

BFAAM Apprenticeship Program

Period 2

Related Training Instruction (RTI)

Module 2 – NFPA 72 – Initiating Devices

Reading material associated with this
module: Chapter 17 of NFPA 72, *National Fire
Alarm Code*, 2013 edition

Initiating Devices - General

- Where subject to mechanical damage, devices shall be protected. Mechanical guards for detectors shall listed with the detector 17.4.2
- Devices shall be supported independently of their circuit conductors 17.4.3
- Shall be installed in accessible areas 17.4.4

Initiating Devices - General

- Duplicate terminals or leads shall be provided to facilitate monitoring integrity of installation conductors
 - Exception: Initiating devices connected to a system that provides the required monitoring (addressable devices)

17.4.6

Initiating Devices

- When smoke detectors are installed in concealed locations more than 10' above the floor, or where the detector's alarm indicator is not visible to responding personnel, a remote alarm indicator shall be provided in a location acceptable to the AHJ

17.4.7

Smoke and Heat Detectors

- Recess mounting not permitted unless tested and listed for application 17.5.1
- If total coverage is required, it shall be:
 - All rooms, halls, storage areas, basements, attics, lofts, spaces above suspended ceilings, and other accessible spaces
 - Inside of all closets, elevator shafts, stairways, dumbwaiter shafts and chutes

17.5.3

Smoke and Heat Detectors - Total Coverage Exceptions

- Where the ceiling is attached directly to the underside of the supporting beams of a combustible roof or floor deck
- Where the concealed space is entirely filled with a noncombustible insulation
- Where there are any small concealed spaces over rooms of 50 square feet or less
- In spaces formed by studs or joists spaced less than 6" apart in walls, floors or ceilings

17.5.3.1.2

Smoke and Heat Detectors - Total Coverage Exceptions

- Detectors shall not be required below open grid ceilings if all of the following exist:
 - Grid openings are 1/4 inch or larger in the least dimension
 - Thickness of the material does not exceed the least dimension
 - Openings constitute at least 70% of the area of the ceiling material

17.5.3.1.3

Smoke and Heat Detectors - Total Coverage Exceptions

- Detectors shall not be required in spaces above suspended ceilings that are used as a return air plenum where equipped with smoke detection at each connection from the plenum to the central air handling system

17.5.3.1.4

Smoke and Heat Detectors - Total Coverage Exceptions

- Detectors shall not be required underneath open loading docks or for accessible under floor spaces if all the following exist:
 - Space is not accessible for storage or entry of unauthorized persons, no windborne debris
 - Space contains no steam pipes, electric wiring, shafts or conveyors
 - Floor over space is tight
 - No flammable liquids handled or stored on floor above

17.5.3.1.5

Smoke and Heat Detectors

- Non-required detectors shall meet all the requirements of the standard, with the exception of the spacing criteria. Additional detectors not necessary to achieve the objective shall not be required

17.5.3.3.2

Heat Detectors

- Heat detectors of the fixed temperature or rate compensation spot type shall be marked with a color code in accordance with Table 17.6.2.1 17.6.2.2.1.1
- Table 17.6.2.1 establishes maximum ceiling temperature for installation of each classification of heat detector ($\sim 20^\circ$ below operating temperature) 17.6.2.1

Heat Detectors

- Operating temperature shall be marked on heat detectors 17.6.2.2.2.1
- Heat detectors where the alarm point is adjustable shall be marked with the temperature range 17.6.2.2.2.2
- Response Time Index (RTI) shall be marked on heat detectors 17.6.2.2.2.3

Heat Detector Location

- On the ceiling not less than 4" from wall –
spot type 17.6.3.1.3.1
- On the wall between 4" and 12" from ceiling
– spot type 17.6.3.1.3.1
- Line type shall be located on the ceiling or
on sidewall not more than 20" from ceiling
17.6.3.1.3.2

