



# THE BOC Bulletin

WINTER/SPRING 2008

A Newsletter for BOC Graduates, Enrollees and their Employers

## Improving Indoor Air Quality, Saving Energy & Reducing Your Carbon Footprint

by William A. Turner, MS, PE; Steven M. Caulfield, PE, CIH and Jeffery H. Harrison, PE

### 1.0 OVERVIEW

As you read this, it has been cold and windy in many areas of the USA. Given the current escalation in fossil fuel costs, and the drive to reduce greenhouse gases, most facility managers are looking for ways to save energy. Given the increased concerns for global warming, in this article we'll focus on reducing heating costs while still maintaining good IAQ/moisture control, and mention some of the impacts heating changes may have on carbon dioxide emissions, one of the greenhouse gases that appears to be a concern.

To provide an environment to enhance productivity or improve learning, a building must be reasonably warm when it is cold outside in the morning, must provide adequate ventilation, and must not blow cold air onto the occupants (create cold drafts). This may sound easy, but when it is 11 a.m., the sun is shining in on a southeast exposure room with a window wall, and a room with the northwest exposure is on the same ventilation and heating system, this can be a real challenge.

The ultimate goals are energy efficiency, good indoor air quality and good occupant comfort/productivity. Additionally, minimizing our carbon dioxide footprint or being carbon neutral is a sound environmental goal.



### 2.0 IMPORTANT QUESTIONS TO ASK WHEN TRYING TO IMPROVE HEATING ENERGY EFFICIENCY

#### 1. Are heating and cooling/ventilation systems fighting each other?

Are some areas overheating? Attempting to heat and cool the same air can be very expensive. Occasionally this is done to dry air, but there are better ways to do that with a commercial dehumidifier or by balancing makeup with exhaust. From a practical perspective, in the swing seasons or in winter, it is important to make sure the heating systems (modulating gas furnaces, modulating heating coils, radiant floors & boilers) are only providing heat when and where it is needed. An inexpensive infrared thermometer can help you figure this out quickly. Leaving a data logger in questionable areas to monitor temperature and relative humidity can quickly answer questions.

In older buildings where the windows and roofs have been upgraded, overheating rooms can be a big challenge for the facility and maintenance folks. Often adding insulation to pipes that don't have it is all that is needed. So long as there are years of future operation left in the piping system, adding heating coils

*(Continued on page 2.) See **Carbon Footprint**.*

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### Reminder:

#### 2008 BOC Grads

*By March 20, 2009, you will need Continuing Ed credit to renew your level certification. Level 1 renewal requires 5 hours annually and Level 2 requires 10 hours. See page 12 in this newsletter for details.*

## **CARBON FOOTPRINT** (Continued from page 1.)

(glycol should be considered) to ventilation systems on northern exposure room wings can also help, or adding additional heating control valves may be a good answer. In general any un-insulated heating pipes in an insulated building leads to lots of overheating problems.

One location where you need to be a bit careful about insulating heating pipes is crawlspaces. In some cases the heat loss may have been keeping the crawlspace dry for years, also keeping mold from growing or wood from decaying. There are likely better means of keeping the crawlspace dry, so certainly consider insulating any heating pipes, but also figure out how to keep the crawlspace from becoming a mold factory if you remove the historic drying mechanism (heat).

We have found that using sub-membrane exhaust systems in crawlspaces (radon removal technology) is very effective in assisting to keep them dry and stopping soil gas odors. There is lots of information now available regarding keeping crawlspaces sealed up, warm and dry year-round, vs. vented, damp and cold.

Air sealing the building envelope is a really important step, and adding insulation to buildings or pipes is also a great way to reduce emissions and your carbon footprint.

When buildings rely on economizer cooling, it is important to have a light colored roof to assist with effective economizer cooling and reducing microclimate effects on the roof.

### **2. Are the rooms with vending machines on the north side of the building?**

Vending machines, even with vend misers installed, give off lots of heat. Placement in a normally cool area is better than one where there is too much heat already.

### **3. Do the roof/wall joints, windows or air intakes leak lots of air at night?**

As noted above, and this is very important, likely more important than the amount of insulation in many facilities. Uncontrolled air leakage during unoccupied hours is a major source of wasted heat energy in any building, old or new. The National Institute of Science and Technology has released a report (rpt. #7238, 2005) showing that tight buildings would save, on average, 60 percent on heating and 25 percent on electricity. Snug fitting windows, doors, and dampers are always an important part of the equation, especially when it is below freezing. One roof penetration the size of your wrist can hinder attic insulation efforts.

Almost all flat roofs leak air where they join the top of the wall unless they have been sealed up with expanding foam. As a retrofit, one can often push the insulation in the joint inward, and use expanding fireblock foam to seal up the gap. The good re-usable foam gun should cost \$30-50 and the foam is about \$20 for a large screw on canister. This type of system is much more controllable than hardware store aerosol can squirt foam. There's not a lot of benefit to anyone to heat and cool the outdoors.

### **4. Are exhaust fans or ventilation systems running when not needed?**

Most ventilation systems that move air out of or into a building need only run when the building is occupied. Further, they likely do not need to run at full speed unless the full occupancy is

present. This can be a tricky topic, but more and more, folks are using demand-controlled ventilation to reduce over-ventilation and excess dryness in the winter or excess humidity in the summer. These control strategies can either reduce outdoor air damper openings on constant volume systems, or control variable speed drives on VAV systems. If carbon dioxide levels are only in the range of 600 PPM in an occupied building by 11 a.m. during very cold weather, the building is likely getting way too much outdoor air, and/or is likely to have severe air leakage problems that can be found with a few hours of infrared thermography. Areas with high quantities of make-up air should be evaluated for any recent change of use that would lower ventilation needs, and long-term energy recovery opportunities. Moving outdoor air through a building is likely worth about \$6 to \$7 a year per CFM depending on your location and hours of operation. Reducing over-ventilation is a great way to reduce one's carbon footprint.

### **5. Can you eliminate odors?**

Odors need to be found and eliminated. Diluting them is a poor way of controlling sources and wastes energy. Wet moldy areas should be removed under containment in accordance with US EPA Guidelines, and rebuilt to keep them clean and dry. Spot odor-makers, such as high use copiers or laminators, should be isolated and locally exhausted; distributing their fumes to the occupants makes no sense.

### **6. Are control systems working as intended?**

Are air filters and belts being maintained? Nighttime operation usually has a very different objective than the occupied mode. Running systems in the occupied mode for 24 hours because the controls are not operating correctly, or because the building shell is leaky and perimeter areas get cold, usually wastes lots of heating and electrical energy. Motors running with loose belts provide poor heating air distribution, and poor or missing air filters (less than MERV 7) mean that the owner will unnecessarily be paying for expensive coil and duct cleaning.

