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Letter from the President

BCA Members,

Now that the summer season is upon us, thoughts naturally turn to vacations and weekends at the beaches, lakes or mountains. The BCA is also turning out to have a very busy summer for 2011. Three big initiatives are culminating that will be sure to positively impact the association and the larger commissioning industry.

First, as many of you know, the BCA is co-hosting the 19th National Conference on Building Commissioning (NCBC) in Cincinnati in August. A dedicated group of BCA volunteers has helped to develop a robust educational program for the NCBC that is sure to inform, energize and educate on all things related to commissioning.

Second, a task force is under way to develop a position paper to explore the merits of requiring licensed Professional Engineers (PES) to lead the commissioning process. The PE versus non-PE debate has been simmering as an industry issue for years, and membership has now asked us to put forth an official BCA position paper as a priority. Our goal is to have a balanced and thoughtful committee that carefully weighs the merits of both positions to provide guidance to the BCA board of directors. We have had an overwhelming response to our call for BCA member volunteers to participate on this task force, which underscores the importance of the issue to our membership. There has also been interest from other industry related associations to participate with the BCA in formulating, endorsing and/or promulgating this work.

The third major initiative that will culminate this summer is the BCA’s New Building Commissioning Best Practices document. As new construction commissioning has matured as an industry, a number of organizations have established guidelines and criteria to define and clarify the commissioning process; however, commissioning is still being inconsistently performed. The BCA’s best practices document identifies and addresses several of the most common and problematic commissioning industry related issues that are being observed and will provide readable practical guidance to help avoid common pitfalls. Public review of the best practices document is scheduled to take place this summer, and a session is planned at the NCBC to review the draft and solicit input from NCBC attendees. I would like to extend my personal gratitude to the best practices committee, which has toiled tirelessly through weekly committee meetings, active dialogue and debate, and multiple edits and refinements over the past year and more.

I hope to see all of you at the NCBC in August, and best wishes for a great summer!

Sincerely,

Mark F. Miller, PE, CCP, CEM
BCA President

CCP™ Updates

The BCA congratulates the following individuals on achieving the Certified Commissioning Professional (CCP) designation:

**Roy H. Feinzig, CCP**  
Cosentini MCFM  
New York, NY

**Mark Cambria, CCP**  
M/E Engineering  
Schenectady, NY

Roy joins the ranks of some of the most qualified commissioning providers in the industry. Way to go!

The CCP exam is online and available at more than 200 testing sites. To apply, review the Candidate Bulletin and download the application at [www.bit.ly/bcxacertification](http://www.bit.ly/bcxacertification).

Not sure if you are qualified? Send us your questions at certification@bcxa.org or call the BCA Hotline at (877) 666-2292. ■
Earlier this year, the National Engineers Week Foundation honored the youngest board member of the BCA National Capital Chapter, Tracey Nawrocki Jumper, in its New Faces of Engineering Class of 2011. The award highlights the unique work of young engineers and the resulting impact on society. Jumper, 28, was one of 14 people to receive the honor this year. She was nominated for her work in commissioning, which was unusual as the recognition often goes to young design engineers. Jumper is an architectural engineer and commissioning specialist who focuses on reducing energy use and costs while increasing patient comfort in healthcare buildings.

**Home city and state:**  
Wilkes-Barre, Pennsylvania

**Employer:**  
Keystone Commissioning Group

**Position:**  
Commissioning projects manager

**BCA member since:** 2008

**Years in building commissioning industry:** 3

**Volunteer positions held with BCA:**  
- BCA National Capital Chapter board member  
- BCA National Capital Chapter membership chair  
- BCA Midwest Chapter board member

**Do you know of any other engineers under 30 who are involved with commissioning work, or starting to get involved?** I don’t know any under-30s in commissioning, even in the two regions where I’ve been an active leader in the BCA—but I would definitely like to! I know several other young engineers in my field, but of course, the nature of the technical experience we need specifically for commissioning lends to the seniority in the field (all of my mentors and networking contacts). But that can make it lonely in the lower age groups. One of my efforts as membership chair for the National Capital Chapter this year has been to promote more active involvement from individuals in a younger age bracket.

