New Construction Building Commissioning Best Practice

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Learning Objectives

1. Present the new BCA’s *New Construction Building Best Practice* document.
2. Review Industry Concerns: what are the issues and how does the Best Practice address those issues.
3. How did we develop the new Best Practice?
4. How will you use the Best Practice in your future?
Presenting the BCA Commissioning Best Practice

- Developed by the BCA
- Applies to new building construction and complements the Existing Building Best Practice, published in 2008
- Provides consistency in the commissioning process
- Can be used across all disciplines
- Puts Owners, Design Professionals, Contractors, and Commissioning Providers on the same page
Why create a “best practice”? 

“[T]he BCA felt that writing a best practices document would help distill the long list of guidelines and longer list of tasks into primary activities that represent the ideal commissioning process, applicable to most building types and projects.”

“Defining best practices creates a benchmark against which the market can gauge quality and professionalism. These Best Practices allow the BCA and other organizations to objectively evaluate commissioning initiatives, processes, guidelines, training curriculum and certifications, etc.”
How the “Best Practice” document was developed

An effective formula to address key concerns:

• Surveyed membership to identify concerns
• Distilled responses to twelve fundamental issues
• Developed success factors
• Created the Best Practice processes addressing each industry concerns
• Published a draft version to the membership for review and comment.
Survey the membership

Question to membership: what issues do you see in the industry today?

“[T]he BCA surveyed its members to identify major issues of concern, areas for improvement,…and where potential pitfalls…for the advancement of commissioning for new construction might exist.”
Response from survey:

• Commissioning processes are not understood, attempted or completed properly.
• 12 core industry concerns were addressed in the NCBP document. They are listed in Appendix B of the document.
Distill a solution

Solution:

• BCA Best Practices Committee implemented a sagacious process to address each of the 12 core industry concerns to determine the best method of addressing the issue.

• These formed practical, real-world success factors for real world problems, not an ivory tower process.
The **OPR and the BOD are frequently not being developed** by the project team nor utilized for the Cx process. How to develop an OPR and who is responsible for its development is a common barrier.

**Best Practice Solutions:**
- Utilize a proven method to obtain and document OPR input.
- Assign a champion and utilize a good facilitator.
- Begin early, before schematic design, and **keep the OPR up-to-date throughout the project**.
- Verify and measure success of OPR achievement throughout the project by comparing the design documents against the OPR.
Commissioning **Design Reviews** are being **inconsistently performed**. The CxA may be brought in late to the project or the intent and role of the design review is unclear.

**Best Practice Solutions:**

- Ideally, include three reviews and three review back-checks.
- Review level should be appropriate for the level of design completion.
- Reviewer should have appropriate level of expertise.
- Review comments and response to review comments should be documented.
The commissioning design review is neither a peer review nor value engineering. At a minimum, the commissioning design review should include:

- Verification that the design meets the OPR.
- Evaluation of energy efficiency aspects of the systems and that the systems and equipment specified meet the Owner’s energy efficiency goals.
- Assurance that appropriate O&M Documentation, including the Systems Manual, is detailed within the specification.
- Confirmation that the training requirements included in the specifications are detailed and consistent with the Owner’s training needs.
Issue 3

Generic pre-functional construction installation checklists are being utilized in lieu of project-specific.

Best Practice Solutions:
- Supplement standard checklists with project-specific information.
- Obtain input from the design, construction, and operation team.
- Complete checklists with the aid of the construction team.
**Issue 4**

**Construction Observation** by the Commissioning Authority can be **too infrequent**.

**Best Practice Solutions:**
- Owner should understand importance of field observations.
- Adequate field observations should be included in Cx Scope of Work.
- Couple field observations with regular project and commissioning meetings.
- Consider abbreviated field reports to document Cx visits.
The **functional testing** process is sometimes performed inadequately.

**Best Practice Solutions:**

- Testing scope of work should be well-defined for all parties.
- Follow the BCA *Essential Attributes* for functional testing.
- Encourage O&M staff involvement in functional testing for training benefits.
- Confirm all sequences of operation details through controls integration meetings.
- Utilize trend data as a supplement to functional testing.
There is a **lack of clarity surrounding** the appropriate use of “**sampling**”.

**Best Practice Solutions:**

- CxA reviews with the Owner the resulting rigor, objectivity, cost, time, and risk of potential sampling approaches.
- Sampling should *not* be done in high-risk, life safety, and complicated systems.
- Define the sampling process in the commissioning plan and specifications.
The O&M personnel training can be ineffective at assuring efficient operation.

**Best Practice Solutions:**

- Define training needs early (in design).
- Include active participation from maintenance staff, CxA, designers, contractors, and equipment vendors.
- Perform *systems-level* training in addition to component-level training to illustrate inter-component interaction.
- Incorporate Systems Manual and include syllabus with training.
The **Systems Manual and Final Commissioning Report**, if provided, are often inadequate and do not contain all necessary documentation.

