Evolving Requirements in the Commissioning Industry
Southeast Region Building Commissioning Association

6th Annual Technical Summit
7x24 Exchange Carolinas Chapter

Session Sponsored By:

BCA™ Southeast Region Building Commissioning Association
This presentation looks at the evolution of the Cx industry, Cx guidelines and standards, updated requirements in LEED v4, and the impact of new accreditation requirements on the certification of Cx Authorities. The presenter will share concerns regarding some of the language and requirements being proposed in draft codes, discuss AHJ perspectives, and suggest trends in the commissioning industry, including opportunities for Cx Providers to expand their services.
Learning Objectives

At the end of this course, participants will be able to:

1. Generally understand the forces and factors that have influenced the evolution of professional commissioning credentials with impacts on delivering services.

2. Characterize the impact of commissioning on the performance of energy consuming systems; specifically building systems performance vs. EUI outcomes.

3. Reference a variety of commissioning certification programs, guidelines, standards and codes; and, identify jurisdictions regulating commissioning services.

4. Advocate for the commissioning industry with respect to:
   • Cx as professional services with qualifications-based selection
   • Importance of independent third party Cx services delivery
   • Value and cost of accreditation for Cx Professionals
   • Cx Professional roles in M&V and ongoing commissioning
   • Influence of growth in monitoring-based Cx (MBCx), and the CxA’s role
Yesterday
Milestones of Building Systems Commissioning
LEED Version 3 (2009)
Energy Codes, Standards, Guidelines and Regulations
Code Implementation and Enforcement

Today
Various Commissioning Standards
Government Endorsed Accreditation
CxA/EMP Exam Development/Accreditation

Tomorrow
Commoditization
Building Envelope Commissioning
Monitoring Based Cx and Ongoing Cx via Trending
Integration of Commissioning and Energy Management
EUI, Building Performance Metrics, Measurement & Verification
YESTERDAY
Brief History of Commissioning

1977 – Public Works Canada starts to use Cx in its project delivery system

1984 – University of Wisconsin, Madison begins to offer Cx courses
ASHRAE forms Commissioning Guideline committee

1989 – ASHRAE publishes Guideline 1-1989 on the HVAC Cx process

1991 – BPA and PECI convene Cx Roundtables
Brief History of Commissioning

1993 – Pacific Energy Center offers its first course on Cx

1st National Conference on Building Commissioning (NCBC) hosted by SMUD

1994 – Executive Order 12902 requires a Cx program for Federal agencies

U.S. Army Corps of Engineers develops HVAC Commissioning Procedures

Brief History of Commissioning

1998 – Building Commissioning Association (BCA) incorporated as a not-for-profit trade association
USGBC LEED® criteria includes Cx

2000 – CCC established to promote Cx in California

2002 – AABC publishes the AABC Commissioning Guideline and launches Cx certification program

2004 – BCA launches certification program

2005 – ASHRAE publishes Guideline 0-2005

AABC Commissioning Group (ACG) publishes the ACG Commissioning Guideline and holds first Annual meeting
Brief History of Commissioning

2007 – North Carolina includes commissioning in a bill to increase energy efficiency in state buildings

2008 – BCA publishes “Best Practices in Existing Building Commissioning”

2009 – USGBC LEED v3 - more Owners seek certification

2012 – 2012 International Green Construction Code (IgCC)
         2012 International Energy Conservation Code (IeCC)
         ICC G4-2012: Guideline for Commissioning
         LEED Version 4
Brief History of Commissioning

2013 – **ASHRAE Standard 202-2013**  
Except Low-Rise Residential Buildings  
IAS AC476

2014 – **ASHRAE Standard 189.1** – Standard for the Design  
of High-Performance Green Buildings

LEED

LEED v3 (2009) Fundamental Commissioning

Energy and Atmosphere Prerequisite 1

- Experienced, independent, CxA to owner
- Review OPR and BOD
- Incorporate Cx requirements into CD’s
- Create/execute Cx Plan
- Verify installation and performance of Systems to be Commissioned
- Complete and submit a Cx Report
LEED