### **7. What does the thermal envelope look like with an infrared scan?**

This is a critical step when it comes to finding heat loss. In any size building, the most effective means of quickly finding the building envelope air leakage holes (that cost lots of completely wasted energy use at night during cold weather when the wind is blowing) is with an infrared camera and operator. For likely \$2,500 or less on a heating season night, the owner can very quickly



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

**[www.theboc.info](http://www.theboc.info)**

#### **About the Authors**

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# A Baker's Dozen Energy Saving Ideas

By: Alan R. Mulak, PE and William A. Turner, MS, PE

## Introduction and Overview:

Energy prices have gone up in recent months and all indications and expectations are they will continue to do so. Budgeting for this upward trend is difficult at best. While clear that something must be done ASAP, it is often hard to know where to begin. There are plenty of expensive, hi-tech gizmos out there with complicated guarantees of huge energy savings. These may be in your future, but first it is worth starting with the basics, addressing the simple, often low-tech (and sometimes low-cost) solutions. When doing this, it is also important not to inadvertently sabotage indoor air quality (IAQ), especially in the damper climates of the East Coast and the Pacific Northwest. The following, in no particular order, are thirteen energy efficiency actions, activities, and equipment purchases that will start saving energy tomorrow, with some basic guidance regarding IAQ implications.

**1. Throw Away all Incandescent Bulbs.** If nothing else, get rid of every incandescent bulb in your facility and your home as well. Compact fluorescent lamps (also known as CFLs) are just the ticket and have improved dramatically over the CFLs that first hit the market two decades ago. Modern CFLs can be dimmed, come in all sizes, start in the cold, and provide "warmer" light. Some even look like old fashion bulbs and still others come with reflectors attached! Make sure you know how to dispose of CFLs properly in your state, since most contain some mercury just like fluorescent tubes and other light bulbs.



**2. In Gyms, Garages or Warehouses, Replace Aging HID Fixtures with T5\* High Output Fixtures.** Perhaps the most significant recent advancement in lighting technology is the arrival of T5 High Output lamps and ballasts. By every measure, the best Metal Halide HID (High Intensity Discharge) technology and perhaps most important, T5HOs can be controlled with now readily-available occupancy sensors. This is huge, since old fashion HID fixtures take so long to re-strike (get back up to full brightness) that no one turns them off, even when the room is empty. The photo below is a gym where HID's have been replaced with T5HOs. More light, easy to turn off, 44% reduction in electricity usage, and the tennis and basketball players give a "thumbs up!" As energy engineering associate and BOC instructor Rich Vaillencourt is fond of saying, "You cannot save more energy than when the lights are off."



\* The "T" in T5 indicates thickness or diameter of the lamp, in eighths of an inch. Therefore, a T5 is 5/8 of an inch in diameter, a T8 is 8/8 of an inch, and so on.

**3. Install High Performance T-8s everywhere else.** Now that you have replaced those obsolete HID fixtures, take a look at all the other fluorescent lights. Current practice is to replace all the lamps and ballasts with High Performance T8 systems. These use 1/3 less energy than 32 watt units, thus not only saving electric energy but reducing the air conditioning costs

as well! Most utility and energy service companies offer incentives to help you with this cost-effective investment.

**4. Install Occupancy Sensors.** This is a slam-dunk. For all office spaces, classrooms, rest rooms, conference rooms, gyms, warehouses, garages, and every other space where occupancy is not 100%, install occupancy sensors. Using schools as an example, dual sensing ceiling mounted devices are perfect for a classroom setting. Even in an elementary school, studies have shown classrooms are empty at least 10% of the school day. Occupancy sensors will remember to turn off the lights, even when the occupant forgets, and this lowers the air conditioning load as well.



### HINT:

Be sure to specify "dual sensing" occupancy sensors. These might cost a few dollars more but will eliminate the annoying situation when the lights go out on occupants who are sitting still.

**5. Know Thy Utility Account Rep and/or Your State Energy Contacts!** It is astounding how many facility managers do not know who their utility representatives are and what type of incentive programs are available. In these times of rising energy costs, utility and state programs with their generous cash subsidies are more important than ever. Additionally, these trained individuals can advise on new products, financing, training programs, and a host of other energy related services. In short, these folks are your friends! And by all means, ask for an energy audit of your facility. These folks know what to look for.

**6. Electric Motor Game Plan.** Believe it or not, your buildings have many electric motors running at this very moment. In almost any type of building, electric motors consume a significant portion of the total energy usage—Electric motors drive pumps, turn fans, and perform a variety of other behind-the-scenes tasks. The best time to upgrade your motor is when it burns out, but generally, it is a minor crisis when this happens. Old habits die hard and we often buy the same motor from the same source, ignoring



(Continued on page 4.) See **Baker's Dozen**.

newer and better options. Have a game plan to replace these inefficient devices with premium efficiency counterparts. The utility will very often pay you the incremental difference to do so! Do you have a plan to upgrade?

### **7. Train and Keep Training Your Building Operators!**

Would you bring your car in for service to a garage that hires untrained mechanics? Why then do you allow your buildings to be operated by untrained building operators?

If they are trained, when is the last time they took a refresher course? Equipment changes all the time. Energy costs have risen as much as 80% in the last decade. There is always more to learn. And by the way, the results are the same. Trained auto mechanics are very likely to deliver a complete tune up so that your car operates to its utmost capacity, requiring minimal maintenance. With untrained mechanics, the reverse is true. Same with buildings.



#### **HINT:**

*At a loss as to where to find a course? Contact your local utility or energy service company. They are always promoting and offering such courses. (Obviously we believe the Building Operator Certification (BOC) course is particularly effective!)*

**8. Purchase and Populate a Computerized Maintenance Management System (CMMS).** Often, facilities are maintained by knowledgeable personnel who take pride in keeping their facilities running as smoothly as possible under the budget constraints we all deal with. This is the good news. The bad news is all of the information required to do this complex job is often stored in the head of the facility manager. And when these key personnel retire, so goes this institutional memory. A CMMS is just the ticket. A good system should have:

- A.** a work order trigger for date and season.
- B.** a record of past work completed, with details such as hours required, safety considerations, parts required, etc.
- C.** a comments/notes section to add hints and "watch out for ..." items.
- D.** a user-friendly data entry form/screen for non-expert computer operators.
- E.** Prioritization capabilities for work orders.
- F.** a cost estimate calculator.

And yes, garbage in – garbage out. Someone must take the time to enter technically accurate data. However, once that is done, they are easy to update, friendly to use, issue accurate work orders, have a really good memory, and can even keep track of your yearly energy use.

