

The Checklist

A Quarterly Newsletter of the Building Commissioning Association



2013 - Third Quarter

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NEW FIRM CERTIFICATION

By Katie Spencer



Certified
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Firm

In continued efforts to serve our members and the industry as a whole, the Building Commissioning Certification Board (BCCB) has responded to your requests. There is an increased impetus in the building commissioning industry for practitioners to hold a commissioning certification on the firm level in addition to the individual level. As a result we have released the Certified Commissioning Firm (CCF).

QUALIFIED CANDIDATE FIRMS FOR THE CCF SHALL:

- Employ at least one Certified Commissioning Professional (CCP)
- Have provided commissioning services for at least two years
- Submit three qualified commissioning projects and references

This new firm certification demonstrates the highest standards for professional commissioning firms. Organizations that hold the CCF designation will stand out among competitors for their commitment to provide the highest quality product to potential clients and their active advancement of the commissioning industry.

CCF certification has a one-time application cost of \$1,000 and an annual renewal application cost of \$150. Details are available at www.bcxa.org/certification. Questions regarding BCA certifications should be directed to Katie Spencer at kspencer@bcxa.org.

Letter from the President

Mark Miller BCA President



Dear Members,

As many of you know, 2013 marks the anniversary of the BCA's 15th year. During our year-long celebration and retrospective, we especially want to recognize the people and organizations that helped us get off the ground. The 2nd Quarter [Checklist](#) included statements from nearly all of the individuals involved in planning the launch of BCA. This issue's article, *BCA's Founding Firms: "Without Whom..."* on pages 12 and 13, features comments from leaders of the organizations that helped to found (and fund) the BCA in its formative period.

We are pleased to announce that, also in keeping with the 15th Anniversary, our Fall 2013 webinar series will be hosted by four of our founding members. The series promises to be one of our most technical, and most fun, to date.

If you haven't had a chance to review the [Special Edition Checklist](#) summarizing NCBC, please take a look. Also, the presentations are now posted on our website (www.bcx.org) along with the video of the BCA's Annual Meeting...on behalf of the members I want to offer special thanks and kudos to our new stage Director and Producer, Craig Hawkins, for making the night more memorable than ever.

Speaking of our annual conference, NCBC 2014 is on the calendar for Hartford, Connecticut, home of the first nationally recognized American architect, Charles Bulfinch, who completed the oldest state house in America in 1796 – still standing today. What better place for an event about building performance? Watch for our Call for Speakers coming your way in September.

The Association is growing and stretching well beyond the North American continent. Board Member Jeff Conner is working with leaders from Brazil and Argentina to develop new chapters. We have also had interest from Dubai, Southeast Asia, Russia and France. The Administration Committee is working to create a structure and process to bring international chapters into the BCA family.

Two projects that the BCA is deeply engaged in this year are supporting our education and training mission: the PECE Commissioning Authority Training Program and the BCCB Certified Commissioning Firm certification. The training is a comprehensive resource for new and developing commissioning authorities. Check it out at learn.peci.org, and pass it on.

The Building Commissioning Certification Board (BCCB) recently announced the newest certification offering in their portfolio - Certified Commissioning Firm (CCF). This certification is a must for companies to demonstrate their firm's commitment to delivering quality commissioning services in new and existing buildings and more information can be found at www.bcx.org/certification/certified-commissioning-firm.

This issue of the Checklist includes feature articles on daylighting (DLCx), building enclosure (BECx) and HVAC commissioning, based on interviews and contributions from some of the most respected individuals in their fields. Along with some do's and don'ts in each of these areas, you'll find out what's expected to affect the CxA profession over the next year in codes, standards and guidelines, along with advice from the experts for these specialized commissioning practices.

This is a great time to be a member of the BCA. I personally encourage you join me in the challenge to continue building the BCA, and invite your colleagues to join. At the same time, I hope you'll find occasions to enjoy the "dog days of summer!"

Sincerely,

Mark Miller, PE, CCP
BCA President

DAYLIGHTING: Commissioning a Strategy, not a System

By Diana Bjornskov

Daylighting is an ancient and universal way to bring natural light into buildings. After the first production of sheet glass in 13th century England and France, it became possible to fully enclose buildings against the elements while also allowing for passage of daylight. Eight centuries later, glass and other architectural glazing materials are vastly improved, and widely used as strategies for high performance, low energy buildings.

Advanced daylighting systems, working as intended, can contribute 10% to 20% in energy savings toward net zero buildings. Such advanced daylighting, when coupled with efficient lighting systems, can together deliver as much as one-third of total energy savings toward net zero buildings; it is a powerful strategy for improving visual comfort, building aesthetics, and building performance. However, daylighting can be even more challenging than electric lighting or view windows to design, build and commission well.

Daylighting is not a single building system, and its purpose is not primarily to be an aesthetic architectural element; rather, it's a strategy that involves integrated solutions across most building systems and approaches, including:

- Building form and orientation
- Enclosure, including window & skylight amounts, locations, & material properties
- Interiors (surfaces, furniture layouts, partitions, etc.)
- Electric lighting systems
- Control of lighting and active shading
- Impact on HVAC and building automation controls
- Training of occupants and operators

The commissioning of daylighting (DLCx) can thus be more complex and needs to involve a whole building approach across interior and exterior building systems. A well-designed, installed and commissioned daylighting strategy will provide excellent energy returns and comfort benefits for the “effective aperture,” i.e., natural light opening(s), whose primary purpose is to deliver a specific measure of light into occupied space – not necessarily vision glass to deliver a view. DLCx can involve meeting the owner’s objectives for performance

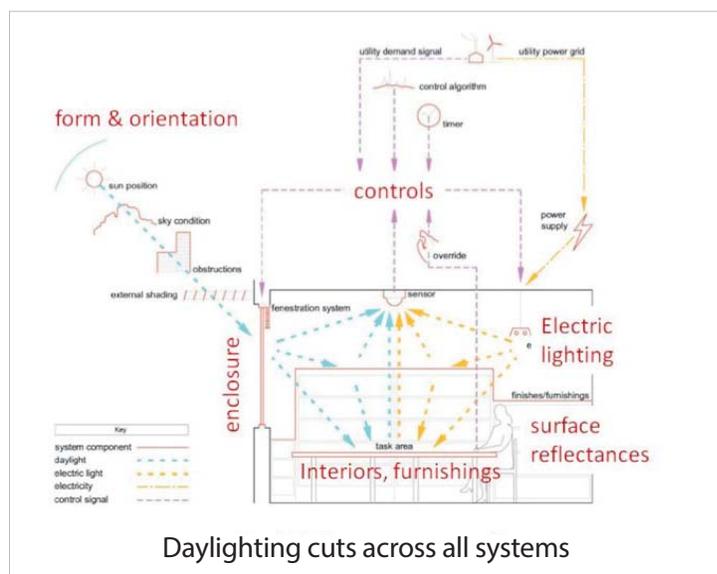
by maximizing the floor area accessible to daylighting in a building, and ensuring a daylighting strategy that minimizes the use of electric lighting without excessive glare from exterior or interior surfaces.

A principal reason for DLCx is the complexity of integrating daylighting with other building systems and specific technologies that are now highly specialized, such as building enclosure systems; materials & assembly interfaces and compatibility; glazing types; building automation systems, for example... not to mention the controls which require expertise in individual systems, and the know-how to test digital versus analog systems.

