

The Commissioning Process supporting Building's USGBC LEED Certification



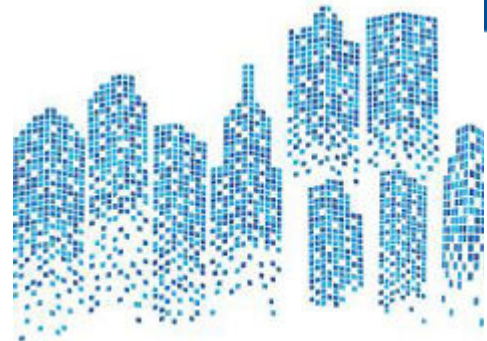
Andrés Sepúlveda
Commtech CEO
ASHRAE Region XIV Europe DRC



The Cx Process supporting Building LEED Certification

Building for People and Performance. Achieving Operational Excellence.

Why Are Great Designs Not Always Delivering Great Operations?



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Building for People and Performance. Achieving Operational Excellence.

How are buildings falling short?

Feature-packed, but not always functional



Unmanageable, complex control systems



Insufficient Commissioning



Energy Consumption much higher than benchmarks



The PROBE Project 1996-2001



Darryl K. Boyce 2019-20 ASHRAE President
Presidential Presentation , *“Building for People and Performance. Achieving Operational Excellence”*, June 24,

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Pre-design

Design

Construction

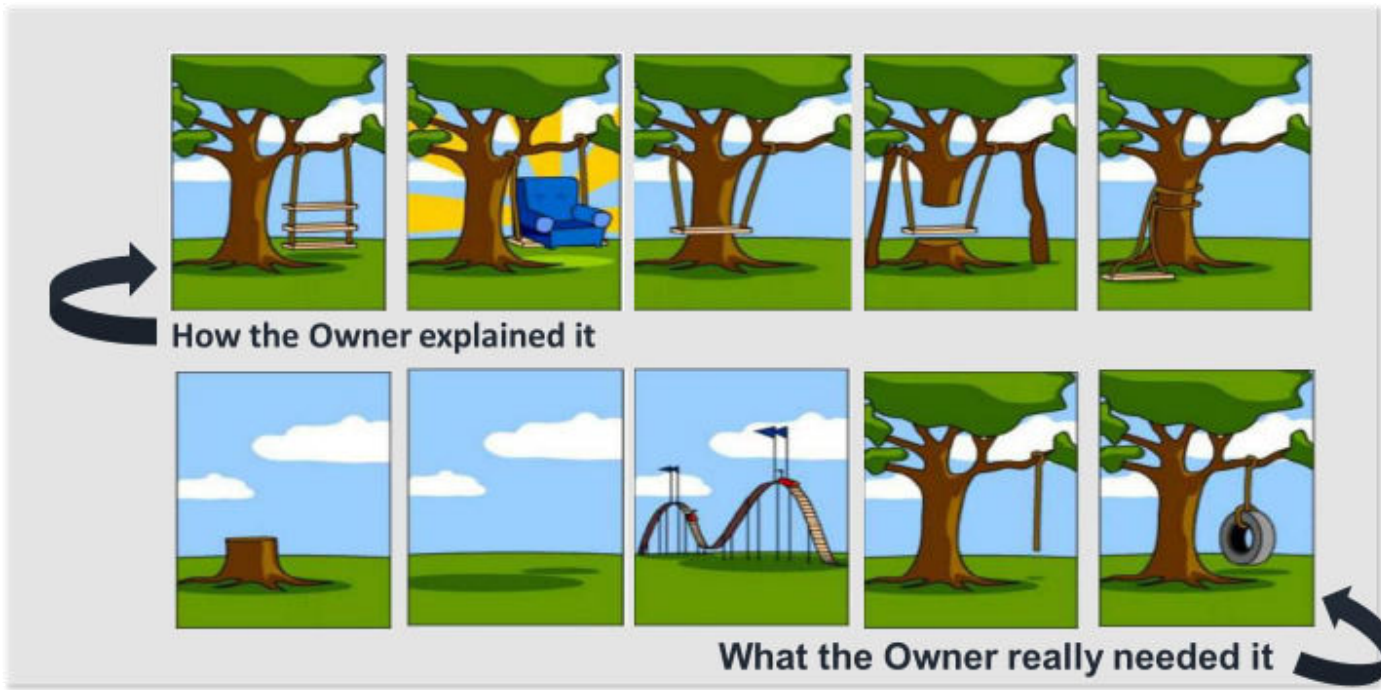
Occupancy and Operations

A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that all of the commissioned building systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements (OPR)



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OPR CLEAR DEFINITION IS A MUST