### **9. Change Your Air Filters and Clean the Strainer!**

What do good (Merv-7) filters do? They clog up with the stuff they are designed to filter, which is great since dust, pollen, and a variety of other airborne nasties have no place on the coils or in our buildings, and you avoid duct cleaning costs. However, once clogged, they are no longer a filter but a dam. A clogged filter requires the fan, pump, or motor to work harder to accomplish less, which of course further clogs the filter. On it goes until you hire the duct cleaner. Why not change all filters at every change of

season. Schedule replacement three to four times a year. Strainers should be serviced yearly at a minimum.

**10. Older Than Three Years?** Often, the objection raised when the topic of energy efficient equipment comes up is "we have done it already." That might be true but in the last three years, electric/gas/oil rates have gone way up. As the cost of energy soars, the economics of an energy-related project improves. Also, as the hours of use add up, efficient products such as T8s need to be replaced before they start failing one at a time, creating a labor headache.

**11. Take a Field Trip. Where?** To your own facility...but always after hours and on weekends. A walk-thru assessment after hours can yield very interesting results. Why are the fans or pumps running? Are the boilers and AC systems really on night setback? Windows open? Lights on? Air conditioning running? All of these "not supposed to be's" add up to serious wasted energy and money.

### **12. A Few Other Things that Save Money as well as Energy:**

- A.** Vending machine controls such as Vendor Misers turn off the machine when no one is around. Since energy costs for these machines can be about \$400 per year, turning these devices off for about 33% of the time is a simple, inexpensive, cost-effective idea.
- B.** Economizers on roof top HVAC systems take advantage of "free" cooling during those days when it is not too hot and not too cold. Yet, many RTUs (Roof Top Units) are not equipped with functioning economizers. And while you are at it, install a dual enthalpy control on the economizer. This can extend your free cooling by as much as 20%!
- C.** Everyone talks about improving Operations and Maintenance (O&M) and the inherent benefits of doing so. The problem is trying to figure out what superior O&M really is. A free resource that belongs on everyone's shelf is FEMP O&M Best Practices Guide which can be downloaded from the following website: [www1.eere.energy.gov/femp/pdfs/omguide\\_complete.pdf](http://www1.eere.energy.gov/femp/pdfs/omguide_complete.pdf).  
*(Note: There may be other O&M guides but this one is the best I have seen and the price is right!)*
- D.** As with the FEMP O&M Best Practices guide above, another free and valuable resource is COMcheck. This software is easy to use and generates very helpful reports. It is the only code compliance software I know of, and the output can be used for a variety of purposes, such as verification of code compliance (for most states), quantification of energy power density for grant applications, back up for LEED and Advanced Building Certifications, etc. And again, the price is right! COMcheck can be downloaded from the following website: [www.energycodes.gov/comcheck/ez\\_download.stm](http://www.energycodes.gov/comcheck/ez_download.stm).
- E.** And keeping with the free software topic, electric motor studies can be made easy by using free software which will quantify energy savings when upgrading to premium efficiency electric motors.  
*(Note: these motors must be NEMA Premium Efficiency). This software is known as MotorUp and can be found at: [www.eere.energy.gov/industry/bestpractices/software.html#mm](http://www.eere.energy.gov/industry/bestpractices/software.html#mm).*

(Continued on page 8) See **BAKER'S DOZEN**.

# BOC Grads Making a Difference!



BOC grad **Luke Hutchins is Director of Buildings & Grounds at Parker Ridge Retirement Community in Blue Hill, Maine.** Parker Ridge's facility, first established in the early nineties, has approximately 65,000 sq. ft. of apartments at its main inn and 24 cottages averaging 1,700 sq. ft. each located on twenty-plus beautifully landscaped acres. Hutchins completed the BOC course in Fairfield,

Maine this past fall. For him, the BOC training "gave me the confidence and ability to come back to my facility and start making decisions based on energy savings and moving ahead with technology."

Having thirteen years experience in the residential management field, Hutchins observed, "Anyone who works in the facilities industry knows time is not on your side, so being able to complete all the projects I want to will never happen, but we're taking it one step at a time." The first project was a small one, a simple exit light retrofit/replacement from the existing CFL design to the new LED lights. Efficiency Maine was giving rebates of \$10.00 per fixture and Hutchins purchased the required fifty fixtures for \$13.50 each. With the utility incentive, the total purchase was \$675.00, less \$500.00 rebate, so that a \$175.00 investment, giving an energy saving of about \$600.00 per year had a payback of less than three and a half months. Hutchins easily installed all the lighting himself in a matter of a couple weeks as time permitted.

Several other projects are on the horizon, including a lighting retrofit in the main kitchen, boiler room and activity rooms where all the lighting is outdated and inefficient. But the biggest project about which Hutchins is most excited an automation system in the boiler room. His calculations indicate that it could save at least \$25,000 per year at a cost of about \$65,000 to implement - a 2.5 year payback without even factoring in the effects of greatly reduced maintenance costs as well as alarm set points that alert facilities personnel to problems before they get complaints. Hutchins is hopeful that the project will be budgeted for this year. Since the automation system consulting company with which he is working has received custom utility incentives for this type of project in the past, he believes payback could be even sooner.



Hutchins discovered many advantages to the BOC training. "The content that the BOC course included was great, covering all aspects of facility maintenance and energy savings, but a major part of the course for me was making friends and contacts with people from other facilities in Maine. I have touched base with many of them, asking questions about policies or operations, and have been able to make good decisions based on the many more years of experience that they have in the industry. Without the BOC course I would be in the dark on everything that is good about a changing industry."



In early 2007, **Matt Thomson, BOC graduate and Facilities Coordinator at Gunderson Dettmer in Menlo Park, CA,** worked with his facilities management team on a small, focused remodeling project. The challenge was to convert what had previously housed a law library, an area of about 600 square feet, to a multi-purpose area for anything from client meetings or business presentations

to CPR training or yoga classes for employees. The goal was to make it as comfortable, useable and energy-efficient as possible.

Nine windows were professionally re-covered using 3M P18 ARL window film, protecting occupants from southern and northeastern exposure, particularly during low angle sun periods. Of the work Thomson says, "We are very happy with the crystal clear results, which afford a very relaxing, pleasing view of coastal California hills, replete with redwoods and birch in this established business park. We enjoy backyard San Francisco Bay migratory flocks throughout much of the year, the ebb and flow of bay waters, ducks annually pairing off in the foundation plantings and a very special pair of red-tailed hawks!"