STANDARD PRACTICE. Daylighting, and therefore DLCx, has not been standard practice in most code compliant buildings until recently. However, daylighting has been a standard design component in many high performance buildings including newer offices, schools, big box retail, libraries, etc. Daylighting is now the most widely used

“If you’re designing, building or commissioning daylighting, you don’t treat it like a single system – it’s a strategic approach to multiple systems. If it were music, it’d be more like playing chords than single notes.”

Joe Deringer, AIA, LEED AP, President of Building Science Analytics, LLC. Committee member for commissioning guidelines NIBS GL3-2012 & IESNA GL-29-11. Chaired NIBS GL3-2006 committee for first BECx Guideline.





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strategy in recent buildings striving to be net zero (New Buildings Institute *Getting to Zero 2012 Status Update*). The design team needs to include someone with the knowledge to select the right controls vendors and to provide advice during design, construction, calibration and testing, and operator training.

INTEGRATED APPROACH. Daylighting, advanced electric lighting, HVAC and photovoltaics (where possible) are four important elements of an integrated approach to performance. A fundamental design objective is to have all these systems and strategies support and complement each other (which can together get you two-thirds of the way from current codes to a zero net energy-ready building) for best performance, comfort and efficiency. Commissioning those systems and associated controls is essential.

Commissioning Authorities Add Value

Unless the CxA is a daylighting specialist, it's important to have daylighting expertise on the commissioning team (separate from the design team). Any daylighting consultant(s) on the Cx team should have the expertise to review the daylighting design, as well as the experience to spot problems and to know what elements could fall through the cracks.

Once improper daylighting solutions are installed it's often too late and too expensive to take corrective action.

As with all commissioning, the OPR serves as the directive to track daylighting strategies and progress, to mitigate owner's risk, and make sure the intention of the OPR is sustained through design and construction. When commissioning of daylighting strategies begins with a review of the Owner's Project Requirements (OPR) illumination criteria for ambient and task lighting, the project roadmap is understood by the whole team.

Commissioning design reviews are critical steps. An iconic and/or high risk daylighting design in a high cost building may well benefit from several design reviews – at completion of schematic, design development and construction documents – where any issues can be discovered and corrected before going on to the next phase. A less risky daylighting design might settle a risk-resources tradeoff with a single review toward the end of construction documents.

Recommendations for DLCx Process

The process of commissioning daylighting is different from HVAC and other single building systems. The Owner or representative and an occupier rep should also be part of this process to make sure users get adequate input and control of their lighting needs. Look for opportunities where architectural decisions can save operating costs.

Here are some issues the CxA needs to be aware of during design and construction phases:

- **Pre-Design.** Develop the first version of the OPR prior to development of the architectural program.
- **Schematic Design.** Refine & Expand OPR, adding items such as illumination criteria, daylight objectives, glare criteria and preferred control devices, and electric lighting system performance characteristics
- **Design Development & Analysis.** For sidelighting, the higher the window, the deeper into the room is the daylighting zone. Include interfaces of daylighting with building envelope, lighting design, lighting controls, mechanical systems and controls. Check for changes in glass type, head height, shading, blinds, roller shade size; as design gets more detailed, make sure that original daylighting intent is being honored and not diluted.
- **Construction Documents.** Review checklists and specifications framework. Conduct daylighting design review at 95% completion of construction documents.
- **Construction.** Closely observe and document all functional testing, acceptance testing, and calibration. During construction, the commissioning process should include an assessment of the general contractor's knowledge of daylighting, plus training and communication with installation crews before they install. The CxA should know whether or not there is a knowledgeable daylighting technician on the construction crew. Functional testing and calibration (not the same as TAB) should take place as soon as components are installed to ensure that systems are installed and integrated properly and in the right sequence. This should happen before the lighting installation trades leave the construction site.
- **Operations Training.** Daylighting should be included in the specific Cx training process to make sure there is funding for this component, and that it is comprehensive.

In ideal circumstances, continuous commissioning using functional testing would go on throughout the first year of operation to ensure that controls can be adjusted to respond correctly to available daylight at different times of the year. Automatic daylighting strategies can be calibrated and tested perfectly on one day, but varying sunlight conditions, and the potential for glare due to light splashing across interior surfaces, will be quite different a month or two down the road. Daylighting-controlled lighting loads need to be adjustable in reference to available daylight over the course of a day and a year (diurnally and seasonally).

Be Aware of New Daylighting Codes, Standards and Guidelines

Daylighting was incorporated into ASHRAE/IES Standard 90.1-2010 and IECC 2009/2012. By October of this year (2013), all states in the U.S. will be required to adopt a commercial building energy code at least as stringent as ASHRAE/IES 90.1-2010, making daylight harvesting standard practice in new construction. Further, the California Energy Code (Title 24-2013, Part 6) becomes effective on January 1, 2014.

The 2013 versions of ASHRAE 90.1 and California Title 24, the most stringent statewide daylighting code in the nation, generally parallel each other with a few differences. Both strongly require the use of automatic daylighting controls. IECC 2012, on the other hand, currently has a loophole that allows manual daylighting controls, although some anticipate that IECC will up-level its requirements for automatic daylighting controls in succeeding versions.

ASHRAE Standard 90.1-2013: Stricter controls and testing on the way.

ASHRAE 90.1-2010 & 2013 both have mandatory requirements for daylighting with automatic controls for all space functions – for sidelighting from windows, or toplighting from skylights, or monitors – once modest minimum thresholds are exceeded. Commercial retail is the only nonresidential space function exempt from the sidelighting requirements, but it is not exempt from toplighting requirements.

In ASHRAE 90.1-2013 skylights with associated photocontrols will be required to produce daylight areas over more than half the floor area for most spaces (a) in

buildings larger than 2500 sf (90.1-2010 requirement was “larger than 5,000 sf”); (b) directly under a roof with ceiling heights greater than 15 ft.; and (c) nearly all nonresidential space.

Functional Testing. ASHRAE 90.1-2010 included a requirement for the functional testing of all lighting systems including daylighting. ASHRAE 90.1-2013 will have more specific requirements for functional testing for daylight controls, occupancy sensors, and automatic time switches. Detailed protocols are not yet established for conducting the functional testing, but the Standard requires documentation that all control devices (photocontrols) have been properly located, field-calibrated and set for appropriate set points and threshold light levels. In addition, daylight controlled lighting loads must adjust to “appropriate” light levels in response to available daylight, and the location where calibration adjustments are made must be readily accessible only to authorized personnel.

ASHRAE Standard 189.1 2011 for the Design of High Performance Green Buildings. This Standard defines daylighting criteria

consistent with ASHRAE 90.1-2007, and updates provisions for minimum top lighting/skylighting, minimum side lighting effective apertures (windows specifically designed for daylighting) by climate zone, and shading to be consistent with ASHRAE 90.1-2010.

California Energy Code: No more simply checking the box. California may or may not become the prototype for daylighting and DLCx

“Lighting controls are on the verge of becoming all digital, so there will be more detection devices and more choices available. Commissioning in the broadest sense will be an important part of the community makeup due to Title 24 and ASHRAE.”

Jim Benya, PE, Principal at Benya Burnett Consultancy, advisor for ASHRAE/IESNA/ANSI Standard 90.1, energy code development, and California Energy Commission; author, *Advanced Lighting Guideline*

best practices, but with 16 climate zones and strong commissioning requirements, California does represent a pathway that industry stakeholders will track, test and potentially adopt to support federal energy efficiency mandates.