**How did you get involved in commissioning?** I started out in design. I did construction all the way through school. I went to Penn State for architectural engineering (graduating in 2005). So I got right into design and high-profile projects. I worked on the Indianapolis Colts stadium. That was my first project. I was low man on the totem pole, and I didn’t get to go out in the field a lot, so I used my personal time to go hang around with the construction guys. I used to walk the sites and ask the supervisors, hey, what should I have seen in the design here? And then an opportunity came up at another company in commissioning. I didn’t really know what commissioning was, but I kind of went for the hands-on, get out in the field, get out and see what you’re designing, kind of work. So my technical background and my interest in being on the end-product side of the business gave me the skill set for commissioning. Commissioning is not a profession that you plan to do right out of school. People saw it in me, I guess, and gave me the chance to try it out.

**Do you think that was a unique experience for you, compared to other engineers coming out of school?** I don’t know if it was my job interviews that caused me to get lined up with the mentors I did. But literally, if I could find the best guys in the field, they were those guys. They took me under their wing, and I ran with every opportunity I was handed. If there was a guy who couldn’t make it to a meeting, I would say, oh, I’ll go—even if it meant cleaning the trash at meetings. It was half work and half taking opportunities as they came. I was handed leadership roles and picked up bigger, more exciting responsibilities as a result.

**It sounds like you were motivated and really have a love for the field.** Yeah, I don’t know if it’s my practical nature or what, but when you like what you do, you’re willing to, like I said, sweep the floors at meetings, if that’s what it takes to meet the people you want to meet—the mentors and people in positions where you eventually want to be.

**You didn’t literally sweep any floors, did you?** No (laughs). Actually, I’ve always been active in professional societies and hosting meetings and have gotten to make a lot of connections just meeting people while we were setting up and tearing down. So, I guess at some point, I probably did.

*continued on p. 13*
BCA Launches Online Networking

The BCA has just launched a new online social networking community that’s like LinkedIn, only better, because it’s all about commissioning.

Now, you can connect with colleagues in any location, day or night. Get instant updates on chapters, committees and topics that interest you the most.

Connecting is simple. Go to www.bcxa.org and log in. You’ll find the community at the bottom of the navigation bar on the left side of the home page. Once inside, your personal dashboard allows you to access industry feeds, participate in discussions, make recommendations and find new contacts with similar interests. The community also has an all-association calendar, which makes it easy to see what’s happening across the association.

Only one thing is missing…you! The community gets better with participation, so log in and see what it’s all about. Need help navigating the community? Check out the Resources section. Still have questions? Let us know at webadmin@bcxa.org.
Improving Control System Cx with Control Profiles

By Peter Keithly

I have been in the commissioning business for 15 years, and the number one obstacle I continue to wrestle with are the incomplete, inappropriate and confusing control system designs my firm too often receives for review.

While the basic engineering, such as pipe sizing, tonnage requirements and required outside air delivery, are typically well considered and provided for, the control system plans are frequently vague, or even non-existent, and the specifications are most often generic boiler plates from past projects.

Considering the level of complexity associated with most modern control systems, there should be much more emphasis on training design engineers in this specific discipline. Yet, in my experience, very few design engineers have an adequate understanding of control systems, and often after roughing out the design they concede the remaining details for the control system contractors to determine during the installation of their products.

The result is confusion and misconceptions during the bidding phase, and frustration when the system fails to meet owner expectations. While in many cases it could be argued that the control system designers should be held accountable, commissioning providers typically do not have the time to debate responsibility and are usually forced to do the best they can to somehow successfully commission a poorly designed control system.

To improve the quality of control system design, building system commissioning procedures should include a specific process aimed at better defining and clarifying the design intent and proposed control system components associated with each building system. This distinct process should be in addition to the general design document reviews typically conducted by the commissioning authority and should occur before completion of the design phase. At a minimum, the process should include the system designer, commissioning authority and those who will be ultimately responsible for the building system operation.