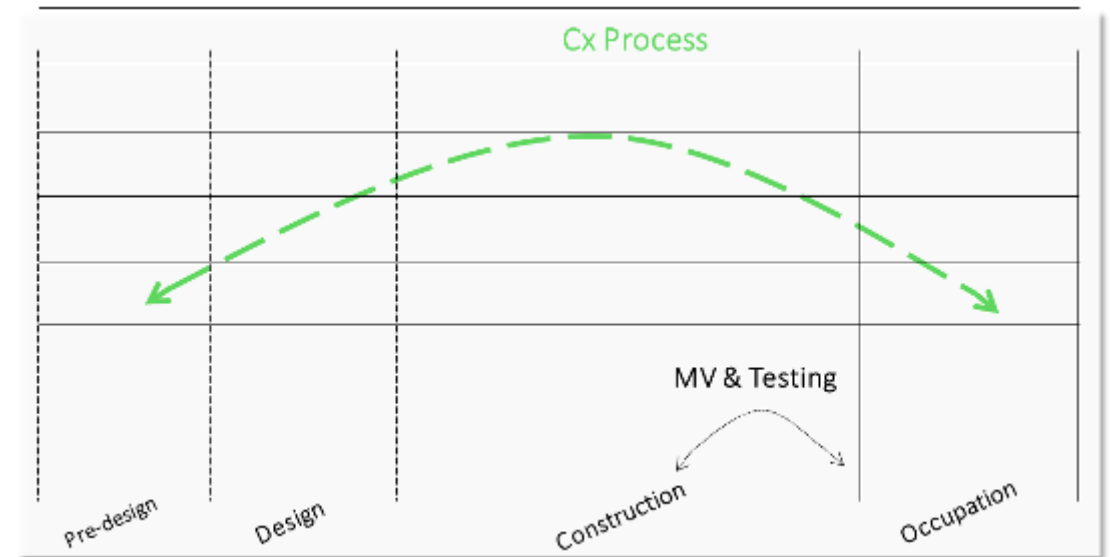
- Project overview, type, uses, planning and budget
- User requirements
- Project goals: sustainability, IEQ,...
- Other requirements: health, comfort, constructibility, materials, aesthetic, acoustic, accessibility, security, safety, adaptability, benchmarking,...
- O&M and Warranty Strategies

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Commissioning duties can NOT be included in the role of the:

- Design Team
- General Contractor and/or Subcontractors
- Manufacturers
- O&M Staff
- Project Manager
- Construction Manager
- Facility Manager

And Commissioning is NOT Testing



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Is Commissioning really needed ?

Each phase of the project acquisition process can hold pitfalls that reduce the likelihood of a high-performance building

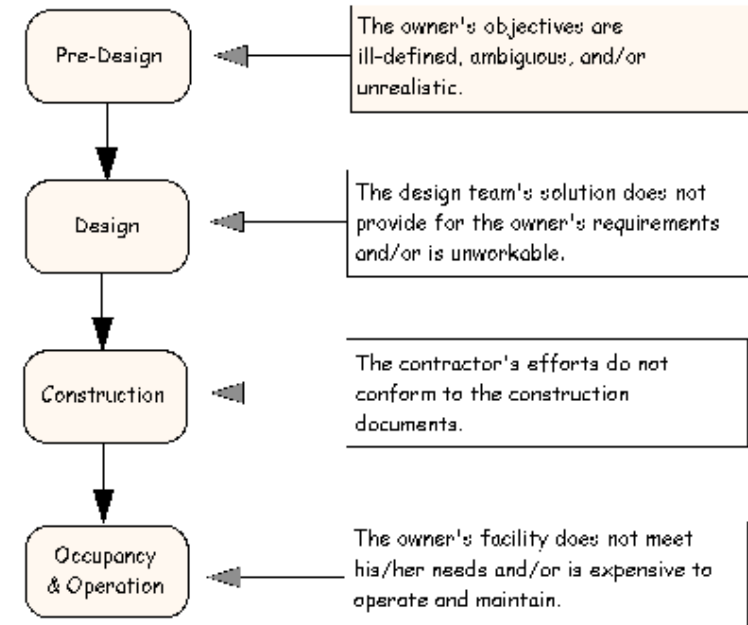


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Within the Cx Process Scope:

- Whole buildings
- Building systems
 - Active systems (dynamic)
 - Passive systems (static)
- Building sub-systems



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Cx Process Acronyms:

- **Cx Team**
- **CxA/CxP**
- **Cx Plan**
- **Cx Progress Report**
- **Systems Manual**

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Key Factors for a Successful Cx Process