Beginning January 1, 2014, California Energy Code requires that all nonresidential lighting – including daylighting – must be both dimmable and controllable. The code states that all lighting shall use at least one automatic control approach, and that the project cannot take credit for automatic controls for daylighting within the building controls requirements. Further, automatic multi-level daylighting controls will be required when a skylit or primary sidelit zone exceeds 2,500 sq. ft. The controls must be calibrated so that space always meets or exceeds design footcandles and electric lighting is fully dimmed when daylight is 150% of design illuminance. Lighting controls can be significantly more sophisticated than many mechanical control systems. Title 24 will require metering provisions to disaggregate

DAYLIGHTING: Commissioning a Strategy, not a System (cont.)

lighting from other loads. Starting in 2014, lighting design in California will be more complex, and a whole building lighting energy efficiency management system is advisable.

Under the heading "Commissioning," Title 24 adds a performance standard compliance requirement in 2014 to produce a whole building performance rating twice: once during design permit stage ("design rating") then after construction acceptance testing ("as-built rating"). No one will be approved to conduct acceptance testing for electric lighting and daylighting unless they have received training and are certified under the California Advanced Lighting Controls Training Program (CALCTP) program – a statewide partnership between utility companies, manufacturers, electricians, lighting designers and electrical contractors. Certificates of occupancy will only be given for facilities that have been tested and certified under this provision. At this time, the first generation of graduates, some 2,500 electricians, have become certified.

U.S. GREEN BUILDING COUNCIL: LEED V.4, THE "NEXT GENERATION"

The purpose of daylighting in USGBC's rating system context is "to connect building occupants with the outdoors, reinforce circadian rhythms, and reduce the use of electrical lighting by introducing daylight and views into the space."

LEED V.4 for New Construction (draft) contains two provisions for acquiring up to three daylighting points for nonresidential buildings with possible extra two points for healthcare facilities. LEED V.4 for Existing Buildings (draft) contains two provisions for acquiring up to four daylighting points. Both are optional.

Champions of DLCx

The list of organizations that research, advocate and promote DLCx is growing. Among them are AIA, IESNA, NIBS, ASHRAE, USGBC, DOE, LBNL, NBI, Energy Center of Wisconsin, and a

host of government institutions and universities. It's fair to say that DLCx supporters are amassing, and the use of daylighting is being mandated by both national standards and leading state energy codes. Daylighting is likely to increasingly become standard practice in the coming years. A list of useful daylighting resources is available on BCA's website at www.bcx.org.

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What Do You Really Need To Be A Qualified Commissioning Authority?

By Liz Fischer, BCA Executive Director

Every time owners or facility managers ask me, “How do I know if I’m choosing a good Commissioning Authority?” I remind them that nothing can replace a personal recommendation for the quality of work done in previous similar projects. But that’s not all – an outstanding resume of projects, along with certification, prove that they’re hiring a Commissioning Authority (CxA) or firm that has the knowledge, skills and abilities (KSAs) to do the work.

There’s a lot of talk these days about what it takes to be a qualified CxA. Of course, we can point to “bad” providers (or as my friend Ed Faircloth would call them, “pick-up truck commissioning providers).” And most of the time we all agree on who is outstanding in our field. Now it’s time to do for ourselves the one thing we know is the foundation for success of the commissioning process: document the requirements: in this case, the OPR of our profession and advancements in the scope of work we are asked to deliver.

The good news is that CxAs are increasingly involved in the process of ensuring quality throughout the whole building design, construction and operability acceptance process. Rather than being “general practitioners,” commissioning has evolved into a team effort requiring specialty experience and individual systems specialists who, together, offer a broader spectrum of capabilities. Commissioning KSAs are becoming more complex, and owners of high-risk, high-cost, unique or mission critical buildings want to see education and certification in specialty systems. As a result, continuing education is critical for all CxAs to keep up with technology trends, regulatory changes, and industry updates.

BCA members adhere to the Association’s [Essential Attributes](#) and ASHRAE Guideline 0, The Commissioning Process, which defines commissioning and goes on to state that “commissioning is an all-inclusive process for all the planning, delivery, verification, and managing risks to critical functions performed in, or by, facilities.” So, how do you show that you understand the critical functions, and can work with design and construction teams to deliver risk-free, quality performance buildings to owners? You can’t eliminate all risk, but today you must build a CxA team portfolio of capabilities to help identify and mitigate performance and cost risk – the owner’s biggest “elephant in the building.”

The BCA and the Building Commissioning Certification Board (BCCB) have long upheld the most rigorous, and most respected, certification process in the nation. The BCCB’s Certified Commissioning Provider (CCP) certification content and process were designed and implemented in 2004 to parallel ISO 17024, so that ISO accreditation would eventually be applied for and received. Now, as a mature certification institution, and as the market is demanding a broader and deeper level of commissioning services, it is time for the BCA and BCCB to offer ISO-accredited certification to the market.

In June of 2012 the BCA Board of Directors published [The BCA CxA Qualifications and Certifications Statement](#). This statement included a call to action to create a unified the commissioning industry that strives to maintain the highest standards of quality, and a coherent certification strategy. Today the BCA Board and the BCCB are working on this with other like-minded organizations and I believe we are making progress. Quality certifications will demonstrate for the owner that you have knowledge, personal dedication and experience to succeed in the demanding and ever-changing profession of building commissioning.

Certifications and certificates are your credentials to support the owner’s evaluation process in picking a good provider. Commissioning is a professional service, not a one size fits all product. Unlike test and balance it is a service to owners that ranges from predesign through operation – not a “commodity.” It’s important for CxAs to stay on top of the changes in technology, codes, and standards that sustain the profession’s value to owners and building professionals.

So, own your profession! Keep learning! Write your professional OPR, and revisit it as time goes on. And for our owners – know that the professional services you are buying must be equal to the qualifications you need for your project. Make sure they fit your team. In the meantime, we are working to make the CCP designation even more valuable to those who hold it and those who seek Cx services by proving that we adhere to the strict international standards and best practices for certification programs.



Every Spring for 21 years the NCBC has served as the pivotal forum for stakeholders in building commissioning. Starting with a handful of dedicated engineers and researchers, this conference has continuously vitalized the building performance industry, providing the meeting place for colleagues in the built environment to define tomorrow's tools and standards of excellence.

NCBC 2014

May 19-21, 2014 | Hartford, CT

Look for the call for Abstracts this September.



Annual Cx Summit

In March the Northeast Chapter hosted its annual Cx Summit at Keene State College in Keene, New Hampshire. For the past seven years the Northeast Chapter has hosted its Summit in various locations, and has been successful in putting together engaging commissioning related presentations and attracting attendance throughout the northeast.

PRESENTATIONS INCLUDED:

- An overview from the Massachusetts School Building Authority's Executive Director about their statewide Commissioning Program
- A review of local state utility incentive programs
- The importance of Cx design reviews
- A panel discussion on commissioning at colleges and campus
- The critical nature of ventilation and moisture management in buildings
- Whole building air leakage testing

Attendees were treated to an engaging tour of the new Technology, Design and Safety Center on campus.

The Northeast Chapter's annual event has been very successful in terms of getting members together for face to face discussion. It also supports the Chapter through modest admission fees and features sponsors that we have been able to work with on a regular basis.