This group could complete the process during a workshop, and the steps of the process could look like this:

• Clearly define and list all the system components (chillers, pumps, VAV boxes, exhaust fans, etc.) that will require some level of system control or monitoring.

• Specify the desired level of control for each system component (local or DDC, on/off, speed reset, temperature reset, differential pressure reset, etc.).

• Specify the desired monitoring points for each system component (temperature, speed, differential pressure, run-proof, etc.).

• Define the desired operational sequences for occupied or unoccupied, or any other potential modes of operation. Include every system component.

• Define desired alarm conditions for each monitoring point.

As a result of this process, a control profile then could be created for each system component and provided as part of the final design bid documents (refer to example at right).

Developing a control profile for each system component would clarify the design and substantially help contractors to more accurately bid and build the control system. In addition, the process would force the consideration of each design element at a point early enough in the project so that desired changes could be made with minimal cost impacts. And the commissioning authority would find the functional testing scripts much easier to develop with a comprehensive control profile document available for reference.

Peter Keithly is the managing principal for TEAM Commissioning Associates. He has extensive experience in commissioning-related specifications writing, design document review, commissioning plan development and functional performance testing. As a founding member of the BCA, he served for six years on the association’s board of directors.
### FIGURE 1: EXAMPLE CONTROL PROFILE

<table>
<thead>
<tr>
<th>Building System Description</th>
<th>HVAC</th>
</tr>
</thead>
<tbody>
<tr>
<td>System Component Description</td>
<td>Fan Powered VAV Boxes with Electric Reheat</td>
</tr>
</tbody>
</table>
| Desired Level of Control | • DDC VAV box fan on/off  
  • DDC primary air min/max flow setpoints  
  • DDC reheat stages on/off  
  • DDC zone setpoint |
| Desired Level of Point Monitoring | • DDC VAV box fan proof switch  
  • DDC primary air flow CFM  
  • DDC zone temperature  
  • DDC VAV box supply air temperature  
  • DDC primary air temperature (from AHU) |
| Desired Operational Sequences | • Occupied Mode: VAV box fan on; primary air damper modulates from minimum to max airflow based on zone temperature. Electric reheat stages on/off based on zone temperature.  
  • Unoccupied Mode: fan off; primary air damper closed, reheat off.  
  • Fire Alarm Mode: fan off; primary air damper closed, reheat off. |
| Alarm Conditions | • No fan proof when fan commanded on.  
  • VAV box supply air temperature below 50 degrees or over 120 degrees.  
  • Zone temperature above 78 or below 67 degrees. |
The Commissioning Agent as Anthropologist — Part 1

By Marcel Harmon

If the goals of the commissioning process are to ensure that a building and its systems provide a quality environment and meet the owner’s operational needs, including adequately preparing operations and maintenance staff and occupants, then the commissioning agent must adequately account for human factors and interactions throughout the commissioning process. It would seem, then, that anthropology—the comparative study of human societies and cultures in all their various manifestations now and in the past, might have something to offer commissioning.

WHY?
You might be asking, though, why do I as a commissioning agent need a better understanding of the nuances of occupant behavior? The simple answer is that if you don’t have it, the owner is at a greater risk of ending up with an inefficient facility negatively impacting occupant health and productivity; nor may the owner have all of the information needed for evaluating the costs and benefits of facility or operational improvements.

For example, in 2009/2010, M.E. GROUP performed retro-commissioning services for the General Services Administration’s Conrad Duberstein U.S. Courthouse and Post Office in Brooklyn, New York. This project heavily incorporated a human factors assessment as part of the retro-commissioning process, consisting of interviews, observations and surveys. Multiple mechanical and electrical energy conservation measures (ECMs) were proposed, and those selected were projected to have an annual energy savings of approximately $872,000, as well as annual occupant productivity and health related savings of $3.57 million (addressing thermal discomfort, occupant control, daylighting quality, etc.). That’s approximately 4.1 times the energy savings, and this was only a partial list of the productivity and health related savings possible. Based on industry research, the actual ratio could be well above 20 times the energy savings.

