



ARE YOU A BUILDING OPERATOR In a City with Energy Benchmarking Requirements?

Energy benchmarking is a building operation best practice that's on the rise. Owners and managers of all kinds of buildings – small and large, new and old, from offices to schools, warehouses, and shopping centers – are measuring their property's energy consumption and taking steps to reduce it.

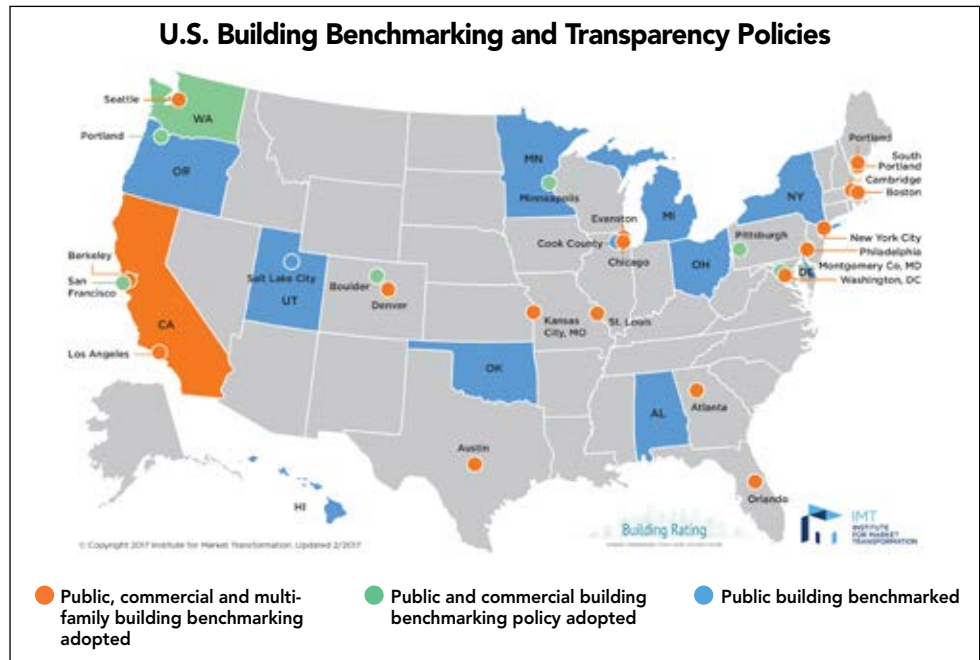
Benchmarking means measuring a building's energy use and then comparing it to the average for similar buildings. It allows owners and occupants to understand their building's relative energy performance, and helps identify opportunities to cut energy waste.

A recent analysis by the U.S. Environmental Protection Agency showed that buildings that are benchmarked save on average 7 percent in energy costs over three years.

What does this mean for building operators?

You may be assigned the job of benchmarking energy performance of your building. While it may feel like one of those "other duties as assigned" projects, think about it as a way to show your value to management. Consider this impressive example from the Institute for Market Transformation (IMT). Buildings across the U.S. that benchmarked over a 3-year time span reduced energy consumption by an average of 2.4% annually. **For a 500,000-square-foot office building, this could result in cumulative energy cost savings of \$120,000!**

An energy benchmark can lead you to new opportunities. For example, you may be asked to do a building energy audit and recommend energy savings actions to improve the benchmark. Could this be an



opportunity to fund those projects on your wish list such as making needed repairs and replacing older inefficient equipment?

If you're fortunate enough to get your projects funded, you can use the benchmark tool (Portfolio Manager) to track their performance over time.

What does it mean for BOC graduates?

- You have a leg up on energy benchmarking because you studied it in the BOC 1002 class and completed a project assignment using the ENERGY STAR Portfolio Manager tool.

- If you live in Chicago, BOC credentialed operators are qualified to serve as data verifiers to ensure accuracy of energy performance ratings.
- If you live in Seattle, BOC Level II credentialed operators meet the qualifications to be a tune up specialist.
- If you live in one of the 20 cities involved with the City Energy Project (CEP) to improve the energy efficiency of buildings, you play a role in keeping the building running well. Some cities have included training and certification as a requirement for participating in a challenge program, while others have incorporated certification requirements within the guidelines for managing the city's own buildings.

Check the map above to see if you live in a city or state with benchmarking requirements.

Tell us how energy benchmarking is affecting the work you do. Email us at bocinfo@theBOC.info.

