

# MASSACHUSETTS SCHOOL BUILDING AUTHORITY



## Facility Operations – Benefits of Commissioning

November 10 , 2020



## Topics:

# Benefits of Cx to School Operations

- Background and Intent
- Commissioning “Road Map”
- Key Objectives/Benefits
- Roles and Responsibilities
- OPR – What is it?
- What is the Cx firm looking for?
- Controls Integration Meeting
- Questions & Answers



*Somerville High School | Somerville, MA*



*Brightwood-Lincoln Elementary | Springfield, MA*

## Background + Intent

- Turnover to the Operations Staff is a significant gap on construction projects
- Contributing factors:
  - **Training is a major component (more than 50% of the problem)**
  - Establishing a plan
  - Lack of documentation
- Cx firm's responsibility to monitor and shepherd the process by filling the gaps:
  - ***System training***
  - ***Controls***

**10 → Excellent**

**8-9 → Great**

**6-7 → Good**

**4-5 → OK**

**2-3 → Bad**

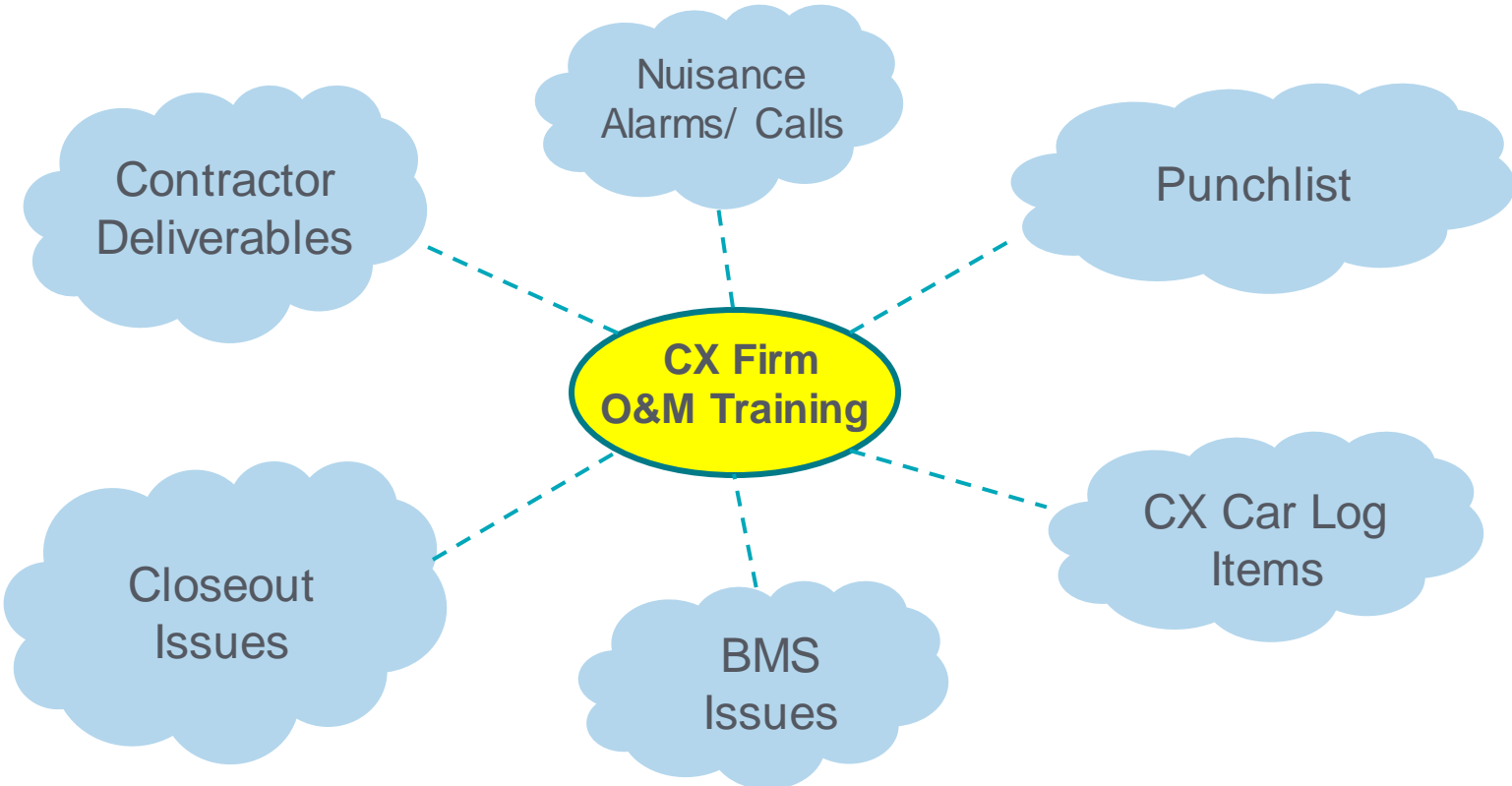
**1 → Terrible**

## Background + Intent

- GC, Subs, and Vendors provide **specified, standard training** to meet project requirements. **No more, no less.**
- Division-1 indicates hours of training to be owned by the construction team.
- Most of the time, **very generic, not enough detail**, and **not scheduled**

