Fire Alarm System Design & Inspection

Presented on behalf of the
Burglar and Fire Alarm Association of Michigan
by
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Topics Addressed

- Fire Alarm System Design
- Reviewing submittal documents
- Fundamentals of Fire Alarms
- Fire Alarm Inspections
Codes & Standards Application over the Lifespan of a Building

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Fire Alarm System Design

Fire Alarm System Design

- Two primary types of systems utilize fire alarm control equipment:
  - Sprinkler supervisory service – monitors the valves controlling water supply, pumps, tanks, water levels and temperatures, air pressure and waterflow switches. Required to be electrically supervised by a listed fire alarm control unit, and monitored by a supervising station per NFPA 72

901.6, 903.4

Fire Alarm System Design

- Two primary types of systems utilize fire alarm control equipment:
  - Fire alarm and detection systems – Provides occupant notification and monitoring of detection devices. Requirements for a fire alarm system and the extent of detection devices are specified by occupancy group in 907.2. Fire alarm systems are required to be monitored by a supervising station per NFPA 72

901.6, 907.2
Fire Alarm System Design

- Sprinkler supervisory service per MBC 903.4
  - Monitors sprinkler system flow switch
  - Monitors sprinkler system valve tamper switches
  - May also monitor other conditions associated with the sprinkler system, such as alarm outputs from fire pump controllers, room temperature, air pressure in dry sprinkler systems

- Not required to provide occupant notification of system activation – BCC FI 09-53
- Not required to have duct smoke detectors connected (907.3 requires connection when a fire alarm system is required for the occupancy by 907.2)
- Not required to have kitchen hood systems or other fire suppression systems connected (904.3.5 requires connection when a fire alarm system is installed)
Fire Alarm System Design

- Fire alarm system requirements in MBC 907.2
  - The term “manual fire alarm system” is used to refer to an occupant notification system that is activated by manual fire alarm boxes. When the occupant notification is activated by a sprinkler system, the manual fire alarm boxes are not required.
  - Certain occupancies are required to have an emergency voice alarm communications system for the occupant notification.

Fire Alarm System Design

- Fire alarm system requirements in MBC 907.2
  - Fire alarm systems are to be installed in compliance with NFPA 72. Effective 1/1/2014, NFPA 72 requires audible appliances for sleeping areas to be low frequency, specifically 520 Hz square wave
  - Typical 3,000 Hz alarm tone
  - 520 Hz square wave alarm tone
Fire Alarm System Design

- Fire alarm system requirements in MBC 907.5
  - Visible signals are required in public use and common use areas (defined as rooms or spaces that are not for public use and are made available for the shared use of two or more people)
  - Visible signals are required in a specified number of rooms in I-1 and R-1 occupancies
  - R-2 occupancies shall have the capability to provide visible signals for future addition to the system

Fire Alarm System Design

- Must satisfy minimum requirements of Code
- Michigan Building Code establishes requirements based on occupancy
- Michigan Bureau of Fire Services (BFS) establishes requirements based on the NFPA Life Safety Code and their rules for occupancies under their shared jurisdiction (Schools, Health Care, Penal Institutions, Nursing Homes)
BFS Regulated Facilities

- Design must meet applicable BFS Rules and referenced Codes for the occupancy
- BFS reviews plans for Registered Design Professionals and BFS Certified Firms
- System must also comply with other applicable codes (MBC, MEC, MMC, MPC)
- Electrical Certificate of Approval from the enforcing jurisdiction is required by BFS

Fire Alarm System Design

- Buildings with shared jurisdiction with the BFS are also required to comply with the requirements of the Michigan Building Code, and there are differences in the requirements. For example, the MBC requires educational occupancies with over 100 occupants to have an EVACS system, which is not a requirement of the BFS rules or the Life Safety Code the rules are based on.
A (Assembly) Occupancies require a manual fire alarm for over 300 occupants, and an EVACS for 1000 or more occupants.

B (Business) Occupancies require a manual fire alarm for 500 or more occupants, or more than 100 occupants above or below the exit floor. Ambulatory care facilities require occupant notification and either smoke detection or sprinkler coverage throughout.