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BOC Grads Making a Difference

Don Hovland

BOC LEVEL I Certificate
The Evergreen State College
Washington



Don Hovland

Don Hovland is a Maintenance Mechanic III/Electrician with **The Evergreen State College (TESC)** in Olympia, Washington. He's responsible for installing new electrical equipment and related control systems, and electrical maintenance & diagnostic assignments related to equipment and lighting control systems. The campus consists of approximately 1,000+ acres with most of the major buildings located in a 350 acre core area. Don estimates campus building square footage, excluding dormitory buildings, is 1.5 million. He took the BOC Level I and II with a group of fellow employees from the College's Facilities Department. He estimates 20 individuals from TESC have attended the BOC training in the last 6-8 years. Read on for a brief interview with Don to learn about his background, responsibilities and recent experience.

What is your work background? Years in the field?

Don's background is in the heavy construction industry. He's worked at the College in the Facilities Department for over 24 years, primarily on electrical related projects and coordinating electrical related technologies.

Recent experience?

His current work involves working with a group of campus stakeholders to develop a campus standard for a building electrical metering system that will allow desktop access to read meters and look at trending energy use. These new meters and sub meters will be connected using the campus I.T. network to provide the Facilities Department remote access to meter data via a direct connected laptop or network desktop computer. This information can be used for billing and to evaluate future energy

conservation projects and document using actual data.

Were you able to work with your utility company on any rebates?

The College has worked with Puget Sound Energy on rebates for the campus energy project. They completed multiple lighting system upgrades "in house" in addition to working with ESCO contractors to plan and complete additional energy saving projects which are typically coordinated by engineering and project management staff in the Facilities office.

Why did you take the BOC training? Does your company require it?

The training wasn't required but it was presented as an opportunity to get a good, well rounded base that his group would benefit from, so he attended.

How did BOC training help you on the job?

The BOC training helped Don see how multiple building systems are interconnected and benefit from interdisciplinary coordination to operate at peak efficiency. "As we move forward, and more equipment and control systems are being offered with network connectivity, we can take advantage of the opportunity to partner with the IT folks to deliver a better experience for our building users." One example is that we can take advantage of the opportunity to coordinate space scheduling, heating, lighting, occupancy and other related system use to operate the building more efficiently.

Don explained that new technology is being incorporated into systems and equipment which his organization is starting to use. New electrical metering systems that he installs have the ability to be connected to the IT network so individuals can be granted desktop access to this metering information and analytical software to document current conditions and energy saving projects after they have been installed.

Another example is several building lighting control systems can be connected to the campus network to allow remote programming change in addition to offering scheduling options based on room or space needs. Typically, the IT team has access to computer systems technology that can be connected to facility related equipment and systems to take advantage of the enhanced functionality being offered and better monitor current and future energy use. These two

work groups – Facilities and IT - are under separate management organizations with different codes and standards. The two are discussing ways to work together to build into a functional working model that meets the organization's needs.

Scott Davis

BOC LEVEL I Certificate
Michigan's State Facilities Administration (SFA)
Michigan



Scott Davis

Scott Davis is a **Facility Supervisor** for **Michigan's State Facilities Administration (SFA)** Building Operations Division. He is responsible for multiple large facilities located at the State Secondary Complex in Dimondale, Michigan. The complex consists of 13 facilities totaling approximately 2.5 million square feet and includes diverse building types for the state police academy, research laboratories, office buildings, warehouses and maintenance garages. Scott and his facility management team completed the BOC program in Lansing in 2013 and have subsequently reviewed O&M procedures and implemented large-scale energy efficiency improvement projects. Read on for a brief interview with Scott to learn about his background, responsibilities and recent experience.

Please share a little about your work background. How long have you worked with your current facility?

I have been working with the State of Michigan Building Operations Division since 2002. I have been involved with facility maintenance and operations for 20 years with a prior construction background. I have a well-rounded background with strength in mechanical and electrical trades. I had the opportunity to work within the State of Michigan Energy Center being at the heart of a centralized campus utility productions facility, providing steam, chilled water and electrical for the complex.

(Continued on page 3, see **BOC GRADS**.)

BOC GRADS (Continued from page 2)

Tell us about managing facilities for the State of Michigan. What is your favorite part of the job, and what is challenging about managing these facilities efficiently?

