Commissioning of New and Existing Building Fire Protection Systems

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Commissioning Process

It’s an Administrative Process that organizes the roles and responsibilities, who is doing what, how it should be tested, scheduled testing, systems manuals, training and warranties.

It is not just testing the systems at the end of the project.
Commissioning Process Overview

PROJECT TIMELINE

PRE-DESIGN

DESIGN

CONSTRUCTION

ACCEPTANCE

OPERATION

Scope & Budget for Commissioning

Basis of Design

Submittal Review

Site Visits

Training Review

Seasonal Testing

O.P.R

Design Review

Functional Test Procedures

O&M Document Review

Pre-Functional Checklists

Final Cx Report

Lessons Learned

Commissioning Plan

Cx Spec Development

Functional Testing

Functional Testing

Warranty Review

Lessons Learned
Guidelines, Standards and Certifications
LEED Commissioning

Energy and atmosphere prerequisite 1 (EAP 1) Requires
- OPR
- Basis of Design
- Commissioning Plan
- Commissioning Specifications
- Performance Verification Documentation (Functional Performance Tests)
- Commissioning Report

Energy and Atmosphere Credit 3 (EAC3)
- All of the Above
- Design Review (at 50% Completion)
- Review Contractor Submittals
- Develop a Systems Manual for Staff
- Verify Training and Completion
- Review Building Operation 10 Months After Completion

- Energy Usage Systems
Fire Protection Systems Cx
Then Why do it?

- Building Damage caused by fire
- Structural Damage caused by fire
- Loss of equipment ($/minute)
- Loss of your building, company and job
- Loss of lives in a fire
- Piece of Mind
Fire in the USA

*Fire Loss in the USA during 2009

1,348,500 fires were reported in the U.S. during 2009.
- 3,010 civilian fire deaths
- 17,050 civilian fire injuries
- $12.5 billion in property damage
- A fire department responded to a fire every 23 seconds

480,500 structure fires occurred in the U.S. during 2009.
- 2,695 civilian fire deaths
- 14,740 civilian fire injuries
- $10.8 billion in property damage
- One structure fire was reported every 66 seconds

Most Frequent Reported Occurrences

- Testing/inspections not performed
- Maintenance not performed
- Inadequate maintenance
- Failure to document maintenance actions
- Electrical failures
- Improper installation or construction
- Failure to adapt to change of function or use
Fire Protection Integration with Numerous Types of Building Systems

- Wet Sprinklers
- Fire Pumps
- Dry Sprinklers
- Mist Systems
- Preaction Systems
- Deluge Systems
- Clean Agent Systems
- Foam Systems
Fire Protection Systems Integration

NFPA 72 deals with the design, installation and component testing of components like fire alarm devices and wiring but does not deal with hydraulics.

NFPA 13 deals with the design, installation and component testing of components like sprinklers and valves but does not deal with wiring.

Devices are being tested independently.
Verify first alarm occurs at FM-200 panel and an FM-200 panel alarm is indicated at the building Fire Alarm Panel. Verify notification devices activate for the FM-200 system and the building fire alarm system. Verify release initiating circuit does not actuate. Verify alarm signal was received at the HUB.

Check system for proper response, actuate an FM-200 system photoelectric smoke detector in the initiating circuit by applying smoke to a random detector within the selected room.

Actuate a second smoke detector before the first detector clears by applying smoke to a random detector with the selected room.