E (Educational) Occupancies require a manual fire alarm utilizing emergency voice alarm communications for more than 50 occupants. (Exception: EVACS not required for 100 or less occupants)

F (Factory) Occupancies require a manual fire alarm for two or more stories with more than 500 occupants above or below the exit floor.
Michigan Building Code 2015

- H (Hazardous) Group H-5 (High Hazard) requires a manual fire alarm system, and an automatic smoke detection system is required for highly toxic gases, organic peroxides and oxidizers.
- Consumer fireworks facilities require a manual fire alarm system (MBC referenced NFPA 1124, which references NFPA 101, which requires a fire alarm system)

Michigan Building Code 2015

- I (Institutional) Groups require a manual fire alarm system, and an automatic smoke detection system for Group I-1 (Assisted Living), Group I-2 (Hospitals) and Group I-3 (Detention)
- M (Mercantile) Occupancies require a manual fire alarm system when the occupant load is 500 or more, or more than 100 persons above or below the exit level
Michigan Building Code 2015

- R-1 (Hotel) Occupancies require “local” smoke alarms in rooms/suites, and common area fire alarm systems that provide notification in rooms/suites.
- R-2 (Apartment) Occupancies require “local” smoke alarms in apartments, and may require common area fire alarm systems based on building configuration.
- R-2 College/University buildings require automatic smoke detection systems with occupant notification.

Michigan Building Code 2015

- R-3 (Care facilities) Occupancies require “local” smoke alarms in and outside of, sleeping areas.
- Includes adult foster care homes for 6 or less, boarding houses (non-transient) with less than 16 occupants, boarding houses (transient) with less than 10 occupants, foster family homes, foster care family group homes.
Fire Alarm Systems also are required to interface with:

- Fire Sprinkler Systems
- Special Hazards Suppression Systems (Kitchen Hood Systems, Computer Room Clean Agent Systems, Industrial CO2 and Dry Chemical Systems)
- Duct smoke detectors, when the fire alarm system is required by Section 907.2 of the MBC

Chapter 4 of the MBC is Special Requirements for certain occupancies

Section 402 requires covered mall buildings of greater than 50,000 square feet to be equipped with an emergency voice alarm communications system
Michigan Building Code 2015

- Section 403.1 classifies buildings that exceed 55’ in height as “High Rise” buildings, usually a surprise to out of state engineers, as the IBC uses a height of 75’ to define “High Rise”
- Fire Alarms for high rise buildings require emergency voice alarm communications systems
- If selective evacuation is employed, survivability requirements from NFPA 72 apply

NFPA 72-2013/Ch. 24
Pathway Survivability

- In-building fire EVACS shall comply with subpart 1 or subpart 2 below: 24.3.6.4
- For systems employing relocation or partial evacuation, a Level 2 or Level 3 pathway survivability shall be required 24.3.6.4.1
- For systems not employing relocation or partial evacuation, a Level 0, 1, 2, or 3 pathway survivability shall be required 24.3.6.4.2
NFPA 72-2013/Ch. 12
Circuits and Pathways

- Pathway Survivability Level 0 – not required to have any provisions for pathway survivability

12.4.1

- Pathway Survivability Level 1 – pathways in buildings that are fully sprinklered per NFPA 13 with conductors, cables or other physical pathways installed in metal raceway

12.4.2

NFPA 72-2013/Ch. 12
Circuits and Pathways

- Pathway Survivability Level 2 – shall consist of one or more of the following:
  - 2 hour rated circuit integrity (CI) cable
  - 2 hour rated cable system (electrical circuit protective systems)
  - 2 hour rated enclosure or protected area
  - 2 hour performance alternatives approved by the authority having jurisdiction

12.4.3
NFPA 72-2013/Ch. 12
Circuits and Pathways

- Pathway Survivability Level 3 – shall consist of one or more of the following in buildings that are fully sprinklered per NFPA 13:
  - 2 hour rated circuit integrity (CI) cable
  - 2 hour rated cable system (electrical circuit protective systems)
  - 2 hour rated enclosure or protected area
  - 2 hour performance alternatives approved by the authority having jurisdiction