My favorite part of the position is to be able to utilize the talents of the team to provide solutions for our department and our customers (state facilities). Our team is a two-part system in which one group takes raw materials and produces usable energy that is distributed to the facilities. The second group interacts with our customers daily to maintain safe and efficient environments. We find that the most challenging aspect is being fluid enough to meet the rapidly changing needs of our customers. That may be in operational hours/building schedules, staffing re-assignments, workspace organization, etc.

What energy-saving actions have you completed since the BOC training?

We have reviewed facility schedules and try to keep them up-to-date with customer occupancy. Additionally, we have taken notice of the facility envelopes replacing door seals, thresholds, caulking, window seals, etc. The largest recent upgrade is a 3,500-count LED smart lighting system with daylight harvesting and motion-sensing capabilities by individual zones.

Did your employer encourage BOC training?

Yes, several Building Operation Division personnel have completed BOC.

How did your BOC training help?

The BOC training was helpful for providing our entire Building Operation Division team with a baseline of knowledge and understanding regardless of individual background.

How did the BOC training influence the decision to do the energy efficiency project?

We were able to calculate Return on Investment on the lighting project based on an improved understanding of utility billing and lighting electrical consumption.

Provided courtesy of the Midwest Energy Efficiency Alliance (MEEA), the administrator of BOC in 10 Midwest states. MEEA wishes to thank Sarah Goodrich with the State of Michigan Department of Technology, Management and Budget for facilitating this BOC graduate highlight.

Q&A With BOC Instructor William M. Leahy



William M. Leahy

How did you get involved in Facility Management?

I was an electricity and architectural drafting Tech Ed High School teacher in the late 1970s. I took a certification course to be trained as a commercial

energy auditor to assist local schools and hospitals complete federal grants for improving their energy efficiency. In 1980, I was recruited by a major electric company to train their Account Representatives and assist them in providing solutions for lowering energy cost at their major customer's facilities. In 2000, I became the director of an energy efficiency application center at a local state university. My FM related career lasted over 35 years.

When and How did you hear about BOC?

Early in my energy auditing days, I took courses provided by manufacturers of boilers, lighting, motors, and controls. The focus of the training was on the basics of the technology, and the features and benefits of their specific equipment. In the late 1990's, I heard about BOC and took the program. BOC provided a more objec-

tive and comprehensive job of covering all the buildings energy systems and provided a whole building approach to performing operations and maintenance functions and assessing the value of efficiency improvements.

"I am always impressed by how much participants really know about how equipment in their specialty works."

- William M. Leahy

What is your area of expertise in FM?

My specialty is in operations and maintenance and teaching building operators to identify cost effective solutions by evaluating the performance of their own system versus alternatives.

What do you see as the greatest challenge to your particular field?

Once building operators are trained to be in-house energy auditors, helping them persuade their management to take action and obtain resources to pay the up-front cost for new equipment.

Is there anything that surprises you when you teach BOC classes?

I am always impressed by how much participants really know about how equipment in their specialty works. I am also disappointed that many building operators do not get the training and financial support to make their facilities more efficient and reliable.

Do you have any FM tips you'd like to share?

Develop relationships with the account executives of your energy supplier as well as manufacturer's reps for the major energy systems in your facility. Challenge them to assist you in making your facility more energy and cost effective ...and of course, get as much training and certification as you can to build your own credibility and future potential.

How do you like to spend your free time?

Restoring pre-1970 automobiles, including my own 1968 Triumph.

Q&A With BOC Sponsor Baltimore Gas & Electric

(Editor's note: Baltimore Gas and Electric (BGE) sponsors BOC training and credentialing for their commercial customers by providing tuition subsidies for operators who meet the eligibility requirements. BGE's implementation contractor for energy efficiency programs is ICF. Jonathan Becker is a Retro-commissioning Program Manager with ICF, and participated in this interview.)



How did you become involved with energy efficiency initiatives?

We are the energy efficiency program implementer for Baltimore Gas and Electric.

How did you and your company first hear about the BOC program?

We evaluated and verified different professional courses being offered nationwide.

How do you go about promoting the training to your commercial and institutional customers?

Most of our outreach is directly through our account management team and email campaigns.

What benefits does BOC provide for your customers?

Our focus is kWh reduction, providing our customers with a clear understanding of the relationship between operating their existing systems as designed and saving energy (kWh) is our goal.



Energy efficiency incentives for your business

pse.com/mybusiness



PUGET SOUND ENERGY

What would you say is the sector breakdown for BOC training participants?

The education sector (K-12 and higher Ed) has been 80% of the participation followed by property management.