Visit us online:

www.bcxachapters.org/northeast

GO TEAM BCA: Volunteer Opportunities Available

By Sheri Adams

Volunteering on BCA committees is a great way to stay connected to important events in the Association and the commissioning profession. You can take advantage of great opportunities to grow, teach and learn by choosing volunteer options that interest you. Here are some examples:

M&O Committee Volunteer Request from Committee Chair Darren Draper:

The BCA is looking for members to serve on the Marketing and Outreach Committee. Key objectives of the M&O Committee include promoting the BCA's activities and developments such as the Best Practices, NCBC, and webinar series. The committee is also dedicated to connecting the BCA to other organizations in our industry through outreach and liaison participation. Current volunteer needs include:

- Crafting the BCA Story, branding and "elevator speech" for use by members when promoting the BCA to non-members
- Participating in tailoring a social media plan
- Assisting with planning for promotion of BCA training activities such as webinars and regional BCA conference events
- Conducting marketing research to assess our competitive position in the industry
- Assisting with development and execution of topical surveys that are relevant to the industry and advancement of the BCA

We anticipate that members will commit between two and three hours per month taking part in exciting activities that continue to strengthen the BCA's position as a thought leader in the industry – nationally and internationally. We hope to have at least one (1) member from each region. We expect that much of this work will be accomplished in 2013 with ongoing maintenance needed in 2014. All interested members should contact Sheri Adams at sadams@bcxa.org.

Member Services (New Committee Start-Up):

The BCA is looking for members to serve on the newly formed Member Services Committee. The International Board of Directors has directed this committee to evaluate member benefits, membership categories, and pricing. We anticipate that members will be asked to commit 2-4 hours a month in meetings and research. We expect that a majority of this work will be accomplished by November of 2013, with ongoing maintenance needed in 2014. Jacob Schu is the Chair of this committee and Ed Faircloth is the Board Liaison (two of the most fun guys in the Association to work with – you won't want to miss this opportunity!) Going once, going twice... All interested members should contact Sheri Adams at sadams@bcxa.org.



To honor our 15th anniversary celebration, BCA's founding members will present sessions at our upcoming Fall Webinar Series. For full details about our Webinar Series, please check out the training page on the BCxA website: www.bcxa.org/training.

- **October 2, 2013**
Valid, Cost Effective FPTs for New Systems; Tools, Rigor & Collaboration
Kent Barber, PE, Keithly Barber Associates
- **October 30, 2013**
New Construction Commissioning Design Review
The Bridge Between OPR/BOS and FPT – Part 1
Craig Hawkins, McKinstry
- **November 6, 2013**
New Construction Commissioning Design Review
The Bridge Between OPR/BOS and FPT – Part 2
Craig Hawkins, McKinstry
- **November 20, 2013**
Improving Functional Testing Using BAS Queries, Reports and Spreadsheets
Karl Stum, PE, Summit Building Engineering

BCA Three Day Existing Building Class

Back by popular demand is the BCA 3-day EBCx Class focusing on the What, Why and How to of EBCx. For full details, check out the training page on the BCxA website: www.bcxa.org/training.

- **October 7-9, 2013** | Fairfax, Virginia
- **October 21-23, 2013** | Dallas, Texas

Dates and a location will be announced for the Seattle, Washington class at the end of August.

BCA's FOUNDING FIRMS: "WITHOUT WHOM..."

As part of our year-long 15th anniversary celebration, we spoke with four people whose firms were deeply engaged in the vision and shaping of the BCA. We would like to express the BCA's heartiest thanks to Debby Dodds (formerly PECl), Pete Sabeff (EEI), John Jennings (NEEA) and Ken Toombs (Toombs & Associates) for their personal and company contributions to the Association's success.

PECl

Debby Dodds

PECl's involvement in creating the BCA built on Nancy Benner's dream of being able to see buildings work "the first time, and all the time." Approaching commissioning from an energy efficiency perspective, we wanted to move the process into the delivery mainstream in a way that could be replicated. We all acknowledged it was only through replication that we could get from 'what we wanted' to 'what we should always get': formalization and industry recognition that special expertise was needed to achieve the expectations of owners and utilities. We suddenly found ourselves talking to owners about energy efficiency, yes – but also about non-energy related benefits. As those discussions expanded, and our advocacy turned into establishing a foundation for standard practice, it became clear that commissioning was becoming a vital and recognized profession. PECl and others helped the BCA to formalize that dream through the professional expertise and passion of people who engaged in its development, with their commitment to energy efficiency and quality performance in commercial buildings.

EEI

Pete Sabeff

It's hard to believe we have already been at this for so long... seems like yesterday that we started down the commissioning path with Nancy Benner leading the charge, with her dream of making building commissioning "business as usual." I am proud that all of us, influenced by her vision, leadership and commitment, have made her dream come true. Commissioning is now business as usual -- not only a part of most new building programs, but a fundamental part of infrastructure renewal programs.

Commissioning, like any new concept or profession, starts out because it is needed. There are differences in thought on how and why by many, but via collaboration between practitioners and organizers, ideas, mission critical concepts, and continual 'testing of the waters' leads to solid foundations and growth that can only continue. Gretchen Coleman was our representative and was willing to spend the time, and we at EEI supported her doing so.

BCA is a grassroots, bootstrap organization, dedicated to commissioning, not an offshoot of another organization with a 'me too' commissioning element. BCA is clean from that perspective, and true to the concept of 'independent third party' commissioning. It's not design with a twist, construction extended, or perpetuating a trade. It is its own entity, a bootstrap entity, which started on a shoe string, but blossomed under the care of those steeped in the principles, the needs, methodologies, and commitments one must make to establish and perpetuate independence and success.

To that end, I have been, and always will be a supporter of BCA. Well conceived and founded... and as we get more experience (we never do stop learning, do we?), and with dedication and hard work by all of us while performing our daily commissioning tasks, commissioning will continue to be 'business as usual,' and Nancy's dream will last forever.

Northwest Energy Efficiency Alliance

John Jennings

The Northwest Energy Efficiency Alliance (NEEA) was launched in 1997 to support and promote energy efficiency and market transformation. NEEA's beginning coincided, by chance, with the founding of the Northwest Commissioning Collaborative, forerunner of the BCA. Jeff Harris and I saw commissioning as an important step in achieving higher levels of energy efficiency in buildings. From 1997 on, NEEA committed nearly \$2 million to support commissioning efforts with the initial goal that commissioning become standard practice in new and remodeled public – and later

also private sector – building projects in the Pacific Northwest. Key indicators of early success were the adoption of policies by state and local governments and incorporation of procedures and guidelines in specifications for building projects.

In 1998, NEEA funded a study by SBW Consulting, Building Commissioning Practices in New Construction and Existing Markets in the Pacific Northwest, to get a handle on the state of the emerging Cx market. Clearly, there was a need and a market for commissioning and qualified professionals to do the work.

Recognizing the need for a sufficient number of competent commissioning service providers available to meet the growing demand, NEEA supported the development of an association of service providers – originally called the Building Commissioning Association-Northwest and composed of 12 full members plus Jeff and myself as associate members from NEEA – which evolved into the international BCA we know today.