12.4.4

Fire Alarm Submittals

- Who can submit plans for review?
  - Typically A/E firms submit fire alarm layouts with their construction documents when the occupancy requires a fire alarm system, to document code compliance
  - Typically fire alarm contractors submit shop drawings as part of the electrical fire alarm permit application process
  - Some jurisdictions required fire alarm shop drawings to be stamped by an A/E
Fire Alarm Submittals

- Legislation was recently signed into law (PA 406 of 2016, effective 1/4/17 and PA 407 of 2016, effective 4/4/17) to authorize licensed fire alarm specialty technicians to design fire alarm systems. Since a licensed fire alarm technician now has statutory authority to design fire alarm systems, shop drawings prepared by a licensed fire alarm technician would not be subject to a requirement for an A/E stamp. This legislation was supported by the A/E trade association, the fire alarm trade association and LARA.

<table>
<thead>
<tr>
<th>Fire Alarm Submittals</th>
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<tbody>
<tr>
<td>- Cover sheet with identification of the property, owner, system supplier and installation contractor</td>
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<tr>
<td>- Shop drawings</td>
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<tr>
<td>- Equipment data sheets</td>
</tr>
<tr>
<td>- Voltage drop calculations</td>
</tr>
<tr>
<td>- Battery size calculations</td>
</tr>
</tbody>
</table>
Shop Drawings – MBC 907.1.2

- Floor plan indicating use of all rooms
- Location of alarm initiating devices
- Location of alarm notification appliances, including candela ratings for visible notification appliances
- Design minimum audibility level for occupant notification
- Location of fire alarm control unit, transponders and notification power supplies

Shop Drawings – MBC 907.1.2

- Annunciators
- Power connection
- Battery sizing calculations
- Conductor types and sizes
- Voltage drop calculations
- Manufacturers data sheets indicating model numbers and listing information for equipment, devices and materials
Shop Drawings – MBC 907.1.2

- Details of ceiling height and construction (affects coverage for smoke and heat detection as well as for notification appliances)
- The interface of fire safety control functions (AHU shutdown, damper closure, release of held open fire doors, release of fire shutters, elevator recall, stair pressurization)
- Classification of the supervising station

Shop Drawings – NFPA 72, 7.4

- Device legend and symbols
- Point of compass (indication of North)
- Graphic scale
- All walls and doors
- All partitions extending to within 15% of the ceiling
- Identification of any ceiling over 10’ in height where automatic fire detection is proposed
- Type and quantity of conductors for each circuit
Shop Drawings – NFPA 72, 7.4

- System riser diagrams indicating the general arrangement of the system in building cross section, showing the number of risers, the type and number of circuits in each riser, the type and number of devices on each circuit, and the number of conductors for each circuit.

- Control unit diagrams indicating power supplies, battery chargers and annunciators, showing all field wiring terminals and circuit identification.

Shop Drawings – NFPA 72, 7.4

- Typical wiring diagrams shall be provided for all initiating devices, notification appliances, remote indicators, annunciators, remote test stations and end of line and power supervisory devices.

- System calculations including battery calculations and notification appliance voltage drop calculations.
Equipment Data Sheets

- Identifies manufacturer, part number, and listing for each proposed component
- Identifies power output capacity for control panels and strobe power supplies
- Identifies power consumption for notification appliances (verify with voltage drop calculations)

Voltage Drop Calculations

- Purpose is to document notification appliance circuits will function as required with device quantity, wire size, and circuit length shown
- NFPA 72 (10.6.7.2) has a performance requirement that fire alarm systems must provide 24 hours of standby capacity, and then 5 minutes of alarm operation (panel power output low, device power consumption high)
Voltage Drop Calculations

- VDC can be either point to point or end load
- Voltage drop should not exceed operational limits of notification appliances
- Circuit lengths used for VDC should be consistent with plan view drawings
- Device power consumption used should be consistent with equipment data sheets