Laying these kinds of numbers out on the table may have a huge impact on the selection and timing of specific ECMs to implement, compared to simply looking at the energy savings alone. Using the interviews to conservatively estimate the amount of time occupants were contacting operations...
and maintenance daily, we calculated approximately $825,000 dollars of time is wasted every year just from occupants reacting to thermal comfort issues. If the energy savings and associated payback wasn't enough by themselves for ECMs such as “Install Reheat Coils in Zones that experience Cold Calls,” “Demand Controlled Ventilation for HV Units,” or “Optimize Economizer Operation,” the potential productivity and health-related costs for not implementing them may very well be enough to sway the owner.

So whether we’re talking about helping develop the owner’s project requirements, verifying system functioning under actual occupancy conditions, or assisting in the evaluation of facility improvements, the greater the understanding of the occupants’ and operation and maintenance staffs’ needs and behaviors in play, the more successful the commissioning process will be for new or existing buildings.

**BUT WHAT EXACTLY ARE HUMAN SOCIAL/CULTURAL FACTORS?**
When we discuss social/cultural factors, we’re typically discussing aspects of behavior and interactions that bind groups of people together—from businesses, to families, to ethnicities, to nations. Culture consists of such things as symbols, values, education, gender roles, employee category roles, language (and other forms of communication), technology and other material things, preferences (music, food, clothing, etc.), and processes (work order procedures, formal and informal lines of communication between occupants and operations and maintenance staff, etc.).

As we learn, or are indoctrinated within a given culture, particularly as we’re growing up, our cultural surroundings, or “cultural scripts,” train our brains to use the basic psychological machinery we all have in different ways, influencing our perception of the world around us, how we interact with others, how we perform tasks, etc. Culture provides us with a lens through which to view and interpret the world, helping to generate our specific experiences. It’s what helps us tell the difference between being comfortable and uncomfortable, thermally, visually, socially or otherwise. And these cultural scripts vary

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**Above:** Comparison of the estimated savings obtained from the recommended building-focused ECMs ($872,284) to the estimated savings obtained by addressing a partial list of the occupant productivity and health issues present at Conrad Duberstien ($3.57 million, assuming a 30% overlap among the different impacts on productivity).
between and within building populations.

Occupant needs are in turn shaped by both the physical environment and the relevant physiological, psychological, and social/cultural factors in play—therefore, the specific manifestation of occupant needs is highly contextually dependant. And the variability of the relevant occupant needs will depend largely on the variability of the building population in question.

So to really understand the relevant needs and behaviors of a specific building occupant population and account for the relevant human social/cultural factors in play, you have to actively engage the building occupants as well as the operations and maintenance staff. But how?

**HOW CAN COMMISSIONING AGENTS ACCOUNT FOR HUMAN SOCIAL/CULTURAL FACTORS?**

Anthropology in general, and ethnography in particular, offer some methodologies and techniques that commissioning agents can make use of. Ethnographies are typically defined as systematic analyses of human interactions in a defined space and time, with a focus on performance, power (who has it and who doesn’t) and ritual (including habits, processes, procedures and events).

It’s important to remember that these concepts of performance, power and ritual apply to all human groups, whether we’re talking about Amazonian hunter/gatherers or corporate board rooms. For the commissioning agent, then, ethnographies are examinations of building and occupant performance, and how that performance is impacted by occupant and organizational habits, processes and procedures, met and unmet needs, and other human factors.

The final part of this series will discuss four key concepts of ethnography and explain how commissioning agents can use them in the field. By no means will it to turn the average commissioning agent into an ethnographer. But the concepts and methods presented in the final installment will provide commissioning agents with a means of gathering further insights when they find themselves in positions to engage operations and maintenance staff and building occupants.