The ceiling was left untouched except for attaching HVAC flexible insulating ducts to existing return air grilles on the plenum side. This is an inexpensive yet effective way to minimize sound transmission between adjoining rooms. Existing T-12 lamps and ballasts were stripped out by facilities staff over a period of several weeks and T-8 dimming ballasts and lamps installed, with a single daylight adjusting sensor and a new occupancy sensor from Watt-Stopper. Initial lamp burn-in caused a few ballast failures, but these were promptly replaced by Sylvania. Thomson notes that, "The lighting controls presented an initial learning curve for our staff but have proven to be worth the trouble by allowing occupants to custom-*alter lighting levels for the purpose at hand.*" I think our main hurdle making initial set-up adjustments was due to the window film presenting a narrower range of set points."

***"The lighting controls presented an initial learning curve for our staff but have proven to be worth the trouble by allowing occupants to custom-*alter lighting levels for the purpose at hand.*"***

One of the hallmark dictums of BOC training is working as a team to integrate operational strategies with innovative building design to bring about optimal solutions. Thomson's experience highlights how successful this approach can be. "Although this was a small project, our estimated ROI is approximately one and a half years. But the sheer pleasure of the results, and the first-hand experience of the installation for our facilities personnel has strengthened our small but friendly core group in ways that are best achieved through simple hands-on work." He says, adding, "In short, we had fun, our results have been warmly acknowledged, and we strongly feel our team has added value to the firm."

# Congratulations!

## BOC Level I & II Students Certified in September 2007 – December 2007

### Level I Certified Students

**Adkisson, Johnnie**, UCLA--On Campus Housing Maintenance  
**Aguila, Reynaldo**, San Jose State University  
**Allen, Jeff**, USMC Camp Pendleton  
**Allen, Timothy**, CSU Channel Islands  
**Alvarez, Jesse**, The Irvine Company  
**Amador, Raul**, CSU LA Facilities Services  
**Amador, Samuel**, Rose Hills Memorial Park & Mortuary  
**Barnette, Leroy**, San Jose State University  
**Batuyong, Erlindo**, USMC Camp Pendleton  
**Bazaldua, Gerard**, Amgen, Inc.  
**Beaudoin, Ron**  
**Beed, Keith**, Southern Oregon University  
**Behrendt, Ken**, Scripps Memorial Hospital  
**Bennett, David**, Raytheon  
**Bialous, Sherie**, St. Joseph Hospital, Eureka  
**Bilka, Donald**, Eastern Suffolk BOCES  
**Birkhofer, Eric**, Camp Pendleton DSG  
**Bolton, Jacob**, St. Joseph Hospital  
**Bonesteel, James**, Northland Investment Corp  
**Bonifacius, Gary**, CSU Chico, UHFS  
**Bracy, Herman**, Mount Desert Island High School  
**Bredesen, James**, Amgen, Inc.  
**Breeze, Donald**, Hawthorne Machinery Co.  
**Briner, Jr., John**, Pelican Bay State Prison  
**Brown, Calvin**, San Jose State University  
**Brown, John**, Scripps Memorial Hospital, La Jolla  
**Burchhardt, Susan**, SDGE  
**Burns, Jr., James**, UCSD  
**Buschman, Jeromy**, Gold Country Casino  
**Camaclang, Patricio**, DSG/ACE Fac, MCB Camp Pendleton  
**Card, Paul**, City of Long Beach, Fac Maint Div  
**Castriello, Liberato**, San Diego State University, Physical Plant  
**Castro, Jose**, St. Paul's Senior Homes & Services  
**Chambers, Scott**, University CA Santa Barbara  
**Chatwood, Todd**, City of Eugene  
**Chirco, Joseph**, Copiague Public School District  
**Clear, Gerald**, Camp Pendleton, Marine Corps Base  
**Clowser, David**, CSU Chico, UHFS  
**Cole, Sr., Ronnie**, Camp Pendleton, Marine Corp Base  
**Comparon, Scott**, Ultimate Services, Inc.  
**Conrad, Michael**, Amgen, Inc.  
**Conrad, Shane**, World Vision  
**Cooper, Carl**, County of Humboldt  
**Costello, Timothy**, Santa Buckley Energy  
**Craig, Barry**, Brunswick Housing Authority  
**Cyr, Frederick**, Loring Job Corps Center  
**Davis, David**, UC Santa Barbara  
**Dayanghirang, Rodante**, San Jose State University  
**Delling, Bruce**, Tetratex EMI  
**Determan, Dan**, Action Property Management  
**Donovan, Thomas**, Eastern Suffolk BOCES  
**Donzella, John**, Deringer-Ney Inc.

**Edwards, Drew**, Durham Unified School District  
**Elisondo, Benjamin**, California State Northridge  
**Ellsworth, Vanessa**, CSU Northridge, Phys Plant Management  
**Elmer, Randy**, St. Paul's Senior Homes & Services  
**Engelhardt, Jeffrey**, Copiague High School  
**Fitzpatrick, Gregory**, Office of Policy and Management  
**Forsyth, Robert**, UC Santa Barbara  
**Fraser, Steve**, UCLA - OCHM  
**Frowiss, Walter**, UC Santa Barbara  
**Gabaldon, Alan**, Scripps memorial Hospital  
**Galang, Ramon**, SJSU  
**Gallagher, Mark**, SHW Casting Technologies, Inc.  
**Garcia, Regino**, San Jose State University  
**Garcia, Rudy**, PM Realty Group  
**Garcia, Sergio**, San Jose State University  
**Gardner, Christopher**, CSU Chico  
**Gauthier, Anthony**, Oregon Coast Aquarium  
**George, Steven**, Scripps Memorial Hospital  
**Gollinger, Jeri**, The Meadows Real Estate Management & Development  
**Gonzalez, Arthur**, Mt. San Antonio College  
**Gonzalez, George**, Longwood Central School  
**Grant, Andrew**, UC Santa Barbara  
**Gregory, Bill**, Silver Stream Production & Design, Inc.  
**Griffin, Greg**, Children's Hospital of Central CA  
**Gubanez, Steven**, HSU Housing and Dining  
**Guillen, Efrain**, CSU Northridge, Phys Plant Management  
**Hale, Richard**, Cal State University Fullerton  
**Haran, John**, California State University Northridge  
**Harding, Johnney**, School District #9  
**Hargis, Jr., Ralph**, Camp Pendleton, Fac Maint Department QAB  
**Hart, Roger**, University of CA, Santa Barbara  
**Hayden, Daniel**, CSU Chico  
**Hembrow, Peter**, University of California Santa Barbara  
**Henry, Michael**, Cedars Sinai Medical Center  
**Herrmann, Joseph**, Applied Biosystems  
**Hill, Raymond**, Camp Pendleton, Fac Maint Department QAB  
**Hill, Renell**, SDGE  
**Hoffman, Jay**, SDSU, Dept of Physical Plant  
**Hornbaker, Erik**, California State Lottery  
**Hough, James**, Pelican Bay State Prison  
**Howard, John**, Cal Poly State University, SLO  
**Howell, Charles**, Camp Pendleton  
**Hughes, Joseph**, CSU Northridge, Physical Plant Management  
**Hunter, Randy**, University of Santa Barbara  
**Hutchins, T. Luke**, Parker Ridge Retirement Community  
**Isbell, Thomas**, SDSU, Dept of Physical Plant  
**Jacobs, David**, San Diego State Univ, Phys Plant  
**Jahnke, Kurt**, University of California Santa Barbara  
**Johnson, Eric**, United Indian Health Services  
**Kemper, John**, DSG Camp Pendleton