The BCA emerged as a forum to define industry goals, the role of the commissioning authority (CxA), and provide a framework for what became known as the “Essential Attributes” of commissioning. NEEA and other members worked together through uncharted waters (and diverse opinions) to create a standardized approach to the Cx process. One goal was to create a consistent professional development platform for the commissioning industry and a credible credentialing process, which resulted in the Certified Commissioning Professional (CCP) designation. NEEA participated as funder and an advisor in this process, and in developing the first BCA business plan focused on these goals.

I felt honored to work in the early years with the BCA leaders. I was always amazed at the level of cooperation, and the depth of technical sharing among the potential competitors on the Board. Their commitment and passion for the common good was the dominant theme. And I enjoyed the camaraderie at Board meetings held in various parts of the country. The connection of local experience to national activities is what gives BCA its strength.

Toombs & Associates

Ken Toombs

Getting involved with the BCA which at its inception primarily was to assist in developing what we felt were the fundamental requirements for what people should expect from a commissioning and those who were to provide those services. At the time Kent Barber was an employee of Toombs & Associates and Kent did a great job of providing input with regards to Toombs & Associates thoughts and philosophy. As commissioning has grown I am glad to see that the BCA has matured into a great resource and first-class organization for the providers of commissioning.



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In collaboration with Fiona Aldous, H. Jay Enck, Bill Nash, Marty Houston and other BECx experts

Imagine yourself in the pouring rain – no umbrella, no hat, light wool coat – you’re cold, damp, and water is seeping through your clothes. Now imagine yourself in a glaring 114 degrees, still no hat, same coat. You look great but your “enclosure” is made for the shade and, either way, your complex systems are working hard to maintain your internal performance at 98.6 F.

Just so with the building enclosure, or skin. Commissioning the building enclosure (BECx) requires awareness of how systems and materials are arranged and integrated to meet both performance and aesthetic objectives. The skin’s complex design characteristics, coupled with various materials, manufacturers, contractors and others involved in producing and delivering the building enclosure require a well coordinated, systematic process. The enclosure assemblies and application of the materials in the assembly are observed and tested throughout the progress of constructing the enclosure, which is what makes it different from other systems. Once the entire building is enclosed, a final performance test is conducted. “If there is a problem when it’s complete,” says one expert, “you have failed in applying the commissioning process.”

Everyone – owner, building enclosure consultants and technicians, A/E design team, general contractors and subs, manufacturers and CxAs – needs to be involved from early project decisions through occupancy. Why? Integration of the skin with other systems is key to preserving air and moisture barriers, systems operation, energy efficiency, durability and functional use.

In the long run it doesn’t matter whether the BECxA is an architect, an engineer or another smart professional. It does matter that strong building science knowledge is coupled with sound technical hands-on experience and problem solving.

Fiona Aldous, AIA
Associate Principal, Wiss Janney Elstner Associates
National Co-Chair for the BETEC/NIBS Building Enclosure Councils

Back in the day, enclosure design was the exclusive province of architects, largely because of the emphasis on creating a visually distinctive façade – especially for “iconic” buildings. Now, structural, mechanical and electrical engineers bring a focus on building science and provide architects with the needed expertise to integrate systems. The CxA checks to see that the OPR is being met, and that the design team has a functioning quality process. Building enclosure specialists (BES), with the experience and technical qualifications to design, critique, validate and support the project teams, typically are hired for larger projects to ensure a safe and healthy building, and help manage the owner’s risk exposure. Smaller buildings have the same issues but less budget so often the main responsibility falls to the architect because there is no budget for a BES. CxAs who have strong backgrounds in building science can help in both small and large projects without being a BES.

How does a building envelope commissioning authority (BECxA) fit into this picture? NIBS Guideline 3-2012 defines and “refines performance objectives for control of moisture, condensation, heat flow, air flow, water vapor flow, noise, fire, vibrations, energy migration, light, infrared radiation, ultraviolet radiation, structural performance, durability, resiliency, security, reliability, aesthetics, value, constructability, maintainability and sustainability.”

That’s a lot for any individual to know. The overarching qualifiers for a BECxA are an understanding of building science, building envelope construction and sequence, and the interaction of the mechanical system with the envelope. Understanding building enclosure performance objectives, and using them to assist in preparing and reviewing the owner’s Project Requirements (OPRs), forms the foundation for a commissioning process that integrates enclosure requirements with other building criteria to meet the owner’s expectations.

BECx Challenges – What You Should Know PEOPLE

At this point in time, many owner’s don’t realize that they need an envelope commissioning authority, nor would they know where to look. They may know commissioning process basics, but they generally need more education to recognize the cost and performance issues related to enclosures.

Collaborative whole-building team dynamics, with an owner committed to quality, will make the difference between a building that sails through the warranty year and beyond with few or no issues, or a building that continues to experience costly operational problems. For the building enclosure, getting the right team on board is different for a 17 story highrise than for a three story senior residential facility.