Marcel Harmon, PhD, PE, LEED AP O+M, is an anthropologist and engineer. He leads M.E. GROUP’s Human Inquiry services, which seek to better understand and optimize the reciprocal relationships between people and the built environment.

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Superior building performance starts with superior commissioning

Whether your facility is new or existing, McKinstry’s commissioning services are your guarantee of exceptional building performance from the beginning and over the long haul. For nearly two decades, we have provided commissioning services as a vital component of our integrated project delivery process. This expertise enables us to support clients in the design, construction, operation and maintenance of superior facilities that keep tenants comfortable and bottom lines strong.
Lessons Learned from Commissioning a Hospital

By Jim Stelson

Hospitals shelter society’s most vulnerable occupants, and therefore, designers and builders construct their systems with extra care. Air-handling equipment is especially robust, and building automation systems are programmed to maximize comfort. Because of this, successfully commissioning a hospital’s systems can require a unique approach.

Located in Montana’s fastest growing city, Kalispell Regional Medical Center is both a community hospital and a regional referral center. The facility has 174 beds and more than 400,000 square feet of conditioned space. Many of its buildings date back to 1975. But in the last decade, the hospital has added a patient tower and a new lab, and expanded its central plant, catheterization laboratory and obstetrics capacity.

With this growth has come a new focus on efficiency, with system-wide operations and maintenance improvements, a building performance scoping estimate of overall savings potential, and the implementation of retro-commissioning. From this activity, Kalispell found that its air-handling equipment and boilers required some unique strategies.

**AIR HANDLERS**

Air handlers that serve clinical areas are designed to provide a high degree of comfort through extremes of outdoor air temperatures while also conditioning large amounts of ventilation air. Consequently, the heating, cooling and ventilating capacities are huge. Efficiency strategies to operate the air handlers when all of this capacity is not required—especially during mild weather, nights and weekends—will reward the operators with large energy savings with very little capital investment.

Supply duct static pressure is sometimes set arbitrarily and is higher than necessary, requiring more fan power. If an air handler serves non-clinical areas where ventilation and pressure relationships are not prescriptive, it is permissible to reduce supply duct static pressure in off-peak times.

**BOILERS/HOT WATER**

Many boilers are equipped with blow down heat recovery. For instance, at Kalispell Regional Medical Center, city water flows through the heat exchanger at approximately two gallons per minute and is heated from approximately 50 F to 90 F. The water is then wasted to the drain. This warmed water can be recovered as make-up water to the boilers or some water heating system to save energy and reduce water and sewer expense.

The American Society of Heating Refrigerating and Air-Conditioning Engineers and the American Institute of Architects guidelines on construction in hospitals both list air filtration efficiencies required for air handlers serving various patient care areas of hospitals. Hospital maintenance staffs tend to stock only a few models of filters, in some cases using a filter that has a higher efficiency than necessary. However, using a higher efficiency filter generally causes a greater pressure drop, thereby requiring more fan horsepower.
The hot water supplied to the HVAC systems should be at the minimum temperature that will satisfy heating demands. Usually a reset schedule for hot water is based on outdoor air temperature. The colder the outdoor air temperature, the warmer the heating water will need to be. For instance, 190°F water may be required at an outdoor air temperature of 10°F, but at 90°F outdoor air temperature 115°F reheat water may suffice.

From an energy management perspective, minimizing the temperature of the HVAC hot water is very important for the following reasons. First, the hotter the water, the greater the heat loss will be from the pipes. If these pipes are running through conditioned space, the heat loss from the pipes is heat gain to the conditioned space (thus requiring more air-conditioning). Second, running very hot water may mask the opportunity to reduce air-conditioning. When a reasonable hot water temperature is supplied to reheat coils and a space cannot be kept warm, this suggests that the supply air temperature may be set too low or that the terminal box air volume may be set too high. By adjusting the supply air temperature upward or the terminal box air flow downward, both air-conditioning and reheat will be reduced.