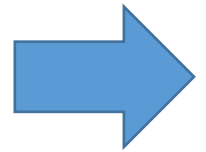
- Accredited and independent CxP, hired from an early stage
- Full support from the Owner
- Reasonable Cx Scope and Budget
- Cx strategy integration at a very early stage
- OPR Continuous monitoring
- O&M Personnel on-board asap
- Update System Manual
- Continuous O&M Personnel training
- Cx perspective throughout the building life cycle

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Commissioning encompasses "All"

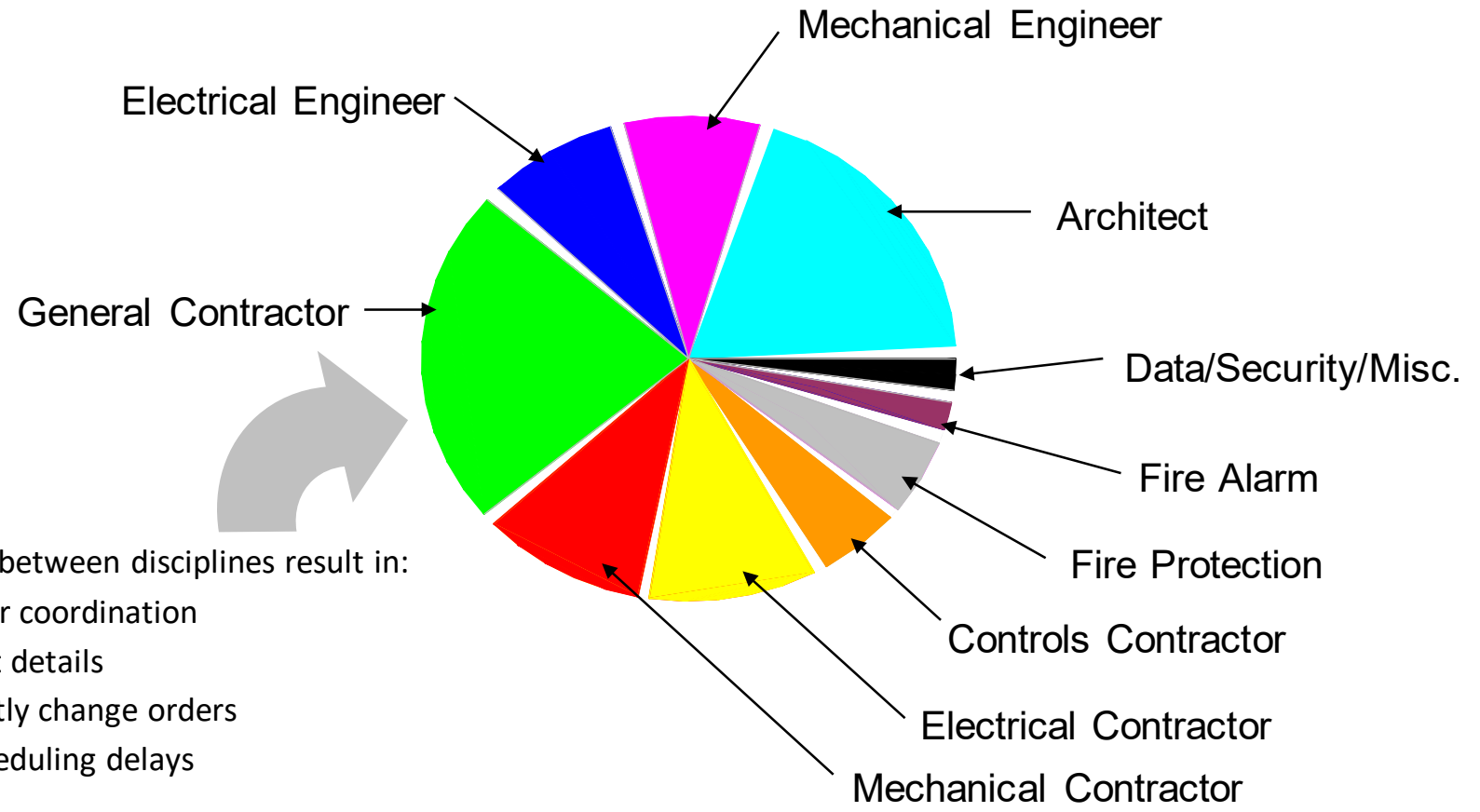


Commissioning helps fill the gaps in coordination



Gaps between disciplines result in:

- Poor coordination
- Lost details
- Costly change orders
- Scheduling delays



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Cx Process included in LEED Certification v4



- Pre-requisite (**LEED NC / CS / CI**): **Fundamental Commissioning and Verification**

Minimum Scope:

- HVAC&R and Controls
- Plumbing (HSW, pumps, controls)
- Electricity (Distribution, lighting and controls)
- Renewable Energy

Optional (as per Owner)

- Electricity (HV), Building Enclosure, FS/DS, Security, Communications...