LEED v3 (2009) Enhanced Commissioning

• Independent 3rd Party CxA

• Review OPR, BOD and Design by mid-CD’s

• Independent submittal review

• Systems Manual

• O&M and Occupant Training Verification

• 10th Month Review of Building Operation
Energy Codes, Standards, Guidelines and Regulations

**ASHRAE—Standards 55, 62.1, 90.1, 100, 135, and 189.1**
Energy Codes, Standards, Guidelines and Regulations

**Cx integrated into Codes**

- **International Building Code (IBC) - 2012** includes Special Inspector Requirements ‘to verify proper commissioning of Smoke Control Systems’. Special Inspector Qualifications include: Mechanical Engineering, Fire Protection Engineering, and Test and Balance Certification.

- **International Energy Conservation Code (IeCC) – 2012** C408 System Commissioning - Prior to Final Inspection, Registered Design Professional shall provide evidence of system (HVAC and Lighting) Commissioning and completion.

- **International Green Construction Code (IgCC) – 2012** Section 903 – Commissioning – The Registered Design Professional in Responsible Charge or Approved Agency shall perform Commissioning during Construction and after Occupancy per 903.1. Approved Agency: (AHJ to approve Qualifications)

- **International Energy Conservation Code (IeCC) – 2015** – Adds: Service Water Heating, Approved agency approval of mechanical commissioning and Lighting and daylighting testing Documentation
Energy Codes, Standards, Guidelines and Regulations

Integration of Cx / RCx w/ Energy

- ASHRAE 90.1-2010 and State Energy Conservation Codes include requirements for commissioning
- Federal, State Legislation & Executive Orders (requiring reduction in energy consumption)
- Energy Benchmarking / Reporting – Local Mandates (Various municipalities like New York, Chicago, Boston, etc.)
- Utility Company Energy Programs (RCx studies and implementation incentives)
- RCx – Highly Effective Energy Conservation Measure “Best First Step Energy Project”
- Cx / RCx role in M&V activities
Energy Codes, Standards, Guidelines and Regulations

**ASHRAE Guidelines 1, 0, 1.1**

- Guideline 1 – HVAC Cx Process for designers
- Guideline 0 – Cx Process
- Guideline 1.1 – HVAC&R Cx Process
- Design Intent Document = Owner’s Project Requirements
- 3rd Party Commissioning and Sampling Strategies
Energy Codes, Standards, Guidelines and Regulations

ASHRAE Standard 202-2013

• Based upon Guideline 0, in ‘normative’ (codified) language

• Divided into 13 steps in lieu of 5 phases

• Differences from Guideline 0
  • Mandatory role for Owner in defining requirements
  • Owner shall define OPR prior to the development of the architectural program
  • Performance criteria should be “measurable and verifiable”

• Commissioning process is harder to assess on a code compliance basis than rules typically found in other codes

• What LEED has under Enhanced Cx (design and submittal review) is now base scope under 202
Energy Codes, Standards, Guidelines and Regulations

- ASHRAE Guideline 0.2-2015
- Multiple Facility Planning
- Assessment
- Investigation
- Implementation
- Hand-Off
- Ongoing Commissioning (OCx)
Energy Codes, Standards, Guidelines and Regulations

- ICC (Code Creator)
- IgCC (Code)
- ICC Cx Guide (Process)
- IAS AC476 TAC (Cx Provider Accreditation)
- ICC 1000 Standard for Cx
Energy Codes, Standards, Guidelines and Regulations

Draft of ICC 1000 - Standard for Commissioning

• Seeks to establish ‘minimum requirements’, but permits “equivalent” alternate processes?
• Requires Cx documentation at time of permit application, including Cx Plan and confirmation of design review
• References that Cx Authority is responsible for verifying compliance with codes (NOT CxA’s responsibility)
• Requirements for “qualified” and “certified” Cx Providers and Specialists
Energy Codes, Standards, Guidelines and Regulations

