BCA Cx Handbook, Templates & Best Practices Update

Karl Stum, BCA Best Practices Committee Chair
Building Cx Handbook Ver 3

- Karl Stum & Diana Bjornskov
- Completely rewritten New Construction and Existing Building Cx Chapters
- New chapters on:
  - Costs and benefits (Diana Bjornskov)
  - Ongoing Cx --monitoring based and manual methods, FDD, etc.— (Janelle Griffin)
  - Building enclosure Cx (Kris Linster)
  - 90 pgs of appendices: How to Hire a CxP and other important details of the Cx process
New Construction Cx Best Practices

**Purpose of Update**

- Take into account changes in the Cx industry and to maintain consistency with Cx Handbook

**Status**

- BP Committee revisions complete, being reviewed by BCA Board

**Proposed Changes**

- Systems Manual--follows closer to ASHRAE and LEED 4
- Recommending more rigorous design reviews
New Construction Cx Best Practices

Proposed Changes, cont.

- Use of elec or cloud based Cx management should be considered
- Development of a PM plan is a recommended task
- More emphasis on performance persistence activities during Occupancy
- Other changes that clarify and emphasize various issues
Existing Building Cx Best Practices

**Purpose of Update**
- Reflect new practices and concepts, like MBCx, FDD, OCx
- Make format more consistent with New Const Best Practices
- Reflect Cx Handbook concepts where appropriate

**Status**
- In process of being revised now
- Publishing expected early in 2\textsuperscript{nd} quarter of 2018
Application Templates

- Revised online format and accessibility
- Templates currently on BCA website: 85
- Number of templates by mid-2018: 123
- Number of completely new document subjects: 44
- Not just more construction checklists, but other useful documents
Application Templates

DESIGN & PRE-DESIGN PHASE

**Owner’s Project Requirements**
- 1.1.1 Owners-Project-Requirements-Template-Outline.docx
- 1.1.2 OPR-Template-and-Sample-Long-Version.docx
- 1.1.3 OPR-Workshop-Guide.docx

**Basis of Design**
- 1.2.1 Basis-of-Design-Guideline-and-Outline.docx
- 1.2.2 Basis-of-Design-Template.docx
- 1.2.3 Basis-of-Design-Sample.pdf

**Requests for Cx Qualifications and Proposals**
- 1.3.0 RFQ-RFP Forms Descriptions.Rev1.docx
- 1.3.1 Pt.A Cx New Constr.Request for Quals for Specific Project.Rev1.docx
- 1.3.2 Pt.A Cx New Constr.Request for Quals for Pool or CxPS Shortlist.Rev1.docx
- 1.3.3 Pt.B Cx New Constr.RFP to Prequalified Pool or Shortlist of CxPs.Rev1.docx

**Cx Contracts**
- 1.4.2 Notice-of-Intent-to-Award-Cx-Services.docx
- 1.4.3 Shortlist-Notification-to-Award-Cx-Services.docx
- 1.4.4 Sample-CxP-ContractCx

**Budgeting & Cost Benefits**
- 1.5.1 Cx-Cost-Benefit-Study-2004-LBNL
- 1.5.2 Cx-Cost-Benefit-Study-2009-LBNL
- 1.5.3 Monitored-Based-Cx-Cost-Benefit-Study-2009-LBNL

**Cx Plan**
- 1.6.1 Design-Phase-Cx-Plan-Template.docx

**Commissioning Specifications**
- 1.7.1 019113-General-Commissioning-Requirements.docx
- 1.7.2 230800-Commissioning-of-HVAC-and-Controls.docx
- 1.7.3 220800-Commissioning-of-Plumbing.docx
- 1.7.4 260800-Commissioning-of-Electrical.docx
- 1.7.5 210800-Commissioning-of-Fire-Suppression.docx

**Building Enclosure Commissioning**

**Training Requirements, Plan, Agendas, Evaluation**
- 1.8.0 Training-Forms-List-and-Instructions.docx
- 1.8.1 Training-and-Demonstration-Specification.docx
- 1.8.2 Overall-Training-Plan-&-Record.xlsx
- 1.8.3 Generic-Equipment-Training-Agenda-&-Record.docx
- 1.8.4 BAS-1-Controls-Fundamentals-Training-Agenda-&-Record.docx
- 1.8.5 BAS-2-Controls-Equip-Specific-Training-Agenda-&-Record.docx
- 1.8.6 Test-&-Balance-Training-Agenda-&-Record.docx
- 1.8.7 Trainee-Evaluation-of-Training.docx

