Fire Life Safety System Commissioning:
Fire Smoke Dampers, FA Relays, and HVAC Tie-in

Presented by
John M Herboth
NorthWest Engineering Service, Inc. (NWESI)
AIA Quality Assurance:

This program is registered with AIA for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.
Course Description:

An important component to commissioning fire life safety system and tie-in with the HVAC system in commercial buildings are fire smoke dampers (FSDs), fire alarm relays, HVAC shutdown and smoke vent sequences. At critical healthcare facilities such as hospitals, testing these components is critical during both new construction, remodels, upgrades, and required 6 year testing cycles.

The presentation will focus primarily on lessons learned from FSD testing and commissioning projects such as notable issues, facility impacts, coordination efforts, in addition to best practices on documentation to satisfy AHJ requirements.
Learning Objectives:

• Improve understanding of changes in enforcement and expectations in healthcare facilities

• Understand why these devices need to be regularly tested

• Identify lessons learned from notable issues found during testing

• Learn best practices in testing and documentation
Intro Discussion: How this all got started

- Changes in Fire Life Safety Enforcement
- Calls to Fire Alarm Providers & Their Capabilities
- How NWESI got involved
- NWESI History with FSD Testing
FIRE DAMPER ACCESS
Meeting AHJ Requirements:

- Know what you have
- Have it tested
- Have documentation ready at the main Fire Alarm Control Panel (FACP)
FLS Dampers: Code Required Testing

- Chapter 7 IBC:
  End of 1st year after new construction and tested every 4 years, unless it is a hospital which is every 6 years.

- Chapter 9 IBC [909.20.1]:
  Smoke Control System Dampers: Semi-annual testing of dedicated systems and annual testing of non-dedicated systems.
Ex. Project: 1 Hospital #1 FSD Cx Project