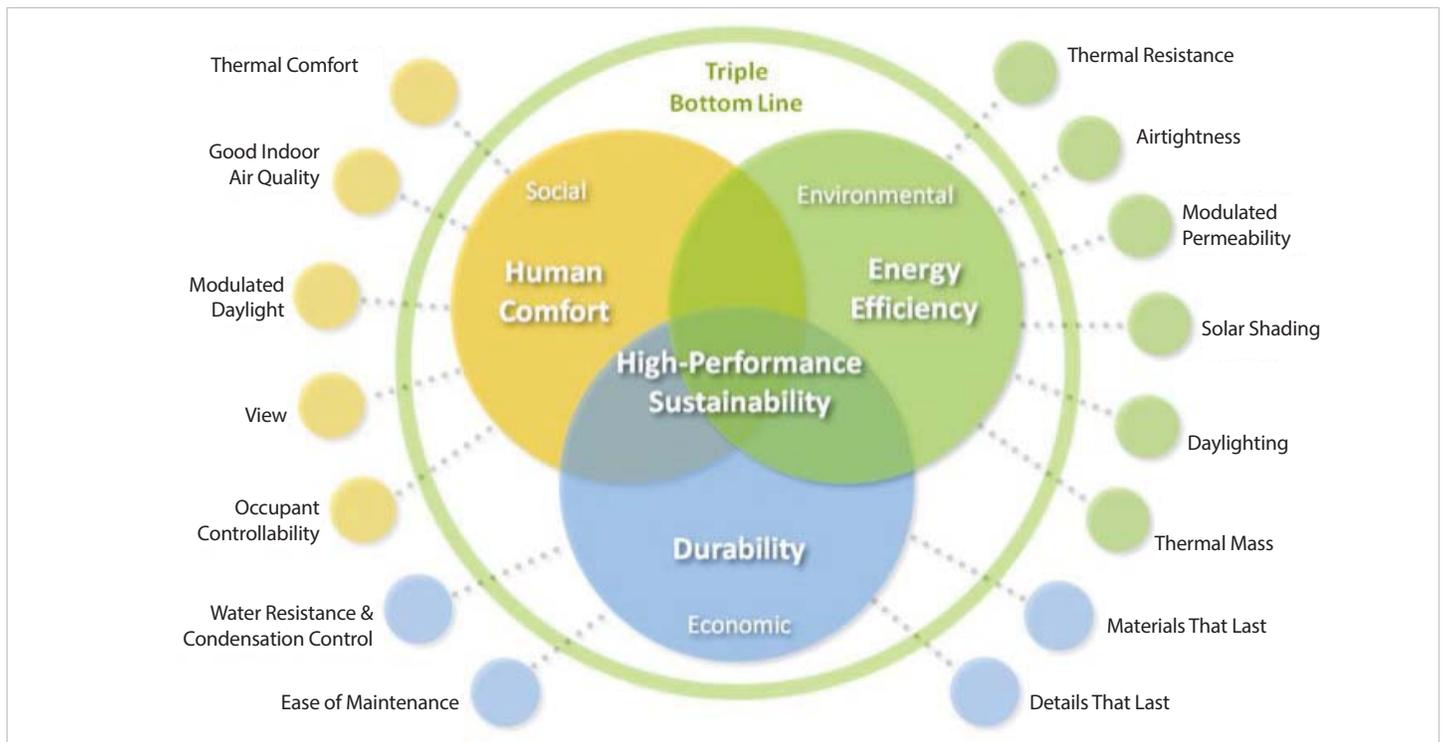
DESIGN PROCESS

BECx is well defined and described in the ASTM E2813-12 - *Standard Practice for Building Enclosure Commissioning* and NIBS *Guideline 3: Building Enclosure Commissioning Process*. To commission the enclosure, the project team must consider how complex the building exterior actually is, ranging from an iconic building to a square box. The more interesting the elements, the more there is a likelihood of performance problems. Here are some commonly encountered challenges faced in real projects by BECxAs:

Owner's Project Requirements. The OPR is usually least developed in terms of enclosure because an enclosure specialist or CxA is often not engaged early

Most long-term owners understand the value of commissioning the building enclosure as they have had to “pay the price” to correct design and construction problems. New or short term owner differs from one who has had to strip an enclosure down to its original structural frame or make costly building repairs as a result of moisture intrusion. In terms of price and risk, what will they value most? What is their business case for commissioning? Does their business model allow for a low occurrence of high impact failures or high occurrence of low impact failures? It all depends on the owner's experience and assessment of his/her risk that influences his/her willingness to invest... Owners change their assessment of risk based on their experience. Whole building commissioning, including the building enclosure, provides great value by helping to ensure the building performs in meeting the owner's goals.

H. Jay Enck, CxAP, HBDP, BEAP, LEED Fellow
 Founder and Principal
 Commissioning & Green Building Solutions, Inc.



Holistic High-Performance Green Building Enclosures

BECx: GETTING THE RIGHT SKIN IN THE GAME (cont.)

enough and the owner may not understand needs. As a subset of commissioning, owners may hire an envelope consultant to view drawings or conduct on site QC inspections, or both; but they and their design team don't often identify a larger process that coordinates BECx activities.

Integration Review. Challenges with enclosure design include moisture control, air tightness, thermal bridging, constructability, maintainability and energy efficiency or heat transfer across the building. Integrating enclosure review into the process is important.

CONSTRUCTION

Working with contractors helps the BECxA to understand and mitigate risk. General and subcontractors can open a vast store of knowledge about what works and what doesn't in the building enclosure system. Contractors deal with costly change orders and call-backs when things go wrong, and their lessons learned are invaluable when testing or observing enclosures during the entire commissioning process.

Observation, Testing and Mock-ups. Even though BECx cannot be completed until all its components are installed, a lot of BECx is observation and testing along the way. Different things are commissioned as construction progresses. For example:

- Testing through early mock-ups, reviewing detailed drawings in contract documents, and checking components such as waterproofing, air barriers, flashings, metal panels and cladding to be installed with interfaces.
- Quality control for some components occurs in the manufacturer's plant or assembly shop before they are shipped to the construction site. For certain enclosure materials – say, non-load bearing curtain walls – almost 20% of commissioning is done in the field, and 80% is done before delivery, in the shop.
- Activities like air barrier commissioning happen throughout the construction process, continuing until the very end. For example, the project team needs to understand how to design, build and test to mitigate chimney-like stack effect where pressure forces air down through the envelope in hot weather and up in cold weather.

- Some facilities, like biotech labs, are tested at certain phases during construction. Isolated spaces such as infection control rooms can be tested for air flow and leakage of airborne contaminants by temporarily enclosing an outside corner that has three exterior walls. The BECxA would observe and document this process.
- Commissioning of some components occurs before completely "closing up." A fluid applied membrane (liquid polymer as a water or air barrier, for example), must be checked to ensure that the application surface is clean and dry enough, and absolutely correctly assembled without holes for penetration, that the substrate material allows adherence, and that flashing counter-flashed. Each is a costly error if not tested before total enclosure.

There is some potential for changing interior mechanical electrical systems during design and construction, but not much of an avenue to recover from building enclosure mistakes... people are not the issue, it's people not following the process or thinking through what's required in materials and testing and documentation and sequencing.

William R. Nash, PE, Senior Project Manager
Whitlock Dalrymple Poston and Associates
Construction Chair, NIBS Guideline 3-2012

CONSTRUCTION PHASE BECx: MAKE SURE ...

- GC and team understand the project's BECx "language"
- GC has personnel with enclosure experience (such as air barriers, continuous insulation) on the team
- Have preconstruction meeting(s)
- Review with GC and team what's on paper, how to do what's on paper, getting actual foremen workers (not just company reps) at the preconstruction meeting and at progress meetings
- Review schedule and sequence of construction activities
- Allow enough time in schedule to get it done right in the first place
- ID and test components as early as possible
- Start visual observation at the beginning of building enclosure construction

- Conduct BECx on a first constructed area with a fine tooth comb
- Contractors follow manufacturer recommendations
- Critical people know how to install enclosure components and will be staying on the job
- Review subcontractor packages; GCs are responsible for purchasing correct packages on subcontractors

MATERIALS

Materials and control layers must respond to the specific and fluctuating conditions where they're situated – the impact of moisture penetration, materials expansion, contraction, temperature, UV exposure and other factors must be well understood in the siting and design context of the specific project.

This is where chemistry comes in. Building enclosure specialists become familiar with the products of manufacturers and material specifications. Working with manufacturers has proven extremely useful in BECx to understand the interactions between materials under a variety of possible conditions, especially where they may interface with one another. Manufacturers can be a great support group. They want to sell their product and they likely have (or should have) conducted compatibility testing to prove potential applications and identify its limitations. Their knowledge may make the difference between materials and assemblies that can or cannot be used together successfully if integrated into the building skin.

New materials, sensing equipment and devices are coming into the market all the time. It's useful – sometimes essential – to ask manufacturers directly about specifications, how materials have been stored and should be installed, and limitations such as temperature and duration of exposure to

It's not the amount of rain in the Pacific Northwest, it's the lack of drying. We rank pretty high in number of days of rain, but not amount of rain. Buildings have to be designed to deal with that, and it's also essential to have a process for mitigating the effects of all that rain during the course of construction.

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UV. Liquid applied materials are being reformulated all the time; staying up to date on new materials science and compatibilities between materials is imperative. Others, like "smart windows," can sense light and glare, and respond by instantly becoming more or less translucent. But, new materials with a short history in the marketplace also are of high concern, especially relative to their interfaces with other components.

Ideally, the BECxA will understand materials compatibility – which ones work together, and which don't. For example, a BECxA should be able to review design concepts and schematic drawings to help ensure that materials installed in the assembly will form the required continuous air, vapor and thermal

You have to understand the system. To understand a system comprehensively, you need to take it apart and put it back together again. And it helps to have experience in the field of construction.

Fiona Aldous, AIA

barriers needed to control thermal bridging, trapping vapor in the wrong location or undesired moisture and air intrusion.

