

BFAAM Apprenticeship Program

Related Training Instruction (RTI)
Module 7 – Fire Alarm Signaling Systems
Reading material: Chapters 15 & 17 of Fire
Alarm Signaling Systems, Third Edition or
Chapters 18 & 20 of the Fourth Edition

Plan Review

- Plan review is typically conducted by the governmental jurisdiction or their agent, and may also be performed by the electrical contractor, general contractor, and architect/engineer on construction projects
- The purpose of plan review is to verify compliance with applicable codes, project specifications and coordination with other systems and equipment

Plan Review

- Providing the information required on documents submitted for review (submittals) is the first step in a successful submittal process
- The building code is generally the code document that determines what the fire alarm requirements are, and this is based on the “occupancy classification” of the building or area of the project

Plan Review

- The size of the space involved can also affect the fire alarm requirements, so it is important that the plan reviewer can readily determine the dimensions, including height, of the building shown on the drawings. The best method to provide this information is with the use of "scale" drawings, typically where $1/8'' = 1'-0''$

Plan Review

- All structural features such as walls, doors and windows should be shown on the drawings, and any non-structural items (such as moveable partitions) that may impact smoke movement or the visibility and audibility of notification appliances, should also be shown and noted on the drawings

Plan Review

- Where duct smoke detectors are provided, the plans should indicate the location of the air handling unit (furnace or air conditioner) they are associated with
- HVAC supply and return diffusers should be shown in areas where ceiling smoke detectors are used, as the air movement could affect the operation of the smoke detectors

Plan Review

- Ceiling heights can be indicated either by notation or with a cross sectional view of the space. Cross sectional views are preferred when there is a change in elevation with the space
- Reflected ceiling plans, showing the location of all items on the ceiling, are useful in determining the proper number and spacing of heat and smoke detectors

Plan Review

- All fire alarm devices proposed for the project should be shown on the submittal drawings. This makes it easy for the plan reviewer to determine if the requirements of the codes and specifications will be met by the proposed quantity and layout of equipment

Plan Review

- All interconnecting wiring for fire alarm devices proposed for the project should be shown on the submittal drawings. This allows review of whether a sufficient number of circuits have been provided, and becomes the basis for supporting the wire lengths shown in the voltage drop calculations

Plan Review

- The plan review submittal typically consists of drawings, data sheets, and supporting calculations
- The drawings should include *plan views*, showing the building layout, fire alarm components and interconnecting wiring, a *riser diagram*, a line diagram showing the devices and interconnecting wiring to the control unit, and *detail* drawings

Plan Review

- *Data sheets* should be provided for each fire alarm component including control equipment, field power supplies, initiating devices and notification appliances. The data sheets are typically prepared by the equipment manufacturer, and reflect the conditions for which the product is listed (such as occupancy and environmental limitations)

Plan Review

- *Supporting calculations* include battery calculations, voltage drop calculations, and the sequence of operations
- The submittal documents should include information identifying the parties involved, the occupancy classification of the building, and the building address. This information can be on either the drawings or supporting documentation, or both

Plan Review

- *Plan view* drawings should include:
 - Uniform scale (1/8" = 1'-0" typically)
 - A "Key Plan" if the size of the building exceeds what can be shown on one page. This identifies which area of the overall building is being depicted
 - A compass point reference (North) to simplify plan review comments or questions

Plan Review

- *Plan view* drawings should include:
 - Page number, drawing date, revision #
 - Device legend to identify symbols used for devices
 - Wire legend to identify line types, colors or notations to identify different wire sizes and types

Plan Review

- *Plan view* drawings should include:
 - Identification of room names, room numbers and occupancy (a room used for a private office has different fire alarm requirements than a conference room)
 - Location of HVAC supply and return registers (when smoke or heat detectors are used)

Plan Review

- *Plan view* drawings should include:
 - Ceiling height and type of construction (can play a role in both automatic detection and notification appliance performance)
 - Location of fire alarm control panel(s), annunciator(s), transmitting equipment, and power supplies

Plan Review

- *Plan view* drawings should include:
 - Placement of all initiating devices, including mounting heights for wall mount devices. Addresses should be shown for addressable devices, and the circuit/sequence number shown for conventional devices. Temperature ratings for heat detectors should be shown

Plan Review

- *Plan view* drawings should include:
 - Placement of all notification appliances, including mounting heights for wall mount devices. Addresses should be shown for addressable devices, and the circuit/sequence number shown for conventional devices. Strobe candela and speaker wattage should be shown

Plan Review

- *Plan view* drawings should include:
 - Placement of all interface and fire safety devices should be shown, such as AHU and damper interface relays, door holders, stair pressurization, and access control system interfaces

Plan Review

- *Plan view* drawings should include:
 - Point to point wiring paths indicating number and size of conductors, and wire type
 - If the building has fire or smoke barriers, these should be shown as wiring zones must coincide with smoke and fire zones

Plan Review

- *Riser* drawings should include:
 - All devices on the system
 - Riser should be specific for the submittal (not typical) showing the devices in the same order on each circuit as shown on the plan view
 - Each device address and room number or name should be shown as well

Plan Review

- *Riser* drawings should include:
 - Wiring from each circuit or loop back to the control equipment
 - Device symbols and wire legend should correspond to plan views
 - NFPA 170 provides standard fire alarm symbols