Verify the second alarm occurs at FM-200 panel initiating a 30 second “Pre-Discharge” countdown. FM-200 audio-visual notification devices activate with the selected space, building fire alarm notification devices remain activated, all dampers close within the FM-200 protected room and all HVAC units serving the protected space shut down.
### Functional Test Procedures

<table>
<thead>
<tr>
<th>M3.2.2</th>
<th>FM-200 Pre-discharge: Simulate FM-200 pre-discharge. Smoke two FM-200 photoelectric detectors for a predischarge condition.</th>
<th>Battery and Rectifier room Verify that CRAC units 1, 2 and AHU-2 are off, Fire/Smoke dampers D-1, D-2, D-5, D-6, D-7, D-9 and D-10 are closed.</th>
<th>Y</th>
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<tbody>
<tr>
<td>BAS</td>
<td>Verify at the BAS workstation that</td>
<td></td>
<td>Y</td>
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| M3.2.3 | FM-200 Discharge: Smoke management begins. | BAS/NOC Workstations Verify at the BAS workstation that an FM-200 discharge alarm is logged. After a 10-minute delay, verify at the BAS workstation that the above conditions are reflected. Verify at the BAS and NOC workstations that a smoke control alarm is logged. | Y |

**After a 10 minute delay, verify that CRAC units 1,2 and AHU-2 are off. FSD D-1, D-2 and D-10 are closed. VU-1 and EF-1,2 7 3 are on. FSD D-5, D-6, D-7 and D-9 are open and control strobes are on.**

Chapter 1 – Administration
Chapter 2 – Referenced Publications
Chapter 3 – Definitions
Chapter 4 – Commissioning
Chapter 5 – Integrated Systems
Chapter 6 – Interconnected Systems
Chapter 7 – Passive Systems
Chapter 8 – ReCx & RetroCx of Fire Protection and Life Safety Systems
Chapter 9 – Periodic Integrated Testing
Chapter 10 – Qualifications of Cx Personnel
Annex – Explanatory Material
1.3.2* Commissioning shall achieve the following:

(1) Documentation of Owners Project Requirements (OPR) and Basis of Design (BOD) is provided.
(2) Equipment and systems are installed as required.
(3) Functional performance testing for all integrated fire and life safety systems has been performed and documented.
(4) Operation and Maintenance (O&M) documentation is compiled and delivered.
(5) Facility operating and maintenance staff are trained.
(6) Verify that the documentation is in place for maintaining system performance to meet the original design intent after initial occupancy.

NFPA 3 Commissioning Process

Pre-Design phase
OPR,
Code Review,
Scope & Budget
Cx Plan

Design Phase
Sequence of Operation (draft)
Training
Systems Manuals
Construction Checklist
Test Procedures
Basis of Design
Develop Cx Requirements
Update Cx Plan
NFPA 3 Commissioning Process

**Construction Phase**
- Verify Systems Manuals
- Verify Submittals
- Verify Construction Checklists
- Update Seq. of Operation
- Update OPR & BOD
- Issues Log
- Acceptance Tests
- Resolve Issues

**Occupancy and Operations Phase**
- Periodic testing
- Integrated Systems
- Verify Sequence of Operation
- Coordinate Contractor Callback
- Warranty Review
- Acceptance
- Update Issues Log
Ongoing Commissioning Process

- Change of use
- Integrated Testing
- Evaluate Impact of OPR/BOD
- Update OPR & BOD
- Update Drawings, Manual and Training
- Annual Benchmarking
3.3.19 System Connections:

1. **Integrated System**: A combination or group of fire protection and life safety systems either interconnected or separate but required to operate together as a whole to achieve the fire protection objectives.

2. **Interconnected System**: An integrated system that has physically connected component systems or devices.

3. **Interconnections**: The physical connections between interconnected systems.

Existing Building Commissioning

After systems are installed:

- NFPA 25 Recommendations for periodic testing
- Fan Pressure tests
- Check for room openings
- Inspection of Sprinkler Heads

Continuous (Ongoing) Commissioning
Ongoing Commissioning Process

• Identify problems
• Examine Bldg. in detail for system operation, component failures, equipment and piping degradation
• Identify any changes in operating procedures
• Update Documents such as record drawings, systems manuals and training
Ongoing Commissioning

- Yearly inspections for certification
- Continuous construction in the building
- Surprise visits / inspections
- Reduce the risk of fire
- Corrosion: Corrosion related failure at fire sprinkler piping have greatly increased over the past decade - raising not only operating and repair costs but is a threat to building occupants.
Questions?

Thank You!
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