Draft of ICC 1000 – Standard for Commissioning

• **Cx Provider** oversees process while **Cx Specialists** review specific technical systems

• Cx schedule requested at time of permitting; difficult to develop prior to construction schedule

• Additional **Cx documentation required prior to issuance of a certificate of occupancy**

• Required timing of final Cx deliverables (Systems Manual, Record Documents, etc.) may be aggressive, depending upon information provided by other team members.
Code Implementation and Enforcement

- Authority Having Jurisdiction (AHJ)
- Process for Building Permit applications
- Construction drawings plan review for code compliance
- Issue Building Permits
- Perform regular periodic inspections of construction
- Issue violations for building or component deficiencies
- Verify correction of violations
- Issue Certificate of Occupancy
- “Once C/O is issued, power, water and gas is authorized to be turned on and building owner is allowed to occupy and operate.”

International Code Council
People Helping People Build a Safer World™
Code Implementation and Enforcement

Per April 5, 2013 IAS Letter:

“To aid code officials in enforcing commissioning, the International Code Council (ICC) has published a Commissioning Guideline (ICC G4-2012). However, this guideline does not specify what is required when approving and accepting a commissioning agent/agency.”

AC 476 - Establishes criteria for obtaining and maintaining accreditation for commissioning training and certification organizations.

ICC 1000 - Standard for Commissioning
Code Implementation and Enforcement

Building Department Responsibilities

• The building department is responsible for administering and enforcing the provisions of the adopted codes which regulates the design and construction of buildings and structures in their jurisdiction.

• In many communities, the building department is also the enforcement agency of the zoning ordinance and which may also include required clearances from other city agencies such as the Public Works and City Planning Departments.
Code Implementation and Enforcement
2012 IeCC Adoption into State and Local Codes

SECTION C408
SYSTEM COMMISSIONING

C408.1 General. This section covers the commissioning of the building mechanical systems in Section C403 and electrical power and lighting systems in Section C405.

C408.2 Mechanical systems commissioning and completion requirements. Prior to passing the final mechanical inspection, the registered design professional shall provide evidence of mechanical systems commissioning and completion in accordance the provisions of this section.

Construction document notes shall clearly indicate provisions for commissioning and completion requirements in accordance with this section and are permitted to refer to specifications for further requirements. Copies of all documentation shall be given to the owner and made available to the code official upon request in accordance with Sections C408.2.4 and C408.2.5.
Code Implementation and Enforcement
2012 IeCC Adoption into State and Local Codes

- C408.2.1 Commissioning Plan
- C408.2.2 Systems Adjusting and Balancing
- C408.2.3 Functional Performance Testing (FPT)
- C408.2.4 Preliminary Commissioning Report
- C408.2.5 Documentation Requirements
- C408.2.5.4 Final Commissioning Report
- C408.3 Lighting Systems FPT
Code Implementation and Enforcement

Cal Green

- California Green Building Standards Code (Part 11 of Title 24, California Code of Regulations)
- California Building Standards Commission and ICC
- January 1, 2016 enforcement date (2010 @ 1/1/11)
- Mandatory and Voluntary Requirements
- Nonresidential and Residential
- Reduce construction waste
- Make buildings more efficient in use of materials and energy
- Reduce environmental impact before and after construction
Code Implementation and Enforcement
2012 IgCC Adoption into DCRA Building Code

- District of Columbia (DC)
- Mayor Vincent C. Gray
- Department of Consumer and Regulatory Affairs (DCRA)
- DCRA is responsible for regulating construction and business activity in the District of Columbia. The agency operates a consolidated permit intake center and reviews all construction documents to ensure compliance with building codes and zoning regulations.
Code Implementation and Enforcement

2012 IgCC Adoption into DCRA Building Code

Sample IgCC Code Mandated Commissioning Test:

606.1.2.2 Testing requirement. The building envelope air tightness shall be considered to be acceptable where the tested air leakage is less than 0.25 cfm/ft² (4.57 m³/hr/m²) when tested at a pressure of .30 in w.c. (75 Pa). Testing shall occur after rough in and after installation of penetrations of the building envelope, including penetrations for utilities, HVAC, plumbing, and electrical equipment and appliances. Testing shall be done in accordance with ASTM E779.