What type of feedback do you get on the training?

All positive feedback.

Is there anything else you'd like to add?

Alison, Ken, and Jack (with the National Sustainable Structures Center at Pennsylvania College of Technology*) providing support and helping us work through the logistics from trade shows to the actual training course has been a huge help. It definitely takes a team effort to make these courses a success.

* NSSC is the regional administrator of BOC training in Pennsylvania and Maryland.

New to BOC®?

Listen to a FREE Informational BOC Webcast:

BOC Informational Webcasts are for building professionals who want to learn more about the BOC program and the benefits it offers. Learn about Level I and Level II course topics, schedules and credential requirements in detail. Join us to find out how BOC training and certification can give you and your staff a professional advantage and how graduates are improving their facilities.

Our next session is scheduled for:

**August 23rd
8:30 AM PST/11:30 AM EST.**

A recorded version of the webcast can be downloaded from the BOC website 24/7.

To register for the August webcast or download a recorded version, please visit the BOC website at www.theBOC.info.

Training is available from Maine to Hawaii, Montana to Texas – and now even Canada!

NEEC Partners with SEEA and ADECA to Offer BOC in Alabama

The Northwest Energy Efficiency Council (NEEC) is excited to announce its partnership with the Southeast Energy Efficiency Alliance (SEEA) and the Alabama Department of Economic and Community Affairs (ADECA) Energy Division to bring the Building Operator Certification (BOC®) training program to the state of Alabama.

ADECA is a recipient of the U.S. Department of Energy's State Energy Program award, which will enable the project team to offer the BOC program to building operators in local government and K-12 schools over the next three years. The goal of the project is to develop the BOC program along with other technical assistance resources. The project also aims to address barriers that make it challenging for public building operators to receive comprehensive energy efficiency training.

"NEEC is so pleased to partner with two great organizations, SEEA and ADECA, who provide outstanding leadership on energy efficiency in the Southeast. Their efforts to extend the BOC program to facility professionals throughout Alabama will provide great benefit by improving the operational cost and performance of commercial and institutional buildings across the state," said Stan Price, Executive Director of NEEC.

"We are thrilled to be working with ADECA and NEEC to offer BOC training. We have seen BOC's positive impact on workforce development in other regions and are excited to be bringing it to Alabama," said SEEA President Mandy Mahoney. "BOC provides a unique opportunity to engage a broad group of stakeholders, including local governments, utilities and energy service companies, in supporting the creation of a more skilled and knowledgeable building operator workforce."



A BOC Level I course is scheduled to begin in Clanton, Alabama in October 2017. For more information, please visit theboc.info. Details on the BOC courses offered in Alabama can be found at www.bocalabama.com.



BOC Celebrates 20 Years

The Building Operator Certification (BOC) is celebrating 20 years of saving building owners money on utility costs and equipment maintenance through operator training. BOC was founded by the Northwest Energy Efficiency Council in 1997, the same year a federal mandate began requiring Federal agencies to report energy costs and energy saving activities in their buildings. Today, over 19,000 operators have earned a BOC credential in the United States and Canada, saving over \$30 million dollars in energy costs during 2016 alone.

Celebrate 20 Years with us by entering a drawing for one of two prizes - a BOC hat or a complimentary webinar of your choice. Three winners will be selected and must have a BOC credential in good standing to win. <https://www.surveymonkey.com/r/BOC20years>



nationalgrid

Sign up for Building Operator Certification®, get more comfortable buildings.

Find out More at theboc.info

Check out BOC's Technical Webinar Series!

The BOC program offers webinars, both live and recorded, to keep you informed on the dynamic field of facilities management. Learn practical solutions to reduce your building's energy use and increase your equipment longevity from leading industry experts, covering topics such as building retuning, addressing air handler issues, and the latest in lighting. Register at the BOC web site (www.theBOC.info) and receive a link with log-in and password information. Successful completion of each webinar and its accompanying quiz earns you 1.5 points towards maintaining your BOC credential and .15 IACET CEU's towards the renewal of industry certifications, certificates, and licenses including but not limited to AIA, PE, LEED, IFMA, ASHRAE, and AEE.