At some hospitals, the heating coils are programmed by the building automation system to have hot water flow whenever the outdoor air temperature is below 30°F. A small but still significant amount of heat will be lost from the coil if the face and bypass dampers are not sealing well.

MAINTAINING IMPROVEMENTS

NEEA’s BetterBricks has found that the potential for energy savings from operations and maintenance of the HVAC systems at most hospitals are 10 percent of facility electricity use and 25 percent of facility gas use. The improvement measures are not capital intensive and are normally funded through the operations budget. Kalispell’s projected yearly energy savings from retro-commissioning and operations and maintenance improvements were $77,000 or 1.2 million kWh and 26,800 therms.

As it became clear that many of the savings opportunities in Kalispell required more staff time, the hospital management recognized it needed a staff member dedicated to managing energy efficiency opportunities system-wide. Given the number of energy improvements and their cost-savings, Kalispell has hired a resource conservation manager to manage the energy improvements, measure their performance and communicate goals and successes system-wide. By setting energy performance targets and aligning them to mission-critical goals, the organization has elevated energy management across facility maintenance and capital projects. Continuous preventive maintenance, monitoring and commissioning are required to ensure long-term success and savings.

Jim Stelson is a market specialist for the Northwest Energy Efficiency Alliance’s BetterBricks program.
Who are the mentors you mentioned? Did you want me to name names? As far as the BCA goes, there's Phil Saoud and Frank Mauro. They were the ones that kind of signed me up for the first leadership conference. They introduced me to the BCA founders. We were joking at a conference that I was the next generation BCA—third generation, “3G.” So I was in contact with the main leaders of the whole association. And then people like Gretchen Coleman, in the national chapter here, and Emmillee Hogan. These were the first people I met in the association. As far as mentors in commissioning, the guys at BSALifeStructures—that’s where I started in commissioning—Brent Simler and Jim Groeshl. I also have to mention my mother and the good people of northeast Pennsylvania who raised me in a small business community and gave me the communication skills I need to be comfortable talking with building owners, contractors, designers…people in all roles.

What do you find appealing about commissioning specifically? I guess the idea that to be a good commissioning provider, you have to be in boots one second and a suit the next. Half the time, you’re out on construction sites, and you’re checking out systems. And the next moment you’re walking around with building owners and administrative staff and maintenance staff. Just the versatility of it.

What do you think is needed to attract more young people to the field of commissioning? ASHRAE has a young engineers group. If we could do something like that I think it would get more young people involved. Even doing social networking events kind of attracts younger people. You get involved in an organization because they’re doing the things you like to do. For us, that’s commissioning. If there’s more people your own age doing the same thing, you’re more likely to get involved.

As the membership chair for the National Capital Chapter, you’re trying to promote more active involvement from younger individuals. Can you talk about that? Mainly I’m helping with organizing events and going to them. That’ll be a chance for me to get out and meet other younger people in the industry, possibly get them signed up as members or get them interested in the BCA.

Where do you see yourself in 10 years? I reconnected with a guy I knew from Pennsylvania, who is now my husband, on that first BCA leadership retreat, so I even have commissioning to thank for accomplishing that personal 10-year goal. It’s funny, but we’re a commissioning couple to people we know in the BCA, even though he’s a college music instructor. As for career, hopefully fully owning a commissioning company, I am currently managing one, or being a partner in a commissioning company.
Whether you are interested in ensuring that your new building systems perform interactively in accordance with operational needs or identifying opportunities to improve conditions and achieve savings in an existing building, Eaton’s Energy Solutions group is focused on helping you manage the integrated, often complex process.

We help administer a systematic commissioning approach that ensures the most efficient use of natural resources that can result in reduced operating costs and risks, improved work environments and productivity, increased traction with sustainability initiatives and compliance with energy legislation. These capabilities enable us to evaluate, guide and direct your decision-making processes to meet your objectives.

For more information, please visit Eaton.com/energysolutions.