**Kestel, Gary**, San Jose State University  
**Ketron, Kimberly**, SDGE  
**Kieny, Richard**, HSU Housing and Dining  
**Kirby, Richard**, Camp Pendleton, Marine Corp Base  
**Kirkpatrick, Thomas**, Marine Corp Base Camp Pendleton  
**Koetz, Ron**, USDA/Forest Service  
**Krause, Ken**, Eastern Suffolk BOCES  
**LaBreck, Robert**, City of Augusta  
**LaMothe, Richard**, Maine Public Service Co  
**Langendorf, Ben**, City of Moreno Valley  
**LaPointe, Clayton**, Military Dept.  
**Linbrunner, Richard**, Longwood School District  
**Lindstrom, Matthew**, Camp Pendleton Marine Corp Base  
**Lombardo, Joseph**, San Bernardino City Unified San Diego  
**Lopez, John**, California State University LA  
**Lowden, Brian**, Feather Falls Casino  
**Macek, David**, Camp Pendleton  
**Martin, Robert**, CSU Chico  
**McNeally, Andrew**, Maine Public Service Co  
**McElhinney, Melissa**, Continental Rehabilitation Hospital  
**McGrath, David**, Cablevision  
**McMahon, Tom**, Nonwalk-La Mirada Unified SD  
**Melhorn, Sonny**, Lane Transit District  
**Miles, Ulysses**, University California Santa Barbara  
**Montgomery, William**, University California Santa Barbara  
**Montoya, Rick**, Raytheon  
**Morgan, Michael**, City of San Clemente  
**Morris, Robert**, HSU Housing and Dining  
**Morrow, Wayne**, CSU Northridge, Physical Plant Management  
**Niekrasz, Michael**, County of Humboldt  
**Novellino, Nicholas**, Longwood School District  
**Nowak, Andrew**, The Irvine Company  
**O'Connor, Loni**, Eagle Point School District #9  
**Ohr, Damon**, The Irvine Company  
**O'Keefe, Chris**, Sun City Lincoln Hills  
**Pakingan, Juanito**, Camp Pendleton, Fac Maint Dept QA  
**Pampliega, Cornelio**, CSU Northridge, Phys Plant Mgmt  
**Parsons, James**, MSAD #56  
**Paschalidis, Panos**, AO Sherman Co, Inc.  
**Patino, Adam**, City of Moreno Valley  
**Paulson, Richard**, California State University Channel Islands  
**Pierce, Mitchell**, Johnson Controls, Inc.  
**Pinell, Bill**, CSU Northridge, Phys Plant Mgmt  
**Place, Duane**, The Mill Casino-Hotel  
**Plance, Robin**, Halton Company  
**Polishchuk, Mark**, San Francisco State University  
**Polkowski, Christopher**, Pratt & Whitney  
**Prieto, Jose**, The Irvine Company  
**Prue, Phillip**, Servus Management Corp  
**Puig, Julio**, California State University LA  
**Radcliffe, Steven**, Linemaster Switch Corp  
**Ramsey, Clel**, MEO--Pest Control

**Reifer, Earl**, California State University LA  
**Reyes, Doug**, California State University LA  
**Riedo, Doug**, University California Santa Barbara  
**Robinson, Charles**, Raytheon, Inc.  
**Robinson, Tommie**, San Francisco State University  
**Rocha, David**, Humboldt State University  
**Rosales, Chanda**, The Pape Group, Inc.  
**Rosemund, Vaughn**, Marine Corps Camp Pendleton  
**Rusick, Ronald**, Azusa Pacific University  
**Salcedo, Virgilio**, Camp Pendleton Marine Corp Base  
**Schauland, Ryan**, University California Santa Barbara  
**Schmid, Marc**, UC Santa Barbara  
**Shea, John**, Iseli Company  
**Sherman, Jeff**, Lane Transit District  
**Shrope, Tom**, Camp Pendleton, Facilities Maintenance Department QAB  
**Shubb, Scott**, California State University Channel Islands  
**Smith, Dion**, University California Santa Barbara  
**Smith, Thea**, NOAA Northwest Fisheries Science Center  
**Smiyun, Anatoliy**, University California Santa Barbara  
**Smiyun, Mikhail**, University California Santa Barbara

**Soto, Reuben**, San Jose State University  
**Spargo, Kevin**, Pratt & Whitney  
**Spencer, John**, University California Santa Barbara  
**Stanton, Thomas**, Amgen, Inc.  
**Stifel, David**, Quinebaug Valley Community College  
**Stigter, Gary**, Beverly Wilshire Hotel  
**Sullivan, Jerry**  
**Symes, Douglas**, Kents Hill School  
**Tamayo, Armando**, San Bernardino City Unified San Diego  
**Thomas, Steve**, CSU Northridge  
**Torkelson, Erik**, Wiremold/Legrand  
**Torres, Hector**, The Irvine Company  
**Tran, Alexander**, San Jose State University  
**Turner, Ronald**  
**Valentino, Thomas**, City of Albany  
**Vance, Larry**, Butte County Facilities Services  
**Vaught, Johnnie**, DeMarco Management Corp  
**Verbeek-Groth, Jane**, San Diego Gas & Electric  
**Vieu, Rene**, San Diego State Univ, Phys Plant  
**Virissimo, Daniel**, CSU Channel Islands  
**Wahl, Debra**, Jones Lang LaSalle  
**Wallace, Johnny**, Camp Pendleton  
**Waltz, Brian**, Rockwood Retirement Communities  
**Watson, Bruce**, UC San Diego  
**Welch, Gail**, Qualcomm, Inc.  
**West, Craig**, Humboldt State University

**Wheeler, Daniel**, Scripps Memorial Hospital, La Jolla  
**Wilcox, John**, Amgen, Inc.  
**Williams, James**, New York State OGS  
**Williams, Lorenzo**, Open Health Assoc  
**Young, Bradley**, California State University Fullerton  
**Zamora, Pete**, San Diego State Univ, Phys Plant