The **2017 live series of webinars** focus on ways to improve occupant and thermal comfort by addressing issues such as building envelope, procedures for your building, building automation systems (BAS), and no/low-cost methods for energy efficiency improvements. Upcoming live sessions:

- Addressing Hot and Cold Calls – What's Your Procedure? **September 14th**
- Operational Improvement Options without Using a Building Automation System – **October 18th**

Previous 2017 webinar topics available on demand:

- New Technologies for Lighting Retrofits and Upgrades
- Operational Improvements Using Building Automation Systems
- Building Envelope Leakage/Infiltration – Air, Moisture, and the Problems They Cause
- Troubleshooting Common Air Handler Problems – **May 17th**

Live webinars are held from **2pm to 3pm EST** and, once held are available online at our webinar library. Check out the BOC web site for details. And remember, BOC graduates who maintain their credential receive a **20% discount** on the BOC webinars series.

NEW! Exam Prep Webinar Series

The BOC program is offering a webinar series to help you prepare for the BOC Certification Exam. Our last newsletter featured information about the BOC program's alignment with the ISO 17024 standard and the new credential structure. For those of you ready to add the ISO-aligned Certification credential to your professional resume, we encourage you to check out all of our exam preparation resources here: <http://www.theboc.info/preparing-for-exam>

The webinar series will include four sessions, each one focusing on a critical work function from the exam blueprint. **Webinars will be held at 3pm EST / 12pm PST.**

Wednesday, October 11th *Maintain Energy Using Building Systems, Equipment, and Envelope to Minimize Energy Use*

Overview of material to focus on related to performing preventive & predictive maintenance; troubleshooting system & equipment problems & performing diagnostic testing; documenting equipment maintenance

Tuesday, October 24th *Operate Energy Using Systems for High Performance*

Learn more about what the exam covers related to equipment settings & system control points; measuring & monitoring energy performance; and sustaining energy performance

Tuesday, November 14th *Perform Technical and Administrative Duties*

Brush up on what you will need to know about maintaining records & reports, communicating with management, co-workers, & occupants, and understanding building codes.

Tuesday, November 28th *Maintain Indoor Environmental Quality to Standards*

This session will review information related to: measuring and monitoring IEQ parameters; IEQ issues; and developing and implementing an IEQ plan.

The 4 part series is available at the introductory price of **\$179**. This rate is available for Fall 2017 only and will increase to \$199 in 2018. Single webinar registrations are available for **\$59**.

The webinar series is sponsored by Pacific Gas and Electric. The first 50 PG&E customers are eligible for a complimentary registration. Contact the BOC Help Desk for more information.

Stay Ahead: Prep for BOC Maintenance Now!

To maintain your BOC credential, graduates must accumulate maintenance points each year following a full calendar year after they've earned their credential. Level I Training Certificate of Completion and Certification maintenance requires five points each year and Level II requires ten. Points may be earned through activities such as: attending a BOC technical webinar and completing the quiz; reading the tech article from a BOC Bulletin and submitting the quiz; continued employment in building operations; continuing education in building operations; completing energy efficiency projects at your facility; membership in a building operations association; benchmarking your building; attending a facilities trade show.

The BOC program will send you a personalized invitation to maintain your credential in January 2018.

Are you a Current Credential Holder?

WIN FREE STUFF!

Twice a year, current credential-holders may enter a drawing to win merchandise such as BOC gear from our Shop, diagnostic tools, or reference manuals. Our next drawing for a BOC hat, mug or shirt is **October 6th**.

Congratulations to the winner of our April drawing, **Dee Chitty** of Gilford Public Works, Gilford, New Hampshire.



ENTER TO WIN HERE:

<https://www.surveymonkey.com/r/bocsumfall2017>

Another Benefit for BOC Credentialed Operators

BOC graduates who maintain their credential receive a **20% discount** on the BOC webinar series. Check out the webinar schedule and library at:

<http://www.theboc.info/continuing-education/webinars/>

Power Meters & Energy Logging

Measuring electric power consumption of mechanical and lighting equipment is a useful method to establish energy consumption, verify energy savings, or determine the electric load on distribution panels and transformers in commercial buildings. The Tool Lending Library at the Smart Buildings Center in Seattle, Washington has portable power meters from Fluke and Dent Instruments that are simple to use and provide a wealth of data for electric energy consumption and load studies. These instruments are available for loan free of charge to building owners, electrical contractors, and energy service providers in Washington and Oregon. If you aren't located in OR or WA, check with your local utility as libraries are also available in California, Idaho, New York and other locations throughout the US.

