4 - 6, 2006
***Sponsor:*** Washington State Society for Healthcare Engineering

***More info:*** www.wsshe.org



# Retro-Commissioning & Energy Use Benchmarking

## REVIEW QUIZ

*Here is an easy way to earn one continuing education hour towards annual BOC re-certification. Our two guest writers have provided technical articles on Retro-commissioning a building (see Pete Keithly's article beginning on page 1) and energy-use Benchmarking (see Derek Greenauer's article beginning on page 3). Read these articles and take this short quiz on the material. Mail or fax your answers to our offices. With a passing grade, we will apply one credit hour to your record.*

*At the end of the quiz, we have included a brief survey regarding the content of the BOC Bulletin. This is not required for your CEU credit, but we would certainly appreciate your input to help us make the BOC Bulletin as useful to our readership as possible. To any readers not taking the quiz, please help us with your input as well!*

### *Check your answer(s):*

1) Newer HVAC direct digital control systems are hands-off operations, accounting for all a facility's heating and cooling needs and idiosyncrasies.

   a. _____TRUE  b. _____ FALSE

2) What is meant by "design intent"?

   a. _____ Determining how the designer allowed for system upgrades
   b. _____ How the system was meant to work, as put forth by the original designer
   c. _____ The designer's plan for highest possible facility efficiency

3) Interviewing building occupants and maintenance staff yields info on:

   a. _____ chronic issues with building
   b. _____ exactly where building problems exist
   c. _____ water treatment and control systems
   d. _____ all of the above
   e. _____ a & c

4) It is always your best bet to carry out the original design intent.

   a. _____TRUE  b. _____ FALSE

5) Functional testing of equipment can be done in the system investigation stage; comprehensive testing is done once required repairs (if any) are completed.

   a. _____TRUE  b. _____ FALSE

6) The **ENERGY STAR**® benchmarking tool for energy efficiency uses a 1 -> 100 scale, with 1 being the highest rating achievable.

   a. _____TRUE  b. _____ FALSE

7) The benchmarking score is based on buildings of similar size across all industry sectors.

   a. _____TRUE  b. _____ FALSE

8) Buildings that operate at a benchmark score of 75 or more meeting current indoor environmental standards means that the building is in the top 15% of like buildings for both energy efficiency and environmental impacts.

   a. _____TRUE  b. _____ FALSE

9) Building comparison data is normalized for differences in climate, occupancy and hours of operation. The comparison database is updated every four years and, to date, this data base contains info on over _____ buildings.

   a ) ☐ 24,000  b) ☐ 37,000  c) ☐ 58,000  d) ☐ 67,000

10) A utility rate analysis is usually most beneficial to facilities that run 24 hours a day - either just weekdays or 24/7.

   a. _____TRUE  b. _____ FALSE

11) Revenue generated from increased productivity as a result of a more comfortable working environment can be ten times as high as the energy cost savings achieved by efficiency upgrades.

   a. _____TRUE  b. _____ FALSE

12) To calculate a building's EUI (Energy Utilization Index) using Portfolio Manager, you need only 12 months of utility data and the size, in square feet, of the building.

   a. _____TRUE  b. _____ FALSE

### *SURVEY*

What do you like most in the bulletin?_____

_____

_____

What do you like least? _____

_____

_____

What other information do you think would be helpful?_____

_____

_____

_____

*We include a quiz like this in each of our bi-annual newsletters. Also, please remember to help us out with your survey comments. Just a few minutes of your time to give us some feedback would be greatly appreciated and would help to bring you the information you want to read. This can be returned with your quiz. To submit your completed quiz for re-certification credit (1 credit per quiz passed), please complete the following and either fax it to 206-292-4125, or mail it to:* ***BOC Quiz, NEEC Office, 157 Yesler Way, Suite 409, Seattle, WA 98104.***

Your Name: _____

Title: _____

Employer: _____

Address: _____

City: _____

State: _____

Zip: _____

Phone: _____

Fax: _____

Email: _____

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*BOC Fax:*
**206-292-4125**

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***Thank you to these sponsors of Building Operator Certification in California, Oregon & Washington:***

Avista Utilities • California Public Utilities Commission • Energy Trust of Oregon
Northwest Energy Efficiency Alliance
Pacific Gas & Electric Company
Pacific Power • Puget Sound Energy
Sacramento Municipal Utility District
San Diego Gas & Electric • Seattle City Light
Snohomish County PUD • Southern California Edison • Southern California Gas
Tacoma Power • U.S. Dept. of Energy, Federal Energy Management Program

Editor and Contributing Writer: Christine Doonan
Graphic Design: Thom Harris Design

## 2006-2007 COURSE SCHEDULE *

### BOC Level I Certification

The Level I series comprises eighty hours of training and project work in building systems maintenance. Courses include: Building Systems Overview, HVAC Systems and Controls, Facility Electrical Systems, Indoor Air Quality, Environmental Health & Safety Regulations, Efficient Lighting Fundamental and Energy Conservation Techniques. See websites for cost and updated dates and locations.

### BOC Level II Certification

Level II has seventy hours of training and project work in equipment troubleshooting and maintenance. Courses include four core classes and two supplemental classes. The four core classes include: Preventive Maintenance & Troubleshooting Principles, Advanced Electrical Diagnostics, HVAC Troubleshooting & Maintenance, HVAC Controls and Optimization. See websites for supplemental class topics, dates and locations.

**California – Level I** —— www.theBOC.info/ca

San Francisco, CA..... Sept12, 2006 – Mar 13, 2007
San Jose, CA..... Sept 13, 2006 – Mar 14, 2007
San Diego, CA ..... Sept 27, 2006 – Mar 21, 2007
Irwindale, CA..... Sept 28, 2006 – Mar 22, 2007
Stockton, CA..... Oct 24, 2006 – Apr 12, 2007

**California – Level II** —— www.theBOC.info/ca

Irvine, CA ..... Oct 25, 2006 – Mar 28, 2007
San Diego, CA ..... Oct 26, 2006 – Mar 29, 2007

**Oregon – Level I** ———— www.nweei.org

Portland, OR..... Sept 2006 – Mar 2007

**Washington – Level I** —— www.theBOC.info/wa

Renton, WA..... Sept 19, 2006 – Mar 13, 2007
Everett, WA..... Oct 26, 2006 – Apr 26, 2007

**Washington – Level II** —— www.theBOC.info/wa

Renton, WA..... Oct 5, 2006 – Mar 8, 2007

For new and updated information on BOC training opportunities, please visit **www.theboc.info**. There are links to the various regional sites where you will find the latest information available on trainings throughout the country.

** As of publication date; see BOC website for up-to-date schedule information (**www.theBOC.info**).*