### Level II Certified Students

**Alvarez, Jr., Vidal**, Cushman & Wakefield at Adobe  
**Bozzo, Robert**, City of Gilroy  
**Brandini, Rick**, City of Gilroy  
**Hornbaker, Erik**, California State Lottery  
**Perkins Sr., Jubel**, Native American Rehabilitation Association  
**Quach, Thien**, City of Los Altos  
**Rogers, Chris**, City of Gilroy  
**Souza, Anthony**, Cushman & Wakefield  
**Swan, Mark**, Evergreen School District, MOT  
**Terry, Randy**, Applera - Applied Biosystems

## 2008 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](http://www.theBOC.info/ca)  
 San Diego.....2/26/08 - 8/26/08  
 Irwindale.....2/27/08 - 8/27/08  
 Downey.....4/23/08 - 10/15/08  
 Irvine.....4/24/08 - 10/16/08  
 San Ramon .....5/7/08 - 11/5/08  
 Fresno .....5/8/08 - 11/6/08  
 Ontario\*\*.....9/9/08 - 3/10/09  
 San Diego.....9/10/08 - 3/11/09  
 Northridge.....10/9/08 - 4/9/09  
 San Jose.....10/15/08 - 4/15/09  
 San Francisco .....10/16/08 - 4/16/09

**CALIFORNIA - Level II** [www.theBOC.info/ca](http://www.theBOC.info/ca)  
 Santa Barbara .....4/8/08 - 9/9/08  
 San Jose.....4/8/08 - 10/9/08  
 Irvine.....9/3/08 - 2/4/08  
 Los Angeles.....9/4/08 - 2/5/09

**OREGON - Level II** [www.nweei.org](http://www.nweei.org)  
 Portland .....(TBA)... 4/08 - 9/08

**WASHINGTON - Level I** [www.theBOC.info/wa](http://www.theBOC.info/wa)  
 Bellingham .....3/4/08 - 10/7/08  
 Silverdale.....5/29/08 - 12/11/08  
 Renton .....10/7/08 - 4/7/09

**WASHINGTON - Level II** [www.theBOC.info/wa](http://www.theBOC.info/wa)  
 Renton .....9/17/08 - 2/26/09

**NORTHEAST - Level I** [www.theBOC.info/ne](http://www.theBOC.info/ne)  
 Glastonbury, CT.....(SOLD OUT).....3/11/08 - 6/10/08  
 Westboro, MA .....3/13/08 - 7/24/08  
 Bangor, ME.....4/10/08 - 6/19/08  
 Windsor Locks, CT... (SOLD OUT) ....4/15/08 - 7/9/08  
 Westwood, MA .....4/22/08 - 8/20/08  
 Providence, RI .....8/19/08 - 12/9/08  
 Melville, NY .....(TBA).... Summer 2008

Limestone ME.....9/11/08 - 10/31/08  
 Buzzards Bay, MA.....9/23/08 - 12/10/08  
 Andover, MA .....(TBA)....Fall 2008  
 Springfield, MA.....(TBA)....Fall 2008

**NORTHEAST - Level II** [www.theBOC.info/ne](http://www.theBOC.info/ne)  
 Mexico, NY.....(TBA)..... 3/08  
 Leroy, NY .....(TBA)..... 3/08  
 Hartford, CT .....(SOLD OUT).....8/27/08 - 11/12/08  
 Melville, NY .....(TBA).... Summer 2008  
 Sanford, ME .....10/7/08 - 12/16/08

\* As of publication date; see BOC website for up-to-date schedule information ([www.theBOC.info](http://www.theBOC.info))

\*\* dates not yet confirmed

(TBA) – Dates To Be Announced

# BOC Training – A Significant Step to Lifelong Learning

Reactions of participants in the BOC program over the years have been very gratifying. All levels of maintenance personnel report in their program evaluations and recertification applications that they return to their facilities with a new outlook on how to assess and, more importantly, improve operations in terms of energy efficiency and facility comfort.

Technological improvements happen all the time and BOC participants learn to be on the lookout for alternatives. Many BOC grads are interested in more training, information resources, and higher educational certification opportunities. That in mind, here is a quick Q&A to provide some answers.

## **Q. After BOC, where can I go for further educational opportunities?**

**A.** There is a full range of technical and management oriented training and certificate programs for facilities professionals. This link – [www.theboc.info/maintaining.html](http://www.theboc.info/maintaining.html) – provides a good list, and the Continuing Ed section of this bi-annual BOC Bulletin also details information about up-to-date training opportunities in the field available locally and regionally.

## **Q. Are there mailing lists, lists of seminars, or periodicals accessible for ongoing information that you would recommend?**

**A.** Again, the BOC Bulletin has a limited listing of seminars for energy efficiency. It is always a good idea to check your local utility provider web sites, which often have numerous workshops/ seminars on offer. For periodicals, excellent and timely information is available from the following: HPAC Engineering, Maintenance Solutions, Building Operating Management, and Sustainable

Facilities Journal (formerly, Energy & Power). Many of these are available online and can be found with an easy Google search.

## **Q. Are there organizations or programs (ie: IFMA) that you would recommend?**

**A.** There are numerous professional associations in the facilities management industry. Many are sector-oriented – e.g., K-12, higher education, healthcare – where some, such as IFMA (International Facilities Management Association), are broadly focused. Often the broadly focused associations will have web links to more local or more industry-specific chapters. To name just a few: ASHE (American Society for Healthcare Engineering), AEE (Association of Energy Engineers), AFE (Association of Facilities Engineers) and the U. S. EPA Energy Star program. Some of these associations are cited in the Continuing Ed and Conferences & Symposiums section of this issue, but their web sites can easily be found via Google.

## **Q. Can older facilities managers get engineering degrees? Are there programs aimed at older students for this?**

**A.** Education is a life long endeavor. It's never too late to learn or to add professional credentials. You will probably find that in many continuing education programs, the average student age is higher than you think. There are two-year associate degrees in building engineering as well as four-year professional engineering degrees. The sooner you make the decision, the sooner you earn the degree!

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## **BAKER'S DOZEN** (Continued from page 4.)

**13. Begin to Plan for Future Items:** There are many items that require budgeting and planning and with all capital expenses, the dreaded review cycle. The time to start the project rolling is today. Remember, the upward spiral of energy costs is here to stay. The following are a few ideas for the "future upgrade" list.

**A. Roofing upgrades:** Light colored and better insulation is a combination that saves heating and air conditioning costs while improving occupant comfort. Further, a well constructed roof can eliminate leaks which cause all sorts of problems including huge sums of money for mold remediation. A great reference for light colored, energy efficient roofs is the Florida Solar Power website.