Two primary challenges with materials are a misunderstanding of how materials are meant to be used, and basic material failure. Material failures happen all the time with windows, sealants, claddings, etc. The enclosure commissioning process has to include a process by which material failure is identified, understood and remedied.

CLIMATE AND LOCATION

Geographic climate affects how assemblies are built. Temperature and humidity extremes make a difference in where to place vapor/moisture barriers, insulation levels required to control thermal bridging and condensation. Air barrier integrity affects energy efficiency, where condensation can occur, and whether moisture can be trapped within the enclosure causing IAQ problems.

In the mid-portions of the U.S., climate ranges from high temperatures and relative humidity to cold, dry days during winter. The building enclosure must be responsive to those extremes in terms of permeable materials, air barriers, location of vapor barriers, continuous insulation. The enclosure must respond to what's happening in the building's interior.

Weather issues may dictate both design and materials specification. For example, in tornado or hurricane-prone regions, owners should determine whether they will pay to install impact-resistant glazing, or design the structure to withstand wind forces of this magnitude. Some projects, particularly in the government sector, address hardening buildings but in the private sector costs can outweigh benefits. Some areas of the country have short durations of snow and ice where temperatures turn over quickly. In Dallas, Texas, for example, managing ice buildup and release is a safety factor for building entrances. Geotechnical issues, such as soils that expand and contract, water table volatility, etc., demand knowledge of appropriate materials for flexibility and waterproofing against seepage.

Want to be a BECxA?

You can't just start out in BECx, say enclosure experts who contributed to this article. Regardless of formal education, hands-on in the field is crucial to good BECx, ideally under the tutelage of an experienced mentor. A history of forensic investigation into enclosure performance problems helps bring value to all projects by knowing how to identify problems, understand testing processes and criteria, and apply specific BECx tests to projects' complex interfaces.

HERE ARE A FEW POINTERS:

- Find an experienced mentor
- Increase your overall building science knowledge
- Get forensic experience in problem solving and understanding sequences, submittals, shop drawings, construction and operations for the building enclosure – all contribute to a whole building commissioning process
- Look for continuing education opportunities (NIBS workshops, ASHRAE, BCA, regional Building Enclosure Council seminars and conferences, California Commissioning Collaborative, and the University of Wisconsin professional development course)
- Read and use resources such as NIBS Guideline 3 (including RFP sample), ASHRAE Guideline 0, ASTM 2813, presentation archive from the National Conference on Building Commissioning (NCBC)
- Partner with a firm that offers BECx expertise
- Connect with a Building Enclosure Council chapter in your area – 28 chapters in all
- Check out universities that use BE "Coordination" or "Verification" program for review of construction documents, models, and mock-ups that work hand in hand with CXAs
- Study regional codes and standards that include building enclosure elements (California Energy Code will be implementing several new requirements in January 2014)

ASHRAE 90.1-2013: HVAC Changes Can Affect You

Mr. Wallace has been an award-winning mechanical contractor, consulting engineer, and a registered engineer in Texas for over 30 years. Mack is heavily involved on the front lines of the energy conservation industry, having served the past 18 years on the ASHRAE Standard 90.1 Committee. He was director of design build services for TXU Energy, responsible for developing and guaranteeing savings on many energy savings projects. He has trained thousands of engineers and architects worldwide on ASHRAE 90.1, and is co-author of "Significant Changes to International Energy Conservation Code and ANSI/ASHRAE/IES Standard 90.1.

McHenry "Mack" Wallace, Jr., PE, LEED AP
Owner and CEO, WiseWatt LLP
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What is driving ASHRAE's new changes to the HVAC Standard?

After Standard 90.1-2007, ASHRAE and the US Department of Energy together set goals for 2010 to achieve 30% energy savings beyond 2004. The Building Energy Codes R&D team at Pacific Northwest National Laboratory (PNNL), led by Bing Liu, was contracted to run building models and track savings in 16 cities representing different climate zones across the U.S. By 2010, the goal was nearly met (28%), and ASHRAE 90.1-2010 increased the goal for 2013 by 20%, for a total of 50% savings over the 2004 baseline.

To achieve the additional savings, prescriptive measures were modeled, one by one. Over 130 addendums were published as a result; now more than 100 measures are included in the proposed 2013 Standard.

Here's the problem: there's a lot of resistance to this piecemeal approach focused on individual measures combined with individual locations. Due to the number of changes occurring every three years, 90.1 gets more complicated and harder for commissioning, design and construction teams to use. Further, manufacturers cannot continuously modify equipment to meet the Standard, and there is a point where they can't squeeze any more efficiency out of their equipment, either.



By Diana Bjornskov, in collaboration with McHenry "Mack" Wallace, Jr., PE, LEED® AP

Pushing ahead, ASHRAE 90.1-2016 may change all that. There is a growing current of opposition to the prescriptive approach. Many professionals in the building field want to change the approach to energy savings from individual prescriptive measures to a broader-based performance approach, so that there is a consistent performance average across the U.S. and a single efficiency rating for each measure. Using a whole building performance approach, project teams can review whole systems instead of individual parts, and measure Btus out as well as kW in.

What results are expected in the building industry from the 2013 revised Standard?

Overall, 90.1-2013 will result in 50% more efficiency than 2004. The ASHRAE committee made major changes in 2010, diving hard into daylighting, vapor barriers, requirements for skylights (see table of important changes 2007, 2010 and proposed 2013, below). In 2013 there are tweaks to mechanical systems and kitchen hoods, for example, where variable volume hoods must be tested post-occupancy to prove that they slow down – a good reason to push for post-occupancy commissioning services.

Little Bites

Commissioning Authorities need to understand ASHRAE's changes, which in many cases are "little bites," because CxAs are among those responsible for protecting the owner in meeting code or guidelines. If the owner says he/she wants to exceed 2013, then CxAs are responsible for understanding how that can happen, whether it's about kitchen hoods or control sequences for outside air.

What have been the obstacles to adopting the revised Standards (2010 and potentially 2013)?

Simply dollars. The ASHRAE committee has to cost-justify everything in each revision to Standard 90.1. We must set a scale for a defined payback goal and do lifecycle cost analysis. If the payback is longer than the owner wants, the pushback is economic; owners often want a shorter payback time than a system or measure can deliver. On the other hand, what the ASHRAE committee finds important is how much energy a building uses over time.



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New York, NY

In addition to the many benefits BCA members receive, Corporate Members also receive two Individual Memberships and listing on the Corporate Member Directory, accessible to building owners and their representatives in their search for commissioning services.

ASHRAE 90.1-2013: HVAC Changes Can Affect You (cont.)

But the recent final federal ruling will change things. On July 9th, The U.S. Department of Energy (DOE) published “the final rule to implement provisions in the Energy Conservation and Production Act (ECPA) that require DOE to update the baseline federal energy efficiency performance standards for the construction of new Federal commercial and multi-family high-rise residential buildings. This rule updates the baseline federal commercial standard to the ASHRAE Standard 90.1–2010. This rule is effective September 9, 2013... This rulemaking incorporates by reference the following standard into 10 CFR Part 433: ANSI/ASHRAE/IESNA Standard 90.1–2010, Energy Standard for Buildings Except Low-Rise Residential Buildings, I–P Edition, Copyright 2010.”

The table on page 21 is an overview of where you can find important HVAC-related changes to ASHRAE 90.1 that affect the commissioning profession.