“Commissioning verifies that building staff are prepared and able to operate and maintain the building’s systems.”
TODAY
Various Commissioning Standards

Currently Prevailing Commissioning Standards / Codes
• ASHRAE Standard 202-2013
• ICC 1000 (Draft)
• IeCC 2012
• IgCC 2012

Currently Prevailing Guides/Guidelines
• Whole Building Design Guide
• U.S. Army Corps of Engineers
• ACG
• ASHE
• ASHRAE
• BCA
• GSA
• NEBB
• VA
Prevailing Commissioning References

- **ASHRAE Standard 202 - 2013**: Commissioning Process for Buildings and Systems
- **ASHRAE Guideline 1 - 1996**: The HVAC Commissioning Process
- **ASHRAE Guideline 1.1 - 2007**: HVAC&R Technical Requirements for the Commissioning Process
- **ASHRAE Guideline 0 - 2013**: The Commissioning Process
- **ACG Commissioning Guideline – 2005**: For Building Owners, Design Professionals and Commissioning Service Providers
- **NEBB - 2009**: Procedural Standards for Retro-Commissioning of Existing Buildings
- **ASHE - 2010**: Health Facility Commissioning Guidelines
Various Commissioning Standards

Regulation and Oversight

• Continued **tightening** of standards, codes and ordinances to achieve energy reduction targets

• **Expanded incorporation of Cx in codes**, including Cx Provider certification requirements

• Local (municipal) ordinances related to benchmarking building energy use **requiring periodic RCX or OCx**

• Recognized importance of **tracking performance** and establishing M&V procedures

• Increased emphasis of **third party Cx providers**
Various Commissioning Standards

Managing Owner’s expectations of Cx Providers

• Professional service, **NOT** a commodity
• Importance of **third party** independence
• Understand **value of entire Cx process** (pre-design thru post acceptance)
• Need for **qualified and diverse** team
• Importance of CxA’s **communication** abilities
• Understanding limits of CxA’s **authority and responsibility**
Various Commissioning Standards

Developing qualified & experienced Cx Providers

- **Training curricula and programs** developed by national organizations, including ACG, EMA and BCA
- **Mentoring** by experienced CxAs and professionals in related industries
- **Outreach to students** through programs at various universities and community colleges
Government Endorsed Commissioning

DOE / NIBS BBWG

Better Buildings Workforce Guideline – Released in March 2015

- Job Descriptions for
  - Energy Auditor
  - Commissioning Professional
  - Energy Manager
  - Building Operations Professional
  - Facility Manager

- Requires third party accreditation of certification programs, typically through ISO / IEC 17024

- Major organizations (BCA*, ACG, EMA, AEE) working toward revising their certification programs for accreditation

- Will include requirement for ongoing (periodic) continuing education hours / training.

* BCA CCP is ANSI accredited (June 2016)
Government Endorsed Commissioning

**BBWG Cx Professional Certification**

- **Mandatory Requirements**
  - Participate in three (3) commissioning projects
  - Participate in at least 6 of 8 Cx activities

- **Educational / Experience Requirements**
  - Licensed Architect or Professional Engineer – 3 years’ Cx experience
  - Bachelor’s degree in building sciences – 5 years’ Cx experience
  - Assoc./ Tech./ Voc. 2 year degree – 8 years’ bldg. experience with 5 years in Cx
  - High school diploma or GED - 10 years’ bldg. experience with 5 years in Cx