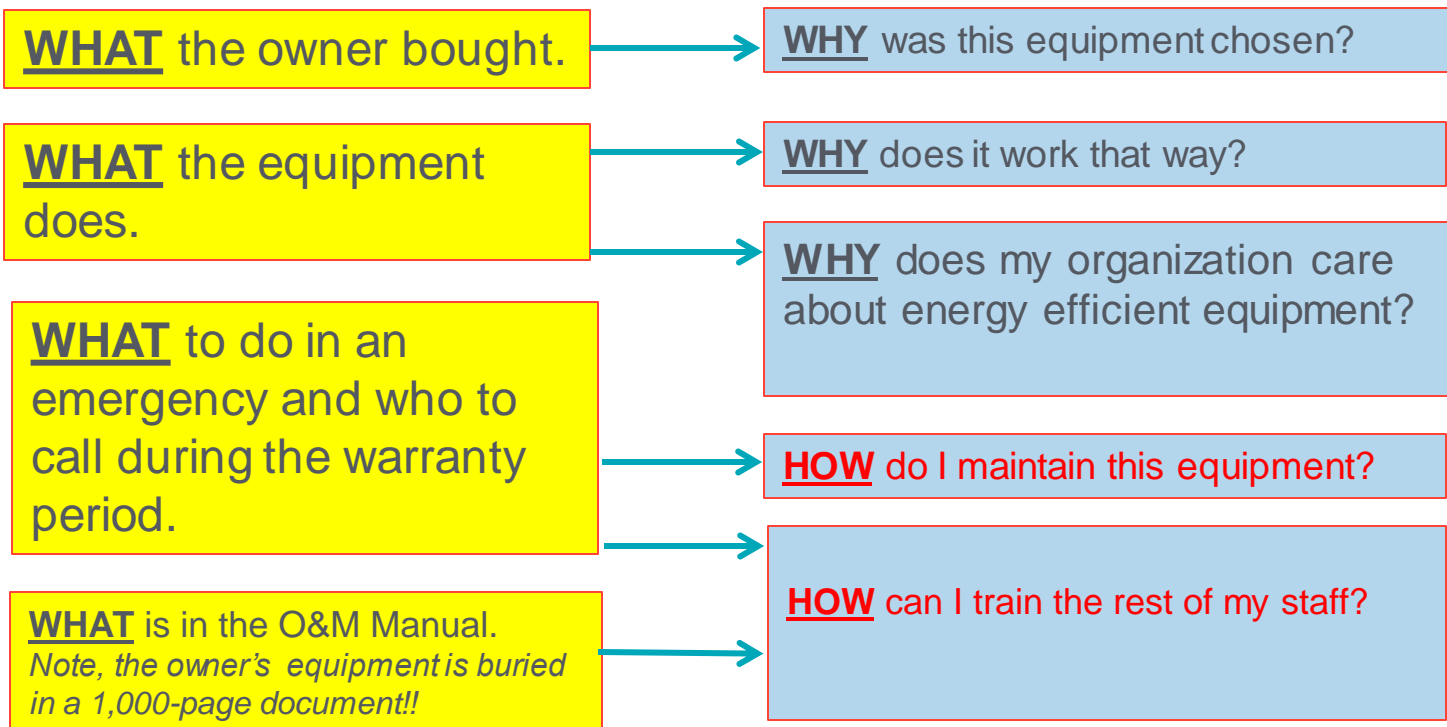


# Project Closeout : Moving Parts



## Construction Team vs. Cx Team:

The **CT** is the **WHAT & WHERE** and the **CX** Team is the **WHY & HOW**.



## Design Phase: Commissioning Roles + Responsibilities

- Basis of Design → Design Team
- Update OPR → Cx Authority / Team
- Design Reviews → Cx Authority / Team
- **Training Plan → Design Team, Cx Authority, and Owner**
- Commissioning Plan → Cx Authority
- Construction Checklists and Test Procedures → Cx Authority / Team
- Commissioning Specifications for Bid Docs → Cx Authority / Team



## Design Phase: Key Commissioning Objectives / Benefits

- Update **Commissioning Plan**
- Verify **Basis of Design** and **Owner's Project Requirements** through **Design Reviews**
- **Detailed Training Plan + Training Requirements**
- Develop commissioning process requirements for the **Construction Documents**, including **Commissioning Specifications**
- **CX firm Develop and Witness Functional Test Procedures**
  - Integrated “pull-the-plug” tests
  - Off-season testing and training



## CX Authority: “What They Look For?”

Design Aspect	Design Review Description
Commissioning Facilitation	Input regarding making the building easier to execute commissioning.
Energy Efficiency	General efficiency of building shell, building layout, HVAC system types, lighting system type, etc.
Operation and Maintenance (O&M).	How building O&M can be made easier (accessibility and system control, etc.)
Indoor Environmental Quality (IEQ)	How thermal, visual, acoustical comfort or air quality can be improved
Functionality for students	Comment on how the design can be changed to improve functionality for the occupants