### Voltage Drop Analysis

**FCPS 24S Notification Appliance Circuit (3.0 amps)**

**Source Voltage: 19.10 VDC Low Line**

<table>
<thead>
<tr>
<th>Device #</th>
<th>Part Number</th>
<th>Current (amps)</th>
<th>Distance (Feet)</th>
<th>Circuit Voltage at Each Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>E50-240M/CW</td>
<td>0.0920</td>
<td>22</td>
<td>18.99</td>
</tr>
<tr>
<td>2</td>
<td>E50-2415M/CW</td>
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<td>38</td>
<td>18.58</td>
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<tr>
<td>3</td>
<td>E50-2400M/CW</td>
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<td>37</td>
<td>18.28</td>
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<tr>
<td>4</td>
<td>E50-240M/CW</td>
<td>0.0920</td>
<td>28</td>
<td>18.06</td>
</tr>
<tr>
<td>5</td>
<td>E50-2415M/CW</td>
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<td>17.88</td>
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<td>6</td>
<td>E50-2410M/CW</td>
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<tr>
<td>7</td>
<td>E50-2415M/CW</td>
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<tr>
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<td>17.01</td>
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<tr>
<td>10</td>
<td>E50-24106/6CW</td>
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<td>53</td>
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<tr>
<td>11</td>
<td>E50-24106/6CW</td>
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</tr>
<tr>
<td>12</td>
<td>E50-24106/6CW</td>
<td>0.2200</td>
<td>33</td>
<td>16.59</td>
</tr>
</tbody>
</table>

**Total Current:** 1.7210

**% Voltage Drop:** 13.12
Battery Size Calculations

- Should reflect total current load on control panel from all powered devices
- 24 hours of standby typically required
- Should reflect total alarm load for either 5 minutes or 15 minutes for EVACS
- Total of standby and alarm load is required to be increased by 20% for battery degradation
- Selected battery size should > calculated size

### Secondary Standby Load
The amount of power that must be supplied by the batteries during non-alarm conditions.

- **0.486 Amps** for **24 Hours** = **11.67 Standby AmpHours**

### Secondary Alarm Load
The amount of power that must be supplied by the batteries during an alarm condition.

- **12.5 Amps** for **15 Minutes** = **3.13 Alarm AmpHours**

**Total AmpHours:** 
\[ 11.67 + 3.13 = 14.8 \times 1.2 = 17.28 \]

Compensation for non-linear discharge characteristic (double-click to change): 
\[ \times 1.2 \]

**Total AmpHours:** 
\[ 17.28 \times 1.2 = 20.736 \]

### Battery Selection
- **Two**
- **Four (two 12V sets in parallel)**

**Battery Charger**
This system will charge its batteries with the following supply:
- **NPS-840**
- **CHG-120 Remote Battery Charger**

Amphour Distribution

(Chart showing distribution of power usage across standby, alarm, etc.)
Fundamentals – Primary Power

- Circuit must only serve the fire alarm equipment
  - No sharing with non-fire equipment – NEC 760.41 and .121 – “The branch circuit supplying the fire alarm equipment(s) shall supply no other loads.”
  - Location of overcurrent device must be identified at the fire alarm control unit
  - Circuit disconnecting means must be red, accessible only to qualified personnel, and identified as “FIRE ALARM CIRCUIT

Fundamentals – Primary Power

- Circuit and connections to be mechanically protected - no open cable per NFPA 72-2010, 10.5.5.3 “The dedicated branch circuit and connections shall be protected against physical damage”
Fundamentals – Primary Power

- No AFCI or GFCI sources (760.121 B) (760.41 B)
- In health care facilities with Emergency Systems (Article 700), the fire alarm system must be powered from the Life Safety Branch of the system (517.32 C)

Fundamentals – Secondary Power

- Two Choices: (72-2013 – 10.6.7.3)
- 24 hours of battery
- Article 700 Emergency System plus 4 hours of battery
Fundamentals – Secondary Power

- Capacity of 24H/5M or 24H/15M for EVACS (10.6.7.2)
- No signals can be lost or delayed more than 10 seconds as a result of loss of primary power
- Storage batteries must be marked with the month and year of manufacture (10.6.10.1)