- Credit (**LEED NC / CS**):

Option 1: Enhanced Systems Commissioning

- Path 1: **Enhanced Commissioning/3 points** (4 in **LEED CI**)
- Path 2: **Enhanced and Monitoring-Based Commissioning/4 points** (5 in **LEED CI**)

Option 2: Building Enclosure Commissioning/ 2 points (N/A in **LEED CI**)

- Credit (**LEED EBOM**):

- **Existing building commissioning — Analysis / 2 points**
- **Existing building commissioning — Implementation / 2 points**
- **OCx/ 3 points**

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Pre-requisite: **Fundamental Commissioning and Verification**

1. Owner Project Requirements (OPR), Basis of Design (BOD) and, project design documents review
2. Develop and implement a Cx Plan
3. Include the Commissioning requirements into the bidding documents and to the contractual documents
4. Coordinate the definition of start-up templates
5. Develop systems validation procedures
6. Validate the system functional tests
7. Prepare and maintain the Issues and Resolution log
8. Prepare a final Cx Report
9. Document all the incidents and recommendations arising during the Cx Process
10. Compile Current Facility Requirements and Operations and Maintenance Plan

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Credit/Option 1/Path 1 : Enhanced Systems Commissioning

1. Review contractor submittals
2. Verify inclusion of operator and occupant training requirements in construction documents
3. Verify Systems Manual updates and delivery
4. Verify operator and occupant training delivery and effectiveness
5. Verify seasonal testing
6. Review building operations 10 months after substantial completion
7. Develop an OCx Plan

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Credit/Option 1/Path 2 : **Enhanced and Monitoring-Based Commissioning**

1. Carry out all tasks included in the "Enhanced Commissioning" credit, option 1
2. Develop monitoring procedures and identify the necessary points to measure and evaluate to assess the energy and water consuming systems in operation
3. Include the procedures and points of measurement in the Cx Plan

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Credit/Option 2 : **Building Enclosure Commissioning**

1. Review contractor submittals
2. Verify inclusion of Systems Manual requirements in construction documents for enclosure systems
3. Develop an Enclosure OCx Plan for maintenance

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The Benefits of Commissioning:

- Facility performance is in accordance with the OPR
- Benefits to building occupants (healthier and more comfortable environment), including greater worker productivity, reduced complaints, and reduced incidence of absenteeism
- Lower operating costs due to improved operational techniques
- Improved operator knowledge of how to optimize the facility O&M due to the early inclusion of operators in the Cx
- Reduced downtime due to better diagnosis of failures
- Extended component life cycle
- Reduced training requirements due to continuously updated documentation of how systems should operate and be maintained
- Improved ability to provide accurate information to occupants on facility operation and maintenance

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Commissioning is a best practice:

There is no single universally “best” way to apply commissioning in all circumstances. “Best” is taken in context of reasonable cost and schedule limitations.

(BCxA Essential Attributes)



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- **ACG Commissioning Guideline**, US
- **ASHRAE BCxP**, *Building Commissioning Professional Certification*, US
- **ASHRAE Standard 202-2018**, *Commissioning Process for Buildings and systems*
- **ASHRAE Guideline 0.2-2015**, *Commissioning Process for Existing Systems and Assemblies*
- **ASHRAE Guideline 0-2019**, *The Commissioning Process*
- **ASHRAE Guideline 1.2-2019**, *Technical Requirements for the Commissioning Process for Existing HVAC&R Systems and Assemblies*
- **ASHRAE Guideline 1.4-2014**, *Procedures for Preparing Facility Systems Manuals*
- **ASHRAE Guideline 1.1-2007**, *HVAC&R Technical Requirements for the Commissioning Process*
- **ASHRAE Guideline 111-2008**, *Measurement, Testing, Adjusting, and balancing of Building HVAC systems*
- **ASHRAE Guideline 1.4-2014**, *Procedures for Preparing Facility Systems Manuals*
- **ASHRAE Guideline 1.3-2018**, *Building Operations and Maintenance Training for the HVAC&R Commissioning Process*
- **ASHRAE The Strategic Guide to Commissioning**
- **BSRIA Commissioning Set**, UK
- **CIBSE Commissioning Codes (A, B, C, L, M, R and W)**, UK
- **ICG G4-2012 Guideline for Commissioning**, US
- **NIBS Guideline 3-2006**, *Exterior Enclosure Technical Requirements For the Commissioning Process*
- **The Building Commissioning Handbook**, BCxA, *third edition*, US

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Andrés Sepúlveda

andres.sepulveda@commtech.es