- # of FDs reduced
- New FSDs into existing FA relays
- New FSDs into new FA relays
<table>
<thead>
<tr>
<th>FL5 Damper Tag*</th>
<th>HVAC Unit</th>
<th>Level</th>
<th>Drawing Page</th>
<th>Duct Size</th>
<th>Service Area Impacted using HVAC Ductwork</th>
<th>Impacts</th>
<th>Available Access</th>
<th>Shutdown Cord</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>PSO-AS017-LL-17</td>
<td>AS017</td>
<td>LL</td>
<td>ME2.00-02</td>
<td>Not listed but approximately 30 x 15</td>
<td>Flexum air at main damper, no impact on floor LL, just passes through, goes up and down. AS017 shutdown may be required</td>
<td>Inpatient Pharmacy</td>
<td>Day Access Available</td>
</tr>
<tr>
<td>2</td>
<td>PSO-AS002-LL-3</td>
<td>AS002</td>
<td>LL</td>
<td>ME2.00-C5</td>
<td>Not listed but approximately 52 x 20</td>
<td>Flex Damper - Supply Air for all LL AS002. Shut down AS002. Duct routing unclear, impacts pharmacy storage and possibly Clean Steaks processing. No drawings for some areas impacted</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>PSO-AS003-L1-1</td>
<td>AS003</td>
<td>1</td>
<td>ME2.01-C1</td>
<td>16 x 10</td>
<td>Inpatient Room, Bathroom, Room 10205. Return (Exhaust) air for Patient rooms 10203, 10205, 10207, 10208</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>4</td>
<td>PSO-AS003-L1-2</td>
<td>AS003</td>
<td>1</td>
<td>ME2.01-C1</td>
<td>30 x 16</td>
<td>Possible shutdown needed. 40000 CFM, Return Air Patient Rooms 10200, 10202, 10207, 10204, Corridor, and Coordinator</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>5</td>
<td>PSO-AS003-L1-3</td>
<td>AS003</td>
<td>1</td>
<td>ME2.01-C2</td>
<td>51 x 20</td>
<td>Possible AS003 fan shutdown. Supply air for 22+ patient rooms and support areas.</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>6</td>
<td>PSO-AS003-L1-5</td>
<td>AS003</td>
<td>1</td>
<td>ME2.01-C2</td>
<td>22 x 14</td>
<td>Located in Patient Bathroom 10206. Return Air for Patient rooms 10203, 10205, 10207, 10208</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>7</td>
<td>PSO-EP05-L1-1</td>
<td>EP05</td>
<td>1</td>
<td>ME2.01-C2</td>
<td>36 x 10</td>
<td>Exhaust air for 10+ patient bathrooms and adjacent areas.</td>
<td>General Exhaust Patient Tower</td>
<td>Never/Always Day Access</td>
</tr>
<tr>
<td>8</td>
<td>PSO-EP05-L1-2</td>
<td>EP05</td>
<td>1</td>
<td>ME2.01-C2</td>
<td>36 x 12</td>
<td>Exhaust air for 10+ patient bathrooms and adjacent areas.</td>
<td>General Exhaust Patient Tower</td>
<td>Corridor Day Access</td>
</tr>
<tr>
<td>9</td>
<td>PSO-AS002-L1-3</td>
<td>AS002</td>
<td>1</td>
<td>ME2.00-C3</td>
<td>42 x 14</td>
<td>Possible AS002 fan shutdown. Main supply air from intensive Radiology Suites and large ductwork evident at 40000 CFM. No drawings for some areas impacted</td>
<td>Room Damper - Supply Air for all LL AS002, Kitchen &amp; CSP</td>
<td>Access from 1st floor, in shaft Night Time Access, after XPM</td>
</tr>
<tr>
<td>10</td>
<td>PSO-AS003-L2-1</td>
<td>AS003</td>
<td>2</td>
<td>ME2.01-C3</td>
<td>24 x 14</td>
<td>Located in Patient Bathroom 2C020. Return Air for 4 Patient rooms</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>11</td>
<td>PSO-EP05-L2-1</td>
<td>EP05</td>
<td>2</td>
<td>ME2.01-C3</td>
<td>36 x 16</td>
<td>Exhaust air for 10+ patient bathrooms and adjacent areas.</td>
<td>Medical Supply Room</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>PSO-EP05-L2-2</td>
<td>EP05</td>
<td>2</td>
<td>ME2.01-C3</td>
<td>36 x 10</td>
<td>Located in patient bathroom 2C036, Exhaust air for 10+ patient bathrooms and adjacent areas.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>PSO-AS003-L2-3</td>
<td>AS003</td>
<td>2</td>
<td>ME2.00-C3</td>
<td>22 x 14</td>
<td>Return Air for 4 patient rooms</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>14</td>
<td>PSO-AS003-L3-1</td>
<td>AS003</td>
<td>3</td>
<td>ME2.00-C3</td>
<td>18 x 6</td>
<td>Return Air for 4 patient rooms</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
<tr>
<td>15</td>
<td>PSO-AS003-L3-6</td>
<td>AS003</td>
<td>3</td>
<td>ME2.00-C3</td>
<td>95 x 24</td>
<td>Corridor Return Air</td>
<td>North Tower Flx 1-3</td>
<td>L1 Day Access Available</td>
</tr>
</tbody>
</table>
Field Testing:

• FACP Softkey Programming
• New FSDs into existing FA relays
• New FSDs into new FA relays
Investigation Findings:

- Incomplete field labeling on existing FSD disconnects
- FA drawings need updating
- Value of integrated testing
Ex Project 2 – Medical Bldg. Attached to Hospital

- 4 Story Bldg with 5th Story Mechanical Penthouse
- 3 Main Large Air Handlers
- 1st Floor with ER Overflow Area
- 2nd Floor with 10 Surgery Suites
- No FSD Testing Records
Initial Testing:

- 38% Failure Rate of FSDs
- Groups of Failed OPEN FSDs
- AHUs didn’t shutdown
- No Smoke Vent Sequences
- Recent Controls Upgrade
Investigation: FA Record Drwgs

FA Points List

- Address Numbers
- Device Type
- Point Type
- Label
Investigation: Labels Matter

- Damper Relays
- HVAC Shutdown Relays
8Com 9NC
Ex Project 3 – Medical Office Bldg with Surgery Spaces