**O&M Manual Requirements, Checklist and Review Forms**
- 1.9.1 O&M-Manual-Specification.docx
- 1.9.2 O&M-Manual-Submission-&-Review-Checklist.xlsx

**Systems Manual Requirements**
- 1.10.1 Systems-Manual-Requirements-&-Organization.docx
- 1.10.3 Systems-Manual-General-Building-Information-&-Contractor-List.docx
- 1.10.4 System-Manual-Record-of-Content-Submitted.docx
- 1.10.5 Systems-Manual-Template-Example-Univ-Lab.docx

**Design Review**
- 1.11.1 Cx-Design-Review-Template.xlsx
Application Templates

CONSTRUCTION PHASE

Meetings
2.1.1 Const-Phase-Cx-Planning-Meeting-Agenda.docx
2.1.2 Kickoff-Meeting-Agenda.docx

Cx Equipment List
2.2.2 Cx-Request-for-Documentation.xlsx

Cx Schedule, Tracking and Progress Reports
2.3.1 Cx-Schedule-(detailed).xlsx
2.3.2 Weekly-Test-Plan-and-Record.xlsx
2.3.3 Cx-Progress-Summary.docx
2.3.4 Detailed-Cx-Progress-Report-Sample.docx
2.3.5 Cx-Progress-Status-Detailed.xlsx
2.3.6 Cx-Summary-Report-Sample.docx

Submittal Review (Equipment)
2.4.1 Submittal-Review-Template.docx

Issue Management & Field Observation
2.5.1 Cx-Issues-Log-Template.xlsx
2.5.3 Field-Observation-Record-Form.docx
2.5.4 Startup-Witness-Record-Form.docx
2.5.5 Test-Witness-Record-Form.docx
Application Templates

Cx Application Tools: Samples and Templates

Cx Application Example Samples and Templates

These commissioning application samples and templates are a few of the documents available to members of the BCxA's New Construction Building Commissioning Best Practices. The BCxA is pleased to make these publicly available.

Public Templates

Cx Application Samples and Templates
(Additional template updates in progress)

Samples and templates are grouped by commissioning process phases, complementing the BCxA's New Construction Building Commissioning Best Practices. They are available in MS Word and Excel formats for BCxA members to download and use.

Not a BCxA Member? Become one today!
New Construction Cx Reference Guide

New Construction Cx Best Practices

a. Confirm general quality and completeness of the documents.
b. Confirm **commissionability** of the design.
c. Confirm adequate **O&M documentation** and **training** requirements.
d. Confirm the **BoD** is accurate and aligns with the **OPR**.
e. Review for discipline-specific compliance with the **OPR** for commissioned systems and assemblies.

3. The commissioning **design reviews** focus on verifying that the **OPR** and **BOD** are met relative to facilitating the commissioning process, including **training** and **O&M documentation**, and ongoing commissioning – in particular, for example for HVAC systems, that the reviews confirm that there are adequate equipment access, test ports, monitoring capabilities and points, and control features. Reviews also verify that energy efficiency, operation, control sequences, maintenance, **training** and **O&M documentation** requirements are consistent with the **OPR** and **BOD**.

Hyperlinked terms italicized or underlined (not shown here)
New Construction Reference Guide

New Const Cx Best Practices Reference Guide Link Page Example

Format Version: 2-18-2016

Term from Best Practices Document

Design Review

- Design review template. BCA 1.11.1 Cx Design Review Template.xlsx
- Sample design review. BCA 1.11.3 Sample Design Review.pdf
- Review process. ASHRAE Guideline 0 The Commissioning Process
- Design phase commissioning plan. BCA 1.6.1 Design Phase Commissioning Plan Template.docx
- Technical information on reviewing. Extensive list of items to check during reviews.
- Guidelines on sampling approaches to design review.
- Example review-Design development phase
- Example review-Construction documents phase

Source Details and Comments

BCA library

BCA library

Refer to the design review section of the guideline.

BCA library. Refer to the design review section of the guideline.

Technical information on reviewing. Manual has extensive check. Not all in this document is considered to be best provides good resource information.

A Word version is also available by logging into EDR online.