Fundamentals – Wiring Supervision

- Conventional – current measured through end of line resistor, no T taps permitted
- Addressable – wiring supervised by polling connected devices, T taps may be permitted*
- Referred to as “Monitoring for Integrity” in NFPA 72
- Generally required for all initiating and notification circuits
  * Subject to manufacturers installation instructions
Fundamentals – Wiring Methods and Materials

- NEC 2014 Article 760 regulates installation of wiring and equipment, including all circuits controlled and powered by the fire alarm system (760.1)
- Only those sections of Article 300 specifically referenced in Article 760 apply (760.3)
- Article 760 includes Part I – General, Part II – NPLFA, Part III – PLFA, and Part IV – Listing Requirements

Fundamentals – Wiring Methods and Materials

- Article 300 methods/materials generally permitted for either NPLFA or PLFA
- PLFA circuits may be reclassified and installed as NPLFA if the power limited markings (at the equipment) are removed and the entire circuit is wired with NPLFA methods and materials
Fundamentals – Wiring Methods and Materials

- PLFA may be installed in compliance with 760.130(B), subject to:
  - Article 110.3(B) (installed per listed instructions)
  - Article 300.7 (exposure to different temperatures)
  - Article 300.11(A) (securing and supporting devices)
  - Article 300.15 (boxes, conduit bodies, fittings - where required)
- Exposed or fished in concealed spaces
- Supported at 18” intervals within 7’ of floor

Can fire alarm wiring be attached to ceiling grid support wires?

No for NPLFA, reference 760.46 “Installation of non power limited fire alarm circuits shall be in accordance with 110.3(B), 300.7, 300.11, 300.15, 300.17 and other appropriate articles of Chapter 3”. Compliance with 300.11 requires separate support wires.
Fundamentals – Wiring Methods and Materials

- Yes for PLFA, reference 760.130(B) “Power limited fire alarm conductors and cables described in 760-179 shall be installed as detailed in 760.130 (B1 – B3) of this section and 300.7. Devices shall be installed in accordance with 110.3(B), 300.11(A), and 300.15.” Note that the reference to 300.11(A) is restricted to devices, and is not required for PLFA conductors and cables.

Fundamentals – Wiring Methods and Materials

- PLFA cables include FPLP, FPLR and FPL
- Cables are available in multiple colors – although red jacketed cable is common, there is no requirement for the color to be red
- Multiple colors of cables typically used to readily distinguish between types of circuits, such as speakers, strobes, conventional circuits, and signaling line circuits
Fundamentals – Wiring Methods and Materials

- FPLP – Fire Power Limited Plenum cable is required in ducts, plenums, and “space used for environmental air”
- Permitted substitutions are CMP (multiconductor) and MPP (coaxial)
- Low smoke producing cable, fire-resistant (maximum allowable flame travel of 5”)

Fundamentals – Wiring Methods and Materials

- FPLR – Fire Power Limited Riser is required for vertical runs in a shaft, and between floors
- Permitted substitutions are FPLP, CMR and MPR
- Fire-resistant cable tested to ANSI/UL 1666 (Flame propagation for cable installed in shafts)
- “Fire-resistant” is from the standpoint of building protection, not circuit protection
**Fundamentals – Wiring Methods and Materials**

- FPL – Fire Power Limited cable is required for general purpose alarm use, except for “spaces used for environmental air”, and risers
- Permitted substitutions are FPLP, FPLR, CM, CMG, MP and MPG
- Fire-resistant cable tested to ANSI/UL 1581 (Standard for electrical wires, cables and cords)

**Fundamentals – Device Installation**

- Devices shall be located and mounted so that accidental operation or failure is not caused by vibration or jarring (72-10.4.2)
- Shall be located in spaces within temperature and humidity limits of 32° - 120° F and 85% relative humidity, unless specifically listed for other environments (72-10.3.5)
Fundamentals – Initiating Devices

- Where subject to mechanical damage, protection shall be provided. Mechanical guards for detectors or notification appliances shall be listed for use with the device.
- Shall be supported independently of their attachment to circuit conductors.
- Shall be installed in a manner that provides access for periodic maintenance.