- CAD based mechanical HVAC on lower level drawings
- Accurate FSD locations on lower levels
- Shell build outs on 3rd - 5th floors with no HVAC drawings
- 14% failure rate
- HVAC smoke control sequences
Smoke Vent Sequences

- Control relays identified
- Relay overrides to specific HVAC system clear
- FA drawings available at main fire alarm panel
Ex Project 4 – 1960’s Hospital with multiple renovations

- Addition areas with accurate drawings, existing areas with 75% accurate HVAC layout
- OR Surgery Suite Update
- 190 Fire dampers never located or tested, multiple styles
- 32% Failure Rate
Common Problems:

- Cables and cords running through fire rated access hatches
- FSDs not tied into the FA system
- FSDs failed OPEN
- FDs with non-replaceable parts
- Large holes in fire rated ceilings and walls
- No master set of drawings
Documentation - Drwgs:

- Marked locations of FSDs and FDs with assigned numbers on a facility layout or mechanical drawings.
Documentation - Spreadsheet:

- Matching spreadsheet with FSD & FDs number, location, electrical circuit, access grade, inspection date, inspectors initials, pass/fail, field notes, and any corrections needed.
Documentation Spreadsheet Detail:

- Spreadsheet should be sortable by category.
- Enough detail to know by device; where, when, who, and how

<table>
<thead>
<tr>
<th>Floor</th>
<th>FSD Room Location</th>
<th>Service Room Detail</th>
<th>Type: FSD/SD</th>
<th>Number</th>
<th>HVAC Service Type</th>
<th>HVAC Service #</th>
<th>FSD Dimension</th>
<th>Access Grading</th>
<th>Manuf.</th>
<th>Inspector</th>
<th>Date of Inspection</th>
<th>Pass / Fail</th>
<th>Comments or Deficiencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mech Rm</td>
<td>-</td>
<td>FSD</td>
<td>1</td>
<td>AHU</td>
<td>AHU-4</td>
<td>-</td>
<td>1D</td>
<td>-</td>
<td>JMH</td>
<td>3/29/2018</td>
<td>PASS</td>
<td>Extension ladder required to view from the 1st floor. Can use scope location in closet on the 2nd floor above.</td>
</tr>
<tr>
<td>1</td>
<td>Mech Rm</td>
<td>-</td>
<td>FSD</td>
<td>2</td>
<td>EF</td>
<td>EF-5</td>
<td>-</td>
<td>1D</td>
<td>-</td>
<td>JMH</td>
<td>3/29/2018</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mech Rm</td>
<td>-</td>
<td>FSD</td>
<td>3</td>
<td>AHU</td>
<td>AHU-4</td>
<td>-</td>
<td>1D</td>
<td>-</td>
<td>JMH</td>
<td>3/29/2018</td>
<td>PASS</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Mech Rm</td>
<td>-</td>
<td>FSD</td>
<td>4</td>
<td>EF</td>
<td>EF-5</td>
<td>-</td>
<td>4D</td>
<td>-</td>
<td>JMH</td>
<td>3/29/2018</td>
<td>PASS</td>
<td></td>
</tr>
</tbody>
</table>
Deliverables:

• Photo Log – sorted, numbered, FSD/FD components, electrical circuit, fully closed seal, confirmed re-opened.

• Compiled & Updated Drawings – accurate mechanical drawings will result in tighter budgets, reduce investigation time, and increased confidence in the known location of all FSDs & FDs.

• Spreadsheet details matter, field notes with initial conditions and final conditions. Sortable for immediate corrections list.
How to Prepare for a FSD & FD Project:

- Pull available building documentation, mechanical HVAC drawings are key
- Locate FSDs/FDs if practical
- Photograph known components
- Get a quote and put in budget prior to AHJ inspection window
- If facility staff can assist, costs go down
FSD & FD Project Disclaimer:

• During testing, responsibility of staff and testing party prior to start of work. If you are not informed about how to react during FSD/FD testing and staff are not involved, risk goes up for both parties.

• Do not hire someone who does not take this seriously.
Questions?
Thank You

John M. Herboth,
Sr. Commissioning Authority Project Manager
johnh@nwesi.com