## New Construction Reference Guide

### Commissioning Design Review

#### Part I: Table Comments

Refer to the Overview page for design review approach, scope and process.

<table>
<thead>
<tr>
<th>Global Comment Num</th>
<th>Disciplines</th>
<th>Sheet or Page</th>
<th>Status</th>
<th>Equip/ System/ Location</th>
<th>Reviewer Comments and Recommendations</th>
<th>Designer Response / Owner and Reviewer Reply</th>
<th>Reviewer Comments</th>
<th>Date Entered / Closed</th>
<th>Special Qs in Const.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CD-001</td>
<td>EF</td>
<td>E4 series</td>
<td>OP</td>
<td>Fire Alarm - Door hold opens</td>
<td>Door hold opens are not shown on the fire alarm drawings. Are there door hold opens at the hallway doors, in particular at CL 2 and 7?</td>
<td>6-30-10 RC. See 95% sat.</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-002</td>
<td>EF</td>
<td>E4.1</td>
<td>OP</td>
<td>Smoke Detector - Main lobby/gathering location</td>
<td>Please verify that the placement of smoke detectors in the main lobby and gathering area has been coordinated to locate them at high points of the ceiling.</td>
<td>6-00-10 RC. Will coordinate.</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-003</td>
<td>EL</td>
<td>10510</td>
<td>OP</td>
<td>Lighting - Submittals</td>
<td>Paragraph 1.06.1.1 appears to limit the lighting designer’s scope of submittal review. Is this language potentially confusing to contractors who are not responsible for the various review responsibilities of the design team members?</td>
<td>5-16-10 AS. Lighting designer available to answer questions regarding installation and control of fixtures</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-004</td>
<td>EL</td>
<td>10510</td>
<td>OP</td>
<td>Lighting - Submittals</td>
<td>Paragraph numbering does not appear to be correct. For instance Para N appears to be the heading for O&amp;M data which then is described under Para O; para B.1 is also labeled as O. These are minor issues, but if addressed will improve clarity when enforcing this otherwise extensive submittal requirements section.</td>
<td>7-9-10 AS. Paragraph numbering has been corrected</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-005</td>
<td>EL</td>
<td>10510</td>
<td>OP</td>
<td>Lighting - Cleaning (1.23)</td>
<td>Recommend adding specific language regarding cleaning of light fixtures at the end of the project. Language such as: “All fixtures, lamps and control devices shall be cleaned to as new condition after all finish work is complete” is useful to ensuring the owner receives as new light fixtures. The electrician often skips down the fixtures after they are installed, but they are soiled by subsequent construction activity. Ensuring that the electrician cleans final cleaning will reduce conflicts at the end of the project.</td>
<td>7-9-10 AS. This language has been incorporated. See 3.05 D</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-006</td>
<td>EL</td>
<td>10570</td>
<td>OP</td>
<td>Lighting Control - All devices</td>
<td>Lighting control specifications do not currently include specifications of required equipment including occupancy sensors, photocells, wall switches etc. Please include specification of all lighting control devices.</td>
<td>7-9-10 AS. Specifications have been included</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
<tr>
<td>CD-007</td>
<td>EL</td>
<td>10570</td>
<td>OP</td>
<td>Lighting Control - Demand Lighting</td>
<td>Demand control and dimming adjustment appears to apply only to fixtures with dimming capability. 1. Is this correct? Please clarify sequences of operation. 2. Has a cost/benefit analysis been prepared to determine whether it will be life cycle cost effective to control the entire building with these energy saving and demand reduction features? 3. Is there a demand reduction control strategy such as a 1/3 fixture or lamp reduction that</td>
<td>7-9-10 AS. Dimming adjustment by its definition requires dimming capability. Demand control for non dimming fixtures would mean turning them off. There are sufficient proportion of dimming fixtures to meet</td>
<td>JC</td>
<td>5/17/10 /</td>
<td></td>
</tr>
</tbody>
</table>
COMMISSIONING PROCESS APPLICATION

A STAKEHOLDER GUIDE

Application of and Participation in the Process for New Construction Commissioning

A Joint Publication of

ASHRAE

and

The Building Commissioning Association
• Provides an overview of the Cx process
• Lists stakeholder roles and deliverables
  • Architect & engineers
  • Owner
  • Contractor
  • Sub-contractor
  • Manufacturer
  • CxP
• Appendices with more guidance
Karl Stum
Summit Building Engineering