**Best Practice Solutions:**
- Develop the Systems Manual outline in the OPR.
- Include contractor requirements in the contract documents.
- Build the Systems Manual contents throughout the project.
At a minimum, the Systems Manual should include:

- Owner’s Project Requirements as adjusted through the design process,
- Basis of Design as adjusted through the design process,
- List of the original setpoints and an operational record of what changes were made throughout the course of commissioning,
- Performance Metrics/Benchmarks,
- One-line flow diagrams for major systems,
- Seasonal start-up and shut-down; manual and restart operations,
- Complete as-built control drawings,
- Description of and rationale for energy-saving features and strategies,
- Retesting schedules,
Issue 8 - continued

- Recommendation for recalibration frequency of setpoints, sensors, and actuators by type and use,
- Description of primary recommended trend logs,
- Plans for continuing commissioning or re-commissioning of the systems,
- List of user-adjustable change points and schedules with description,
- List of time-of-day schedule and frequency for their review,
- Guidelines for establishing and tracking benchmarks,
- List of diagnostic tools to assist the staff,
- Fire alarm and emergency power matrices,
- Operator notes for ongoing achievement of the Owner’s Project Requirements.
The near-warranty-end review, if performed, often omits evaluation of key performance metrics.

**Best Practice Solutions:**

- Confirm that equipment setpoints are being met and are following schedules.
- Utilize occupant satisfaction surveys.
- Document warranty and operational issues and develop resolution plan.
- Evaluate energy consumption trends, assist with energy tracking protocols.
What makes a Commissioning Agent qualified?

**Best Practice Solutions:**

- Experience as the Commissioning Authority on similar projects.
- Independent Owner Advocate.
- Excellent written and verbal communication skills.
- Engineering knowledge of building systems and design.
- Extensive hands-on field experience in construction, operation and maintenance, testing, and troubleshooting.
- Related education, commissioning certification, and/or professional licensure.
Owners and the Building Industry as a whole do not always understand the Commissioning Authority’s (CxA) role for the design review.

**Best Practice Solutions:**

- The Engineer of Record is ultimately responsible for the project design and makes the final decision regarding the design.
- CxA comments should reflect a consulting, not a directing, role.
- CxA limits their comments to their scope (commissioning facilitation versus a peer review).
- Owner arbitrates designer/CxA issues.
Issue 12

The integration and functionality of controls systems is problematic.

Best Practice Solutions:

• Owner-desired control interfaces and functionality should be defined in the OPR and early in the design.
• A controls integration coordination meeting should occur in design and be fully detailed in the construction documents.
• Controls integration coordination needs to continue through the submittal process and construction.
• Controls integration needs to be verified through construction checklists and functional testing.
• Involve all relevant vendors/contractors to resolve integration issues.
Section 2 Pre-Design

2. Pre-Design Phase

2.1 Introduction/Overview
A. Commissioning ideally begins in the pre-design phase.
B. The Pre-Design Phase lays the groundwork for the project and defines the plan for commissioning. During this phase the commissioning team is assembled and the Owner’s Project Requirements (OPR) and the building program are developed. All decisions made in ensuing phases should be made with reference to the OPR.

2.2 Objectives
A. Identify the Commissioning Team
B. Develop the OPR
C. Define the initial commissioning scope and budget
D. Develop the initial commissioning plan
E. Verify that the building program is consistent with the OPR

2.3 Commissioning Team
A. Owner/ Owner’s representative
B. Commissioning Authority (CxA)
C. Design team
Pre-Design Activities

2.4 Pre-Design Activities

A. Owner(s) designates a party to act as their project representative for commissioning related activities.

B. Owner selects /designates a Commissioning Authority for the project.

1. **The CxA is in charge of the commissioning process and makes the final recommendations to the owner regarding functional performance of the commissioned building systems.** BCA Essential Attribute

2. **The CxA is an objective, independent advocate of the Owner.** If the CxA's firm has other project responsibilities, or is not under direct contract to the Owner, a conflict of interest exists. Wherever this occurs, the CxA discloses, in writing, the nature of the conflict and the means by which the conflict shall be managed. BCA Essential Attribute

3. In addition to having good written and verbal communication skills, the CxA has current engineering knowledge and extensive hands-on field experience regarding: BCA Essential Attribute
   a) Building systems
   b) The physical principles of building systems performance
   c) Building systems start-up, balancing, [functional] testing and troubleshooting.
   d) Operation and maintenance procedures
   e) The building design and construction process

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**Industry Concern**

What makes a Commissioning Authority qualified?

**Best Practice Solution:**

- Experience as the Commissioning Authority on similar projects.
- Independent Owner Advocate
- Excellent written & verbal skills
- Engineering knowledge of building systems and design.
- Extensive hands on field experience in construction, O&M, testing and troubleshooting.
- Related education, commissioning certification and/or professional licensure.

See Industry Issue 10 in the Appendix for more detailed information.
The **Best Practices** document is:

- A common reference point for educating other disciplines and stakeholders (Owners, Contractors, Facilities and Maintenance, End Users, and Occupants),
- A reference document for in-house use,
- A training tool,
- A roadmap of the commissioning process for you and your customers.

The **Best Practices** provide a **clear understanding** of the **commissioning process** to steer you through the different phases of a **new construction** project.
Questions?

“Live” survey
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