Environmental Sustainability	How the building materials and systems and landscaping can create less of an impact on the environment
<i>Building Envelope</i>	<i>Envelope design and assemblies for thermal and water integrity, moisture vapor control and assembly life</i>
Life Cycle Costs	Life cycle review of options relative to energy efficiency, O&M, IEQ or functionality

# Design Phase:

## Six Commissioning Documents

### 1. COMMISSIONING PLAN

- This is a continually developing “road map” for upcoming activities and record of completed activities.

### 2. BASIS OF DESIGN

- The purpose of the BOD is to give other parties easy access to the rationale behind decisions.
- This document is valuable when design proposals are compared against the OPR.
- The *Construction Documents* show **what** was selected – but not the **why**.
- The “why” can be very valuable when considering a contractor-proposed substitution or making a decision on building operations.

# Design Phase: Six Commissioning Documents

## 3. OWNER'S PROJECT REQUIREMENTS

- This document captures the essence of the project for the owner and defines the characteristics of a successful project from the owner's perspective.
- Warranty and training detailed
- Updated during design to reflect changes in owner circumstances; as well as, to reflect “desire-meets-reality” conflicts.



*Duxbury Middle School | Duxbury, MA*

# Design Phase: Six Commissioning Documents

## 4. CONSTRUCTION CHECKLISTS

- These are pre-prepared forms used to structure and facilitate verifications conducted as part of the commissioning process.
- Ideally, they would be part of the Construction Documents (or be provided as “for information” documents).
- When completed, they become part of the **Systems Manual** and can assist with ongoing building operations.