Fundamentals – Initiating Devices

- Smoke and heat detectors shall not be recessed unless listed for this mounting configuration.
- Smoke and heat detectors are installed on the ceiling, or wall mounted up to 12” from the ceiling.
- Heat detectors have a listed spacing, i.e. 50’ x 50’, that must be derated for:
  - ceiling heights over 10’
  - solid joist or beam ceiling construction.
Fundamentals – Initiating Devices

- Smoke detectors are restricted to environments between 32° and 100° F, not above 93% RH, maximum air velocity of 300 ft/min
- Smoke detectors should not be installed within 3’ of an air supply diffuser or return opening
- Pull station height is between 42” and 48” to the activating handle or lever of the device

Fundamentals – Initiating Devices

- Pull stations are to be installed within 5’ of the “entrance to the exit” (MBC 907.4.2.1)
- Grouped openings over 40’ in width require (2) pull stations, each within 5’ of each side of the opening (72-17.14.8.6)
- Smoke detectors for door release service are to be installed on the centerline of the doorway (72-17.7.5.6)
Q – The mechanical code requires duct detectors installed on the return side, NFPA standards require duct detectors on the supply side. Why the inconsistency?
Fundamentals – Initiating Devices

- A – The objective is to stop AHU’s from spreading smoke. The NFPA process and the ICC process came up with different conclusions on how best to accomplish that. The supply side detects filter fires and smoke from the outside air intake. The return side is generally highly diluted, and will not act as a single detector for the entire area.

Fundamentals
Notification Appliances

- Sound level of 15dB above average ambient sound level is required (MBC 907.5.2.1.1)
- Audible only appliances to be mounted at least 90” above floor to top of device and at least 6” below ceiling (72-18.4.8.1)
- Visual only and combination appliances to be mounted so that the entire lens is 80 – 96” above floor (72-18.5.5.1)
Both wall mount and ceiling mount devices are permitted by NFPA and ADA guidelines.

Visual notification appliances (aka strobes) have a defined coverage area based on the strobe intensity, typically ranging from 20’ x 20’ for a 15cd strobe to 50’ x 50’ for a 94cd strobe.

Higher candela requires more current, keep VDC in mind when revisions to cd are made.

Q: Does it matter if the strobes stay on after the audible horns or speakers have been silenced?
A: Yes! Requirements for strobes were added to NFPA 72 in 1996 to comply with the Americans with Disabilities Act of 1990, and the intent is to notify both hearing impaired (strobes) and sight impaired (sounders). NFPA 72 requires that audible and visible notification appliances deactivate simultaneously (72-10.13.2).
Fundamentals - Monitoring

- MBC requires monitoring of fire alarm systems and fire suppression systems
- Three flavors of monitoring in NFPA 72
  - Proprietary
  - Remote Station
  - Central Station
Fundamentals - Documentation

- NFPA 72 requires the following documentation:
  - Record of Completion
  - Owners Manual and Installation Instructions
  - Record (As-Built) Drawings
  - Record copy of site specific software for software based systems
- MBC requires the following documentation
  - Record Drawings
  - Certificate of Completion

Fire Alarm Inspections
Acceptance Testing

- Acceptance testing requirements
  - Installer certification of installation compliance with approved plans, and testing in accordance with NFPA 72
    - Visual inspection of 100% of devices
    - Functional testing of 100% of devices
  - Verification of primary power supply connection(s)
Fire Alarm Inspections
Record Drawings

- Record drawings should reflect all construction changes and deviations from the submitted shop drawings. It is unlikely that simply stamping a “Record Drawing” label on shop drawings reflects the actual system installation details.
- A record copy of the site specific software is required for software based systems.