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2007 Standard	2010 Revisions	2013 Proposed Revisions
6.4.1.1 Changed minimum efficiency requirements for many equipment types	6.4.1.1 Changed minimum efficiency requirements for many equipment types	6.4.1.1 Changed minimum efficiency requirements for some equipment types
	6.4.1.2-6.4.1.2.2 Changed how to calculate chiller efficiency and part load performance. Eliminated a loop hole that allowed a small amount of glycol added to the system exempt the chiller from compliance	6.4.5 Adds Commercial refrigeration equipment to the standard
	6.4.2 Added a requirement to deliver a critical loop pump head calculation to the AHJ.	
	6.4.3.4.5 Requires variable speed fans in enclosed parking garages	6.4.4.1.3 It is made clear that piping insulation is to be included on most piping equipment in series with the fluid flow such as pumps, and air separators.
	6.4.3.10 Requires single zone units to have multi-speed fans	6.4.3.10 Removed the requirement from the mandatory section to 6.5.2.1 and made some modifications to the requirements
	6.5.1 Adds Computer rooms and CRAC units to the standard	6.5.1 Adds a requirement for water side economizers with chilled beams and radiant cooling
	6.5.1 Requires economizers in all zones down to 54,000 BTHU. Except climate zone 1	6.5.1.1.3 Modifies the economizer high limit controls and control sensor accuracy is addressed
	6.5.1.3 Requires all economizers to be of the integrated type	6.5.1.3 Makes changes to the economizer control and requires multiple stages of DX cooling
	6.5.2.1 Allows the VAV box heating CFM to be increased after a low CFM dead-band.	6.5.2.1 Requires DDC systems to use the increased heating CFM, "dual maximum control."
6.5.2.4 Added break horse power requirement path to fan power requirements	6.5.2.1.1 Limits the VAV box heating air temperature to 20F above the room setpoint if both the supply and return are 6 foot AFF.	
6.4.3.9 Lowers the DCV requirement to spaces with 40 people/1000 sq ft		6.4.3.9 Lowers the DCV requirement to spaces with 25 people/1000 sq ft
	6.5.3.3 Requires application of 62.1 Appendix A (Dynamic Reset) to most multi-zone VAV systems	6.5.3.2.2&3 Changes the variable fan speed control requirements
	6.5.3.4 Requires supply air temperature reset on certain systems.	6.5.3.5 Requires ECM motors to be used on some small fans
	6.5.4.5 Requires HVAC pipe to be sized by a chart that is provided in the standard.	6.5.4.2.1 If constant volume pumps are used the number of chillers must match the number of system pumps
	6.5.6.1 Requires much more air energy recovery to be used	6.5.6.1 Divides the energy recovery system requirements for those that operate more and less than 8,000 hours per year
	6.5.7.1 Set tough new limits on Kitchen exhaust systems. Includes requirements for performance testing.	6.5.4.6 Adds a requirement for boiler turndown
	6.5.7.2 Allows laboratory exhaust systems to use a combination of strategies to comply with the standard.	6.5.5 Heat Rejection – Adds requirements for heat rejection equipment turndown and variable air and water flows
	8.4.2 Requires half the receptacles be turned off in an unoccupied space	
		8.4.2 Requires sub-metering on many building systems and interval metering of building gas meter.

CONGRATULATIONS to the newest CCPs and ACPs!

The BCA congratulates the following individuals on achieving the Certified Commissioning Professional (CCP) and Associate Commissioning Professional (ACP) designation.

CCP:

- **Michael Barnett**, PE, CCP - Sustainable Engineering Group LLC, Madison, WI
- **Rick Boozell**, CCP, LEED AP BD+C - SystemWorks LLC, Des Moines, IA
- **Isaac Chambers**, CCP - Engineering Economics, Inc, Culver City, CA
- **Robert Crane**, CCP, LEED AP - DNV KEMA, Santa Rosa, CA
- **Peiman Faeghi**, P.Eng, CCP - Seawood, Thornhill, ON, Canada
- **Steve Jankus**, CCP, PMP, C.E.T., LEED AP BD+C - CFMS-West Consulting, Inc., Ancaster, ON, CAN
- **James Jen**, P.E., CEM, LEED AP, CCP - Energy Performance Engineering, LLC, Newberg, OR
- **Michael K. O'Brien**, PE, CEM, LEED AP, CCP - Heery International, Decatur, GA
- **A.J. Speicher**, CCP, PE, CEM - Borton-Lawson, Dallas, PA
- **James Warner**, LEED AP BD+C, CCP - Heery International, Portland, OR
- **Michael Watts**, CCP, LEED AP, CPMP - Affiliated Engineers, Keystone Heights, FL
- **Paula Yelverton**, LEED AP, CCP - Primary Integration, Rockville, VA

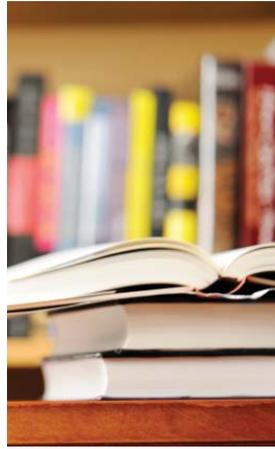
ACP:

- **Nathan Aring**, ACP, CxT - Welsh Commissioning Group, Auburn, WA
- **Lynart Bantog**, ACP - Stantec Consulting, Vancouver, BC, CAN
- **Luis Castilho**, ACP - Petinelli, Inc., Curitiba, PR, Brasil
- **Derek Cheung**, P.Eng, CMVP, ACP - Isotherm Engineering Ltd., Mississauga, ON, CAN
- **Mike Davis**, ACP - System Works LLC, Ankeny, IA
- **Kennon Elmore**, ACP - Primary Integration Solutions, Inc., Leander, TX
- **Sheldon Fukamizu**, ACP - Commissioning Consultants Hawaii, Waipahu, HI
- **Janelle Glick**, ACP, EIT - Heery International, Inc., Sacramento, CA
- **David B. Howard**, ACP - TESTCOMM LLC, Spokane, WA
- **Bryant Kirkland**, ACP, LEED AP, EIT - Eaton Corporation, Raleigh, NC
- **Kenneth Loshelder**, ACP, PE, LEED AP - McKinstry, Denton, TX
- **Brendan McGrath**, ACP, EIT, LEED AP - In Posse LLC, Philadelphia, PA
- **Eric Reinets**, ACP - Commissioning Solutions, Fargo, ND
- **Peter Rochus**, ACP, LEED AP - CFMS West Consulting, Inc., Tillsonburg, ON, CAN
- **Aaron Schiess**, ACP, EIT, PE - Interface Engineering, Tigard, OR
- **Kevin Smith**, CPMP, ACP - CTA, Bozeman, MT
- **John Wixson**, ACP - Henderson Engineers, Inc., Lenexa, KS

These individuals join the ranks of the most qualified commissioning providers in the industry. Way to Go!

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Not sure if you are qualified? Send us your questions at kspencer@bcx.org or call the BCA Hotline at 877.666.2292.



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The Building Commissioning Association is an international non-profit organization that serves as the recognized authority and resource on commissioning. Our membership is made up of professionals from the commercial building industry who are dedicated to using and maintaining the highest standards and practices in the commissioning process. The mission of the BCA is to guide the building commissioning industry by advancing best practices, education and promoting the benefits of commissioning to design and construct buildings that work.

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