Avery Elementary School | Dedham, MA



## Design Phase: Six Commissioning Documents

### 5. TEST PROCEDURES (with Facilities Staff)

- Test Procedures are an extension of verification procedures beyond the level of complexity of **Construction Checklists**.
- *Example: a test script to verify that upon smoke detection in an atrium, the HVAC, electrical and alarm systems do what they should to meet the BOD and OPR.*
- Test Procedures must be scripted and ideally will allow for easy recording and archiving of results for inclusion in the **Systems Manual**.

# Design Phase: Six Commissioning Documents

## 6. COMMISSIONING SPECIFICATIONS

- Communicating Commissioning Process Requirements to the Contractor.
- Provide a clear picture of responsibilities and allow for reasonable bid to be prepared.
- **Specifications will outline:** Participation in activities; Construction Checklists; Test Procedures; Training Requirements.



Auburn Middle School | Auburn, MA



# Commissioning Specifications: Best Practices to be Considered

- Identification of Training requirements  
**(Spec 017900)**
  - Hours Needed
  - Systems to be Trained
- Requirements for Service Contracts on equipment
- Identification of Operations & Maintenance Requirements  
**(Spec 01783)**
- Identification of Required Record Documents  
**(Spec 017839)**
- Preventative Maintenance items & associated schedules
- Requirements for SOPs, EOPs and MOPs
- Requirements for an Operator's Electrical Single Line Diagram
- General Commissioning Requirements  
**(Spec 019113)**

## Design Phase: Drawings + Specifications Reviews

- Verify Design Intent and OPR is being maintained.
- O&M Requirements, including Training.
- Indoor Air Quality Requirements.
- Lead into Controls Integration Meeting.
- All comments will need to be answered by the A/E Team prior to the design review meeting.



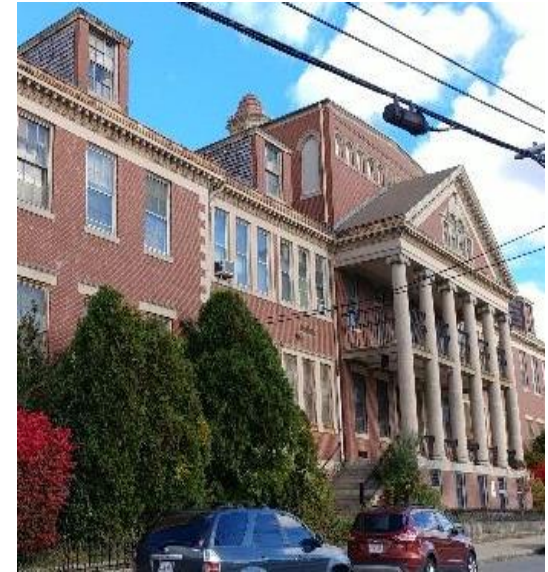
Hull Memorial School | Hull, MA





## Controls Integration Meeting:

- A controls integration meeting during design is a follow-up to a formal design review.
- It resolves outstanding issues that require owner or input from other disciplines.
- Will occur at Mid-CD Phase.
- **A detailed review of the controls sequencing and meeting with the design team and District Facility Manager to discuss the findings.**
- Improves communication across all disciplines, designers, and the owner.



*New Bedford Trinity School | New Bedford, MA*

# Construction Phase: Key Commissioning Objectives / Benefits

- Verify System Performance
- **Document and Develop Non-Conformance items**
- Spearhead the Turnover Phase including;
  - Early Training
  - Controls
  - Warranty items
- Off Season Testing
- Warranty Phase Testing



Hull High School | Hull, MA

## Training Programs: Best Practices to be Considered

- Copies of Service Contracts on equipment
- Approved submittals by Engineer of record (EOR)
- As-built documentation approved by EOR
- Systems Manuals
- Cx firm audit and monitors training (Quality)
- Preventative Maintenance items & associated schedules
- Review of SOP's, EOP's, MOP's

## Key Points:

### Commissioning Road Map



★ OPR Workshop / Development of OPR

★ Importance of Staff Training

★ Early Involvement of School Staff

★ Controls Integration Meeting at Mid-CD Phase

★ Review Training and edit to School Needs

★ Schools to Establish “Training Coordinator”

Thank you!

**Questions?**