**B. Window upgrades:** Argon-filled windows are rated at U - 0.25 vs. U - 1.0 for single pane. The problem with window upgrades is the cost. These are frightfully expensive and the simple payback (cost/savings) is excessive. To attack a window upgrade challenge, grants from government agencies such as EPACT or USDA are almost a must. \*\*

\*\* For more information on these grants, simply Google EPACT or USDA Energy Grant and read the fine print. You may be eligible!

**C. Air sealing:** An infrared scan of your facility will point out the leaky areas which, as you can well imagine, are costing significant dollars in wasted heating and cooling. Sometimes, the local fire department will provide this service for little or no cost. Once the leaks are identified, a "foaming" contractor can seal the air leaks at the wall roof interface or other leaky areas. As a general note, flat roofs always leak air where they meet the outside walls. Why heat the outdoors?

**D. Boiler upgrades:** If your boiler was installed prior to 1990, it is almost guaranteed to be obsolete. New boilers (and furnaces) are as much as 20% more efficient, smaller, easier to maintain, and far more reliable. Full condensing boilers are frightfully expensive (that's the bad news) but worth every cent with dramatically reduced O&M costs (that's the good news). Even some oil-fired boilers are now full condensing.

**Summary.** There are many more ideas and topics that could be discussed in this article. This is just the tip of the energy efficiency iceberg. The most important advice is to do something – anything – and start today. Good luck!

# 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, Professional Development and Events Calendars at these sites or call for information regarding upcoming training opportunities.

## **APPA – Association of Physical Plant Administrators**

*Class Information:* [www.appa.org](http://www.appa.org)

## **BetterBricks Professional Training Program**

*Website:* [www.BetterBricks.com](http://www.BetterBricks.com)

*Contact:* 206-343-3960

Workshops, and webinars for design, engineering and facilities professionals in the Northwest.

## **BOMI – Building Owners & Managers Institute**

*Class Information:* [www.bomi-edu.org](http://www.bomi-edu.org)

## **BOMA – Greater Los Angeles**

*Class Information:* [www.bomagla.org](http://www.bomagla.org)

## **CASBO – California Association of School Business Officials**

*Class Information:* [www.casbo.org](http://www.casbo.org)

## **California Society for Healthcare Engineering**

*Class Information:* [www.cshe.org](http://www.cshe.org)

## **CALIFORNIA ENERGY EFFICIENCY TRAINING RESOURCES**

### **Customer Technology Application Center - Edison, CA**

*Website:* [www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm](http://www.sce.com/RebatesandSavings/EnergyCenters/workshops.htm)

### **Energy Training Center - Stockton, CA**

*Website:* [www.pge.com/education\\_training/](http://www.pge.com/education_training/)

### **FSTC - Food Service Technology Center**

*Website:* [www.fishnick.com/education/seminars/list.php](http://www.fishnick.com/education/seminars/list.php)

### **Energy Resource Center (ERC)**

*Website:* [www.socalgas.com/business/resource\\_center/erc\\_home.shtml](http://www.socalgas.com/business/resource_center/erc_home.shtml)

### **Pacific Energy Center - San Francisco, CA**

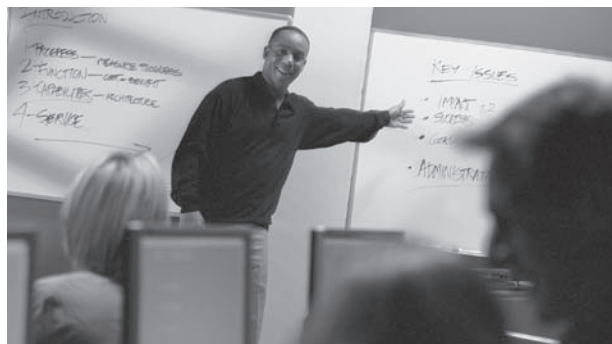
*Website:* [www.pge.com/education\\_training/classes/energy\\_efficiency/](http://www.pge.com/education_training/classes/energy_efficiency/)

### **San Diego Regional Energy Office**

*Website:* [www.sdenergy.org/ContentPage.asp?ContentID=50&SectionID=46](http://www.sdenergy.org/ContentPage.asp?ContentID=50&SectionID=46)

### **Sacramento Municipal Utility District**

*Class Information:* [www.smud.com/education-safety/index.html](http://www.smud.com/education-safety/index.html)



## **NORTHEAST UTILITY ENERGY EFFICIENCY TRAINING CENTERS:**

### **Efficiency Maine**

*Website:* [www.energymaine.com/education\\_programs.htm](http://www.energymaine.com/education_programs.htm)

### **Long Island Power Authority**

*Website:* [www.lipower.org/community/education/](http://www.lipower.org/community/education/)

### **Energy Services**

*Website:* [www.energyexperts.org/calendar/](http://www.energyexperts.org/calendar/)

### **FEMP – Federal Energy Management Program Workshops & Conferences**

*Website:* [www.eer.e.energy.gov/states/](http://www.eer.e.energy.gov/states/)

### **HVACR Education: On-Line Learning for the HVACR Industry**

*Website:* [www.hvacreducation.net/](http://www.hvacreducation.net/)

### **IFMA International Facility Management Association**

*Website:* [www.ifma.org](http://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.

### **NYSERDA - New New York State Energy Research & Development Authority**

*Website:* [www.nyscrda.org/events.asp](http://www.nyscrda.org/events.asp)

### **NEEI - Northwest Energy Education Institute**

*Website:* [www.nweei.org](http://www.nweei.org)

*Contact:* Erik Westerholm at 541-463-3154 or

*E-mail:* [westerholme@lanecc.edu](mailto:westerholme@lanecc.edu)

### **Northwest Lighting Design Lab & Portland Daylighting Lab**

*Class Information:* [www.lightingdesignlab.com/calendar/index.html](http://www.lightingdesignlab.com/calendar/index.html)

### **The UC/CSU/IOU Partnership** (University of California, California State University, Investor-Owned Utility Energy Efficiency Partnership)

*Website:* [www.uccsu.northwoodsoft.com/](http://www.uccsu.northwoodsoft.com/)

### **University of Washington Engineering Professional Programs and Certificate Programs**

*Contact:* 866-791-1275

### **WAMOA – Washington Association of Maintenance & Operations Administrators**

*Website:* [www.wamoa.org](http://www.wamoa.org)

### **Washington State Society for Health Care Engineering**

*Website:* [www.wsshe.org](http://www.wsshe.org)

### **WSU Energy Program – Continuing Education Calendar**

*Website:* [www.energyideas.org](http://www.energyideas.org)