Plan Review

- *Detail* drawings should include:
 - Typical wiring connections to each device
 - Device setup details, such as setting strobe candela output, speaker wattage taps, device addressing or horn audibility level

Plan Review

- *Data Sheets* should include:
 - Control equipment (make sure the listing is not just for residential use if the job is a commercial use)
 - Initiating devices
 - Notification appliances
 - Batteries

Plan Review

- *Supporting Calculations* should include:
 - Battery size calculations showing total current load in standby mode x standby time, plus total current load in alarm mode x alarm time, plus a safety factor (typically 20%) to calculate minimum battery size
 - Actual battery size larger than minimum

Plan Review

- *Supporting Calculations* should include:
 - Voltage drop calculations, either point to point or end load, showing the current load for all notification appliances on a circuit, the length of wire on the circuit, wire size, and total voltage drop. Voltage at the last device should exceed minimum voltage for that device to operate

Plan Review

- *Supporting Calculations* should include:
 - *Sequence of Operations*, in either a narrative format or a matrix, showing which system outputs are activated for each type of system input activated

Fire Warning Systems for Dwellings

- The primary function of fire warning equipment for dwelling units is to notify the occupants of the need to evacuate before their escape is prevented by fire conditions (smoke/heat/flames) in the normal path of exit
- Early detection (smoke detection) is the basis for providing adequate occupant notification

Fire Warning Systems for Dwellings

- *Smoke alarms* are defined as devices responsive to smoke including a sensor, control components, and an alarm notification appliance in one unit operated from a power source either in the unit or obtained at the point of installation

Fire Warning Systems for Dwellings

- *Smoke detectors* do not have internal notification appliances and are typically powered from a remote source. Smoke detectors connect to a control panel which activates notification appliances and may include off site monitoring

Fire Warning Systems for Dwellings

- *Smoke alarms* are referred to as single-station smoke alarms. When interconnected so that all sound when one activates, they are referred to as multiple-station smoke alarms

Fire Warning Systems for Dwellings

- Current building codes in Michigan require smoke alarms to be located:
 - In each sleeping room
 - Outside each separate sleeping area in the immediate vicinity of the bedrooms
 - On each additional story of the dwelling, including basements and habitable attics, but not including crawl spaces and uninhabitable attics

Fire Warning Systems for Dwellings

- Current building codes in Michigan require smoke alarms to be located:
 - For split level dwellings without a door between the levels, a smoke alarm on the upper level is sufficient for the lower level as well, as long as the lower level is less than one full story below the upper level

Fire Warning Systems for Dwellings

- Smoke alarms in rooms with sloped ceilings should be installed at the high side
- Should be installed on the ceiling where practical
- Where installed in the basement, should be near the stairway
- Where installed in the stairway, should be at the top of the stairway

Fire Warning Systems for Dwellings

- Where the ceiling is subject to being hot or cold, the smoke alarm should be located on the wall within 4" – 12" of the ceiling
- Should not be located within 3' of heating or A/C vents, or ceiling fan blades
- Avoid locating near kitchens, as false alarms from cooking can result

Fire Warning Systems for Dwellings

- Avoid locating smoke alarms in garages, where vehicle exhaust could trigger an alarm
- Avoid locating smoke alarms on ceilings with radiant heating installed in the ceiling

Fire Warning Systems for Dwellings

- Where more than one single station smoke alarm is provided in a dwelling unit, Michigan building codes require they be interconnected
- In Michigan, a fire alarm system with smoke detectors and notification appliances is permitted to substitute for smoke alarms, as long as the same level of detection and notification is provided

Fire Warning Systems for Dwellings

- Manufacturers instructions for maintenance should be followed for smoke alarms and fire alarm systems
- NFPA 72-2007 requires single and multiple station alarms to be tested monthly
- NFPA 72-2007 requires household fire alarm systems to be tested by a qualified service technician every 3 years

Fire Warning Systems for Dwellings

- NFPA 72-2007 requires sensitivity testing of single- and multiple-station smoke alarms and smoke detectors, except for one and two-family dwellings
- Where notification appliances are provided for a fire warning system, they should produce equivalent sound levels to smoke alarms – 85db in bedrooms

Fire Warning Systems for Dwellings

- NFPA 72-2007 does NOT require that smoke alarms be equipped with 15 candela strobes (error in textbook)
- Strobes may need to be provided where a hearing impaired person occupies the residence. It is the responsibility of the homeowner to request strobes if needed

BFAAM Apprenticeship Period 1

- This concludes the review of the Fire Alarm Signaling Systems Handbook and Period 1 of the program
- The online testing software is currently in Beta test, and will be available shortly. The test will consist of questions about the material covered in Period 1, including both the handbook and the presentations

BFAAM Apprenticeship Period 1

- Apprentices and their supervisors will be notified when the testing is available, and will need both a passing score on the test as well as their supervisor's approval to graduate from Period 1 of the program

BFAAM Apprenticeship Period 2

- The textbook for Period 2 of the program is NFPA 72 -National Fire Alarm Code[®], 2007 edition
- The reading assignment to prepare for the next meeting is Chapters 1 and 4 of NFPA 72. Chapters 2 (referenced standards) and 3 (definitions) will not be addressed in detail