Fire Alarm Inspections
Power Supply Performance Testing

- Performance requirement is 24 hours of standby power (with AC power disconnected), followed by 5 or 15 minutes of alarm operation.
- Verifies battery size calculations.
- Verifies voltage drop calculations for NACs.
- Identifies unacceptable variations from submitted calculations by observing operation of each notification appliance at end of circuit.
Fire Alarm Inspections
Detection Device Testing

- Smoke detectors tested for smoke entry (magnet test does not test for smoke entry)
- Air Sampling type duct smoke detectors tested for air sampling (typ. Pressure differential meter)
- Waterflow switches tested by flowing water from “Inspectors Test” valve (not manually tripping switch)
- Valve tamper switches tested by operating valve – must activate in 2 turns or 20% of travel distance

Fire Alarm Inspections
Notification Appliance Testing

- Strobe intensity matches value on approved shop drawings
- Audible level is 15dBA above ambient sound level
- Strobe devices (when more than 2) are synchronized
- Audible evacuation signal is Code 3 Temporal
Fire Alarm Inspections

Wiring Supervision Testing

- Initiating zone wiring produces trouble signal on single open or single ground
- Addressable device wiring produces trouble signal on single open or single ground
- Speaker, sounder, and strobe circuit produces trouble signal on single open, short, or ground
- Loss of standby battery produces trouble signal
- 200 Seconds permitted to generate trouble signal

Fire Alarm Inspections

Wiring Installation

- Can FPL cable for a power limited fire alarm circuit be installed in raceway?
Fire Alarm Inspections
Wiring Installation

- Yes. NEC 760-130 permits power limited fire alarm circuits to be installed in accordance with the requirements for non power limited fire alarm circuits (760.46), the requirements for power limited fire alarm circuits (760-130) or a combination of the two methods.

Fire Alarm Inspections
Wiring Installation

- Can power limited and non power limited circuits originating from the same fire alarm equipment share a raceway or device box?
Fire Alarm Inspections
Wiring Installation

- No. 760.136 prohibits power limited fire alarm circuits from sharing a raceway or device box with non power limited fire alarm circuits. There are exceptions (B – G) which basically require separation of the circuits.

Fire Alarm Inspections
Wiring Installation

- Can power limited fire alarm circuits share a bridle ring wiring path with Class 3 circuits from other systems?
Fire Alarm Inspections
Wiring Installation

- Yes. 760.139 specifically permits power limited fire alarm circuits, communications circuits or Class 3 circuits to share the same cable, enclosure, cable tray, raceway or cable routing assembly.

Fire Alarm Inspections
Wiring Installation

- Can power limited fire alarm circuits share a bridle ring wiring path with Class 2 circuits from other systems?
Fire Alarm Inspections
Wiring Installation

Maybe.  760-139(B) permits power limited fire alarm circuits to share a cable, enclosure, cable tray, raceway or cable routing assembly with Class 2 circuits, provided the insulation of the Class 2 circuit is at least that required by the power limited fire alarm circuit.  760.179(C) requires PLFA cable to have a voltage rating of not less than 300 volts, and (I) prohibits the voltage rating from being marked on the cable.  725.179(G) requires Class 2 cables to have a voltage rating of not less than 150 volts, and (I) prohibits marking the cable.

Since the voltage rating cannot be determined by examining the cable markings of the Class 2 circuits, it is necessary to review the data sheet for the conductors.  A number of Class 2 cables are identified on their data sheets as being rated for 300 volts.  Article 800.179 requires communications cables to be rated for a minimum of 300 volts, and for inventory purposes manufacturers typically dual list cables for both Class 2 and communications.
Fire Alarm Inspections
Monitoring Testing

- MBC requires fire sprinkler systems be monitored
- MBC required fire alarm systems be monitored
- Monitoring station to document fire alarm, supervisory, and trouble signals
- Typically signals are noted for the time and order in which sent, and compared with monitoring station report of signals received

AFAA Training

- Fire Alarm Seminars
  - Basic Fire Alarm
  - Testing & Inspection
  - Plan Review
  - NICET Prep
  - NFPA 72 – 2013 Update
  - F.A. Requirements of IBC
Training

- Online Training – dozens of courses available
- Free membership to Code Officials
- [www.afaa.org](http://www.afaa.org)