FLUKE 1730 Energy Logger

The Fluke 1730 Energy Logger provides a simple method to measure and log energy use of single and three phase electrical equipment and systems. The logger can be powered by an integral battery pack for short term studies up to 4 hours. For longer term studies, the logger can be powered directly by the measured circuit. More than



Fluke 1730 Energy Logger with voltage cables, rocoils and carrying case.

20 separate logging sessions can be stored on the instrument. All measured values are automatically logged and can be reviewed during logging and before downloading for on-the-go analysis.

The Fluke 1730 Energy Logger includes flat cables for reference voltage and flexible rocoil type current transducers rated at a maximum of 1500 amps up to 600 volts. The logger includes a USB port for downloading data for analysis using the Fluke Energy Analyze software. The data can also be exported for use in spreadsheet programs for further analysis.

Dent Instruments ELITEPro XC

The Dent Instruments ELITEpro XC is a complete solution for pinpointing and quantifying energy usage. It is capable of measuring, storing, and analyzing electrical consumption data. These meters can capture kWh/kW energy and demand data as well as relevant energy parameters for diagnostics and monitoring on three-phase and single-phase circuits. The meter's fast sampling rate allows for real-time display of voltage, current waveforms and harmonics.



Dent Instruments ELITEpro XC with voltage cables, available current transducers and carrying case.

The portable meter measures up to four channels of energy metrics with currents ranging from 0-6,000 amps. The meter also has the capability of recording analog data with a configurable input range for voltage (0-10 VDC) or current transducers (0-20 or 4-20 Ma). These analog inputs are used for process or environmental correlation studies with power.

The meter is easily configured using ELOG software. A Setup Table is the file that programs the logger for the project. When the Setup File is sent to the logger the meter is ready for deployment. The meter is powered directly from the phases of the service being measured. Measurements are stored in on-board memory which allows for long term logging sessions. Analyze the data and create graphs with ELOG or export the data file for use in spreadsheet programs.

This article was written by Duane Lewellen-BOC instructor and Senior Project Manager-Tool Lending Library at the Smart Buildings Center

Cut Costs and Improve Lighting with Low Wattage T8s

Low wattage T8 lamps, which are available in 28- and 25-watt versions, offer an easy and cost-effective way to immediately reduce energy usage without sacrificing light quality. Successful low wattage T8 projects are happening in a variety of building types across the Northwest. Here are a few examples:

Office Buildings

25-watt T8 lamps are Puget Sound-area lighting supplier Capital Lighting's top recommendation for its customers' projects. Capital Lighting helped one Seattle high-rise replace its 32-watt T8 lamps with 16,000 25-watt versions, for an estimated 387,000 kWh in energy savings annually and \$24,000 in annual utility cost savings.

Retail Stores

Seattle-based pharmacy chain Bartell Drugs brings in an estimated \$100,000 in savings each year since it made the switch to 25-watt T8 lamps in all existing locations three years ago. Thanks to low wattage T8s, Bartell Drugs extended its group relamping schedule from three to five years – and payback is expected in under two years on average.



Bartell Drugs' Lynnwood, Washington location has 25-watt T8 linear fluorescent lamps installed to save energy and money.

Education Facilities

Low-wattage T8 lamps also help facility managers achieve optimal light color and quality for occupants in education buildings. Hillsboro School District in Oregon switched to 28-watt T8 lamps in one of its buildings to save more than \$5,000 in annual operating and maintenance costs.

To find a distributor and learn more about the benefits of low wattage T8s, go to: www.LowWattT8.com

Building Operators and Office Comfort

How are you handling hot and cold calls?

Temperature complaints are the single most frequent grievance building operators hear – surpassing high noise levels, limited space and unpleasant odors. This issue's technical article is offered in two parts.

Part 1 shares research on office temperatures and worker productivity, with **Part 2** discussing tips for addressing hot and cold calls.

Read both parts, including related sidebars and take the quiz at the link listed at the end of the article to earn 1.5 maintenance points toward renewal of your BOC credential.

PART 1

Ideal Office Temperatures For Productivity

by Chris Adams – Updated June 18, 2017

Source: The Thought Company - www.thoughtco.com

Conventional wisdom says that finding the ideal office temperature is important to worker productivity. A difference of just a few degrees can have a significant impact on how focused and engaged employees are. For decades, the available research

suggested keeping the office temperature between 70 and 73 degrees Fahrenheit would be best for the majority of workers.

The problem was that the research was outdated. It was primarily based on an office full of male employees, as most workplaces were until the latter half of the 20th century. Today's office buildings, however, are likely to have as many women as men. So should that factor into decisions about office temperatures?