- **Assessment of Competence – Certification Examination**

- **Code of Ethics**

- **Recertification Requirements**
  - Certification may not be awarded for a period longer than three (3) years
  - Must participate in commissioning for at least one (1) project
  - Must complete minimum of 25 continuing education (CE) requirements **PLUS**
    25 points from Qualifying Recertification Options
Government Endorsed Commissioning

Initial commercial building occupations = Energy auditor; Building/stationary engineer; Commissioning/retrocommissioning authority. Additional occupations will be added based on industry needs.
Building Commissioning Certification Board

- Tim O’Neill – President
- Mike English – Vice President
- Wayne Williams – Secretary
- Louis Redmond Jr. – Treasurer
- Ryan Lean – Director at Large
- Mike Eardley – Director at Large
- Jerry Ensminger – Director at Large
- Sethuraman Sundar – Director at Large
CCP/ Exam Development/ Accreditation

Accreditation Requirements

• DOE/NIBS BBWG ISO 17024 Compliance
• ANSI certification
• Governance & Structure
• Test Development
• Management System/Policy Manual
• Bylaws/Bylaw Amendments
• Gap Certification Implementation Plan
• Job Task Analysis (JTA) Alignment
• Exam Development
CxA/ EMP Exam Development/ Accreditation
CxA/ EMP Exam Development/ Accreditation

**CxA New Exam Development**

- Darren Draper
- Baskar Subbarao
- Rich Diddam
- Scott Gordon
- Chris Smith
- Mike Hartley
- Ken Tella
- Duane Pinnix
- Christian Javorski
- Justin Garner
- Jim Magee, Chair

- Job Task Analysis (JTAs)
- Exam Questions Writing
- Exam Questions Vetting

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6th Annual Technical Summit
Exam Development/ Accreditation

**DOMAIN I: PRE-DESIGN**

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<th>Task 1: Obtain design documents in order to develop the scope of commissioning.</th>
<th>CLASSIFICATION</th>
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**Knowledge of:**
1. Needed design documents (e.g., schematic design diagrams, design narratives, specifications, client standards, design development information) 010101

**Skill in:**
1. Asking for information 010102
2. Analyzing documentation to determine if it is adequate to provide response to RFP 010103
3. Requesting the specific information needed 010104

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<tr>
<th>Task 2: Write and submit a proposal for commissioning services in response to an RFP in order to establish a fee structure and to form a contract.</th>
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**Knowledge of:**
1. Commissioning process 010201
2. AABC Commissioning Guidelines 010202
3. Owners’ expectations 010203
4. Systems to be commissioned 010204

**Skill in:**
1. Writing reports 010205
2. Analyzing systems 010206
3. Calculating fees based on time commitments 010207
4. Estimating hours 010208
5. Organizing Information 010209
6. Interpreting RFPs 010210
Certified Commissioning Professional (CCP)

• Seeking 25 examinees (1/2 price/6 weeks)

• 1st ANSI accredited Cx certification

• 1st Cx certification recognized by DOE BBWF

• 1st Cx certification endorsed by NIBS Commercial Workforce Credentialing Council (CWCC)

• Recertification/Credential Maintenance

• Appeals and Complaints
BCxA University (http://bcxauniversity.org)

- Now accepting new students
- Next lab offering November 2016
- New Construction and Existing Building Commissioning Classes are coming to Charlotte in November 1-4 at UNC (http://bcxa.org)
- All past webinars recorded are available on website
- CxP Certificate Program

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<tr>
<td>Bradley Brooks</td>
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<tr>
<td>Holly Brunk</td>
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<tr>
<td>Amber Buhl</td>
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<td>Robert G. Chronic</td>
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<td>Lia Webster</td>
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LEED Version 4

• “Increased rigor”
• “raise the bar in a way that challenges the building industry to reach higher than ever before”
• “the market has requested additional time to prepare for LEED v4” (national & international)
• Measurement and Verification
• EUI and Energy Performance Metrics
• Maintenance and Operations
• Ongoing Optimal Performance Review
• Extension for LEED users to register projects under LEED 2009 rating system until **Oct. 31, 2016**
• **LEED 2009 Sunset date: June 30, 2021**
LEED Version 4