# Conferences & Symposiums

## National and Regional – Winter/Spring 2008

### NATIONAL

#### Maintenance Solutions Expo

March 4-6, 2008 • Baltimore Convention Center • Baltimore, MD

*More info:* [www.nfmt.com](http://www.nfmt.com)

#### National School Plant Management Association

April 12-15, 2008 • Sheraton Music City Hotel • Nashville, TN

*More info:* [www.nspma.org](http://www.nspma.org)

#### Total Facility Management Show

April 22-24, 2008 • The Navy Pier • Chicago, IL

*More info:* [www.tfmshow.com](http://www.tfmshow.com)

#### National Conference on Building Commissioning

Newport Beach, CA

April 22-24, 2008

*More info:* [www.peci.org/ncbc/ncbc.htm](http://www.peci.org/ncbc/ncbc.htm)

### REGIONAL FACILITIES EXPO EVENTS

*More info:* [www.facilitiesexpo.com](http://www.facilitiesexpo.com) (See link for 2008 schedule details)

#### CENTRAL Valley Facilities Expo

March 12-13, 2008 • Modesto, CA

#### New England Facilities Expo

March 19-20, 2008 • Boston, MA

#### Northwest Facilities Expo

April 16-17, 2008 • Portland, OR

#### Southern California Facilities Expo

April 23-24, 2008 • Anaheim, CA

### CALIFORNIA

#### Facility Management Show West (WESTFAC)

March 5-6, 2008 • Anaheim, CA

*More info:* [www.westfac.com](http://www.westfac.com)

#### CASBO (California Association of School Business Officials)

April 26-29, 2008 • Anaheim, CA

*More info:* [www.casbo.org](http://www.casbo.org)

#### CSHE Annual Institute (California Society for Healthcare Engineering)

April 16-18, 2008 • San Francisco Airport • Burlingame, CA

*More info:* [www.cshe.org](http://www.cshe.org)

### WASHINGTON

#### Engineering Vision 2030

March 26-27, 2008 • Seattle, WA

*More info:* [www.pugetsoundashrae.blogspot.com/2007/12/puget-sound-ashrae-and-ieee-announce.html](http://www.pugetsoundashrae.blogspot.com/2007/12/puget-sound-ashrae-and-ieee-announce.html)

#### West Coast Energy Management Congress (EMC)

May 14-15, 2008 • Seattle, WA

*More info:* [www.energyevent.com](http://www.energyevent.com)

#### Energy & Facilities Connections

May 21-23, 2008 • Leavenworth, WA

*More info:* [www.ga.wa.gov/plant/EFC.HTM](http://www.ga.wa.gov/plant/EFC.HTM)

### MAINE

#### Energy Efficiency in Schools Workshop

April 18, 2008 • Lewiston, ME

*More info:* [www.energymaine.com](http://www.energymaine.com)

**FREE**  
**BOC**  
**Webcast**

Learn more about the program by participating in a free BOC Informational Web Cast. All you need is a desktop browser and a telephone. The presentation describes Level I and Level II course topics, schedules and certification requirements in detail. Listen in and find out who benefits by attending BOC training and how graduates are improving their facilities.

*The next Web Cast dates for 2008 are:*

**Wednesday, March 5th**  
**Thursday, June 26th**

**8:30AM - 9:30AM (PST)**

**9:30AM - 10:30AM (MST)**

**10:30AM - 11:30AM (CST)**

**11:30AM - 12:30PM (EST)**

*To sign up go to:*

**[www.theBOC.info](http://www.theBOC.info)**



## Improving Indoor Air Quality, Saving Energy & Reducing Your Carbon Footprint: During the Heating Season

Here is an easy way to earn **one continuing education hour** towards annual BOC recertification. Read the article on IAQ & Energy Savings that begins on page 1 and take this short quiz on the material. Mail or fax your answers to our offices, with your certification renewal application, as directed at the end of the quiz. With a passing grade, we will apply one credit hour to your record.



### CHECK YOUR ANSWER(S):

- 1) Reducing fuel use via energy conservation strategies is often a productive means of reducing one's carbon footprint and saving money.  
a.  TRUE      b.  FALSE
- 2) In many facilities with northern and southern window exposures, it is important to be able to heat the north side ventilation air and not heat the south side.  
a.  TRUE      b.  FALSE
- 3) A reasonable goal in any facility is: energy efficiency, good indoor air quality, good occupant comfort/productivity and minimizing the carbon dioxide footprint.  
a.  TRUE      b.  FALSE
- 4) To improve HVAC operations which items below should be addressed?
  - a.  Locate areas where fans run unnecessarily during off hours.
  - b.  Locate areas where overheating is occurring
  - c.  Insulate heating pipes that are not insulated.
  - d.  Make roofs a light color where air is drawn in at a rooftop unit.
  - e.  Air seal the building envelope with expanding foam as needed.
  - f.  All the above.
- 5) Vending machines should be located on the north side of buildings.  
a.  TRUE      b.  FALSE
- 6) Tight air sealed buildings allow better control of indoor air quality, save money and should reduce the carbon footprint.  
a.  TRUE      b.  FALSE
- 7) In most parts of the USA, exhaust or makeup air costs \$6 to \$7 per CFM annually.  
a.  TRUE      b.  FALSE

- 8) Retrofitting Variable Frequency Drives to fans and pumps often saves energy and reduces the carbon footprint.  
a.  TRUE      b.  FALSE
- 9) For most facilities, beginning to plan for future energy costs is an important activity, which may help to reduce the impact of future escalations in costs.  
a.  TRUE      b.  FALSE

### END OF QUIZ

We include a quiz like this in each of our bi-annual newsletters. 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, 605 1st Avenue, Suite 401, Seattle, WA 98104. Please remember to send it with your certification renewal application.

Your Name: \_\_\_\_\_

Title: \_\_\_\_\_

Employer: \_\_\_\_\_

Address: \_\_\_\_\_

\_\_\_\_\_

City: \_\_\_\_\_

State: \_\_\_\_\_ Zip: \_\_\_\_\_

Phone: \_\_\_\_\_

Fax: \_\_\_\_\_

Email: \_\_\_\_\_



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Email: **BOCinfo@theBOC.info**



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Northwest Energy Efficiency Alliance • NSTAR  
North Carolina Community College System  
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  
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Federal Energy Management Program • Unitil  
Washington State General Administration  
Western Massachusetts Electric Company

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

**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
• Completion of an energy consumption benchmark for the previous 12 month period using ENERGY STAR® Portfolio Manager or alternative energy accounting tool .....	3 hrs/year equivalency

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 2008, 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 article (pages 1-2 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, **along with your recertification application. Please do not send separately.**