Women and Office Temperature

According to a 2015 study, women's different body chemistry must be considered when setting the office thermostat, especially in the summer months when air conditioners run all day long. Women have lower metabolic rates than men and tend to have more body fat. This means women will tend to be more susceptible to cold than men. So if there are a lot of women in your



office, some temperature adjustment may be required.

Even though the research may recommend 71.5 F as the minimum acceptable temperature, office managers should consider not only how

many women are in the office, but how the building is designed. Large windows that let in a lot of sunlight may make a room feel warmer. High ceilings may create poor air distribution. Knowing your building, as well as the people in it, is crucial to getting that ideal temperature.

How Temperature Affects Productivity

If productivity is the driving factor in setting office temperatures, looking at old research is not going to help create comfortable workplaces. But research shows that as temperature rises, productivity declines. It makes sense that workers, male and female, would be less productive in an office whose temperature was over 90 F. The same is true as the temperature decreases; with the thermostat set below 60 F, people are going to spend more energy shivering than focused on their work.

*(Continued on page 8, see **TECH QUIZ**)*

TECH QUIZ (Continued from page 6)

Editor's note: There is no requirement for employers to maintain a certain workplace temperature under federal Occupational Safety and Health Administration (OSHA) regulations; however, OSHA does recommend employers maintain workplace temperatures in the range of 68-76 degrees Fahrenheit and humidity control in the range of 20 to 60 percent.

Other Factors Affecting Temperature Perception

- How much a person weighs, specifically their body mass index or BMI, can affect how they react to temperature. Those who weigh more will feel warm more quickly, while those with lower-than-average BMI usually get cold easier.
- Age also plays a role. As we get older, particularly above 55, we tend to be more easily affected by the cold. So an older workforce may benefit from a slightly warmer office temperature.
- And let's not forget humidity, which affects how we perceive temperature. If the air is too humid, it can affect people's ability to sweat, which can lead to heat exhaustion. A relative humidity level of 40 percent is optimal for year-round comfort.

And while high humidity can feel oppressive, low humidity can make the air feel colder than it is, which is also problematic. This can cause skin, throat and nasal passages to feel dry and uncomfortable. Being either too humid or not humid enough affects perceived temperature and comfort levels. So keeping a good relative humidity level is key to maintaining a healthy and productive office environment.

About the Author:

Chris Adams is a human factors engineer and industrial designer. As human factors engineering is the parent discipline of ergonomics, he is well-versed in the impact of good design on both health, comfort and efficiency. Chris has provided human factors engineering support to NASA on International Space Station systems and payloads. Working on projects of this magnitude in the unforgiving environments of space and space launch has been a unique and educational experience for him.

PART 2

Two BOC Graduates Share Tips for Handling Hot and Cold Calls

Now that we understand the relationship between office comfort and productivity, let's take a look at the role building operators can play in maintaining a comfortable, productive workplace. What procedures are you using to address these concerns, take corrective action, and provide good customer service? We asked two BOC graduates to share their how-to's with us for this article.



David Johnson

David Johnson, is a Chief Engineer with ABM Engineering Services in Irvine, CA, and holds a BOC Level II certificate. He recommends his team follow a step-by-step checklist of verification steps

for addressing HVAC calls. "We get three kinds of calls – hot and cold, and the "stuffy" room," says Johnson. His engineers carry a basic set of tools when they go out to investigate. "The variety of tools we use escalates as we investigate, but the starting point is always a calibrated thermometer for verifying space temperature and thermostat calibration." For measuring potential drafts, they use a thermo-anemometer for temperature and air velocity. If the air balance or CFM sensor is suspect, they verify actual CFM delivered with a balometer. For conference rooms or "stuffy" calls they use a psychrometer to determine RH (latent heat).

"I avoid IR thermometers for anything but "spot checking" equipment temperatures such as motor bearings, electrical breakers, and switches," Johnson notes. He recommends a Fluke web page which explains the ins and outs of using hand held IR thermometers.

<http://en-us.fluke.com/community/fluke-news-plus/temperature/how-to-get-great-results-with-an-infrared-thermometer.html>

"I'm sure there will be those who think this is a lot, but it all boils down to the continuous commissioning and system optimization every building engineer should be capable of doing," says Johnson. Not only do these practices help with office comfort, but his team reduced electrical use for the company by 500,000 kWh of electricity over the previous year. While the reduction is primarily due to LED lighting projects, it wouldn't be possible if the HVAC systems did not remain optimized.