LEED v4 and Commissioning

• New credit for using an *Integrative Process* during design

• **Pre-requisite** for CxA to prepare a *Current Facilities Requirements and Operation and Maintenance Plan* – (formerly Systems Manual under Enhanced Cx)

• Under Enhanced Cx, Additional 1 point for “*Monitoring-Based Commissioning, “…identify points to be measured and evaluated to assess performance of energy and water-consuming systems…”* and 2 points for *Envelope Commissioning*

• *Building level metering* is a pre-requisite with optional credit for sub-metering
LEED Version 4

LEED v4 and Commissioning

- EA prerequisite for *Energy Performance* – 5% reduction against ASHRAE 90.1-2010 for new construction and 3% for major renovations
- EA credit for *Demand Response* – participation in programs that make energy generation and distribution more efficient
- Under EA credit for *Renewable Energy Production* (Up to 3 points depending upon the percentage of renewable energy
- Pilot credit for *Alternative Energy Performance Metric ACP*
- Pilot credit 88 for *LEED O+M Starter Kit*
Commoditization

Factors Influencing Commoditization of Cx

- Code Compliance
- DOE/NIBS BBWG
- Low Bid Procurement
- Burying Cx in Contractor Specifications (TAB./Mechanical/Etc.)
- Construction Phase Cx instead of Comprehensive
- Lax independent 3rd Party Cx requirements
Building Envelope Commissioning (BECx)

- ASHRAE 90.1-2010 and the 2012 Energy Conservation Code increase emphasis on envelope
- Critical importance of design review for continuity with respect to air and water tightness
- Requirement for envelope mock-up
- Pre-installation meetings for each envelope assembly
- Performance testing:
  - Water nozzle testing
  - Combined air and water test
  - Infrared thermography
  - Blower door test
Ongoing Commissioning Cx (OCx)

- Under ASHRAE Guideline 0.2-2015, the final phase of RCx incorporates OCx
- Under LEED v4, enhanced commissioning offers an additional credit for Monitoring-Based Commissioning (MBCx)
- Importance of “building analytics”, utilizing data gathered and analyzed through defined algorithms
- Fault detection and diagnostics (FDD)
- Integrated with Building Automation System (BAS) and Energy Information Systems (EIS)
- Application in large campus or portfolios of buildings – in-house vs. outsourced through third party
Integration of Cx and Energy Management

Evolution of the Construction Industry

- Use of cloud-based Cx web applications and interfacing with Contractor’s cloud-based software
- Increased integration and interoperability between building systems with enhanced security for remote access
- Expansion of Design/Build delivery system (with and without bridging documents)
- Off-site fabrication of major components, systems and sections of buildings – will some testing be performed off-site?
Integration of Cx and Energy Management

Expansion of services by Cx Providers

• **Expansion of services** into related areas: energy audits and modeling, energy consulting, building analytics, M&V, etc.

• **RCx and MBCx** will surpass new building Cx in annual fees

• More **outsourcing** by Facilities’ departments; relying on others for facilities management, or at least monitoring systems, including MBCx

• **Cx information tied to BIM models and CMMS** with attributes
EUI, Building Performance Metrics, M&V

- Energy Use Index (EUI)
- Measurement and Verification (M&V)
- Computerized Maintenance Management Systems
- Optimization via Ongoing Cx (Trending/Testing)
- Utility costs analysis
- Energy Model Calibration
- Energy Management/Energy Audits
BCA News

• October membership drive month
• Get 3 months free with 2017 membership
• Energy Management/Energy Audits
• Revised New Construction Best Practices
• New Updated Cx Templates
• BCA Int’l Board & Chapter Elections
• Recruit new board members
This concludes a SERBC/7x24ECC Continuing Education Course

Facility Commissioning Group

Jim Magee, CxA, LEED-AP
President

jim@facomgrp.com

Thank You!

BCxA Southeast Region
Building Commissioning Association