Dean Carter

For **Dean Carter**, Chief Engineer with CBRE in Seattle, WA, customer satisfaction is paramount. Tenants call the customer service center to report comfort problems, or they may by pass the service center and

submit a work order themselves. "We ask them to address a set of questions to help the engineering staff understand the conditions – for example, what area or room do you work in? What is the temperature in your area?" Their standard setting for heating season is 71F, explains Carter. If he verifies the zone temperature is within 71F, then he'll talk to others in the space to determine general satisfaction.

Sometimes it's just one person with the complaint, at which point he'll explore other factors such

"Giving people options and staying in close communication are the best ways to increase satisfaction"

– Dean Carter

as relative humidity, and air distribution (it is blowing on them?), and fan operation. Can we redirect the air from the diffuser if there's a draft on them? "Giving people options and staying in close communication are the best ways to increase satisfaction."

says Carter. He may offer to adjust temperature in the space one degree, adjust air flow, trend temperatures at the person's desk over time. If all else fails, the manager of the complaining employee has the ability to request a space heater.

What's Carter's favorite tool? "A sling or electronic psychrometer is ideal. I also use an infra-red (IR) gun" says Carter.



(Continued on page 9, see **TECH QUIZ**.)

TECH QUIZ (Continued from page 8)

TECH QUIZ - SIDE BAR 1

Checklist for Responding to Common HVAC Calls

Hot and Cold Calls:

- Is the thermostat calibrated and reading correctly? If the T-Stat is out of calibration, it doesn't matter if the rest of the system is working perfectly – you will never achieve the correct temperature at the zone level.
- Is working correctly? Check damper actuator and linkage for proper operation.
- Check wire terminations for sensors, actuators and communications.
- Is the air handling unit (AHU) providing supply air at the correct temperature and static pressure?
- Is the boiler on line and making hot water at setpoint?
- Conference and meeting rooms can be occupied rapidly. Latent heat loads produced by people (respiration, perspiration) will rise faster than the sensible heat load resulting in hot calls. Keep this in mind when you are verifying T-stat calibration – 73 degree dry bulb temperature with high humidity is going to “feel” like it's 76 degrees! Open the VAV damper manually to bring sensible temperature down a degree or two.
- Check air balance! If the CFM sensor is not reading correctly, perform air balancing and recalibrate CFM sensors.



Draft or “Stuffy” Calls:

- Is the variable air volume (VAV) system working correctly?
- Is the AHU providing supply air at the correct temperature and static pressure?
- Measure air velocity at area where complaint originated. If feet per second (FPS) measures 50 or greater you definitely have a draft.
- Change direction of supply grills as needed for draft calls.
- In open areas, check surrounding zones. The problem may be with an adjacent VAV.
- Check air balance! If the CFM sensor is not reading correctly, perform air balancing to recalibrate. Changing CFM set points without checking air balance is only going to compound the problem.

Building Pressure:

- Are return fans operating as they should?
- Are AHU's in startup or shutdown mode?
- Is building pressure sensor calibrated?
- Are outside doors closed?

— Courtesy —
David Johnson,
ABM Engineering Services

TECH QUIZ - SIDE BAR 2

Favorite Tools and Resources

Johnson: Calibrated thermometer, thermo-anemometer for temperature and air velocity, bolometer for CFM, psychrometer for “stuffy” rooms.

Carter: Sling or electronic psychrometer, Infra-red (IR) gun.

Read about Using Data Loggers to Address Comfort Complaints:
<http://www.onsetcomp.com/files/Comfort-Complaints.pdf>

Fluke explains the ins and outs of using hand held IR thermometers.
<http://en-us.fluke.com/community/fluke-news-plus/temperature/how-to-get-great-results-with-an-infrared-thermometer.html>

BOC Technical Webinar: Addressing Hot & Cold Calls – What's your procedure?

September 27 from 11am-12noon
<http://www.theboc.info/continuing-education/webinars/>

TAKE THE QUIZ!

You can earn 1.5 maintenance points towards your BOC credential renewal by taking a quiz on the material in this Technical Article at:

<http://www.theboc.info/continuing-education/newsletter-quizzes/quiz-occupant-comfort/>



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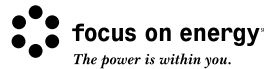
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Graphic Design: ThomHarrisDesign.com