Heat Detector Location Joist/Beam Construction

- On the bottom of the joist with solid joist construction (joists less than 3' apart)

17.6.3.2.2

- Where beams are less than 12" deep and less than 8' on center, detectors shall be permitted to be installed on the bottom of the beams

17.6.3.3.2

Heat Detector Spacing Smooth Ceiling

- Temperature rating of detector to be at least 20° F above expected temperature
- Distance between detectors shall not exceed their listed spacing, and there shall be detectors within one half the listed spacing, measured at right angles, from all walls and partitions extending to within the top 15% of ceiling height

17.6.3.1.1

Heat Detector Spacing Smooth Ceiling

- All points on the ceiling shall have a detector with a distance equal to or less than .7 times the listed spacing (0.7S)

17.6.3.1.1

- For irregularly shaped areas, the spacing between detectors may exceed the listed spacing if the maximum distance to the furthest point of coverage is not greater than .7 times the listed spacing

17.6.3.1.2

Heat Detector Spacing Smooth Ceiling

- An example of this would be a corridor 10' wide by 80' long, using detectors listed for 30' spacing. The detectors would be permitted to be 40' apart, as the distance to the furthest point of coverage would not exceed 21' ($30' \times .7 = 21'$)

Heat Detector Spacing Other Ceilings

- Solid joist - reduce spacing by 50% in direction perpendicular to joist 17.6.3.2.1
- Beam - reduce spacing by 33% in direction perpendicular to beam 17.6.3.3.1.2
- Beam - where beams are more than 18" deep and more than 8' on center, treat beam as a wall (each bay gets a detector) 17.6.3.3.1.3

Heat Detector Spacing Sloping Ceilings

- Peak - locate row of detectors within 3' of peak, additional detectors based on horizontal projection of ceiling 17.6.3.4.2.1
- If slope $< 30^\circ$, space detectors based on height at peak; $> 30^\circ$ space detectors at average height (except top row) 17.6.3.4.1

Heat Detector Spacing High Ceilings

- Ceilings up to 10' tall - use 100% of listed spacing for detector placement
- Ceilings above 10' up to and including 30' - use Table 17.6.3.5.1 to derate listed spacing to compensate for high ceiling
- Exception: Line-type electrical conductivity heat detectors and pneumatic rate of rise tubing heat detectors

17.6.3.5.1

Heat Detectors

- A heat sensing detector integrally mounted on a smoke detector shall be listed for not less than 50 ft. spacing 17.6.3.6

Smoke Detectors

- Environmental restrictions unless listed otherwise:
 - Temperature between 32°F and 100°F
 - Relative humidity below 93%
 - Air velocity below 300 fpm 17.7.1.8
- Shall not be installed until after the final construction cleanup of all trades 17.7.1.11.3

Smoke Detectors

- Spot type detectors shall be located on the ceiling, or 17.7.3.2.1
- Shall be located on a wall within 12" from the ceiling 17.7.3.2.1
- Installation under raised floors shall be in a listed orientation (wall or ceiling, not upside down...) 17.7.3.2.2

Smoke Detectors

- Spot type detectors shall be permitted to use a spacing of 30' (no listed coverage for smoke detectors)
- Manufacturers published instructions shall be followed
- All points on the ceiling shall be within .7 times the selected spacing from the detector

17.7.3.2.3.1

Smoke Detectors

- Distance between smoke detectors shall not exceed 30', and there shall be detectors within one half the listed spacing, measured at right angles, from all walls and partitions extending to within the top 15% of ceiling height

17.7.3.2.3.1

Smoke Detectors

- Solid joist and/or beam construction, with a level ceiling, apply the following:
 - No issues if beam depth is less than 10% of ceiling height
 - If beam depth is greater than 10% of ceiling height, and beam spacing is $\geq 40\%$ of ceiling height, use smooth ceiling spacing parallel to beams and reduce spacing by 50% perpendicular to beams

17.7.3.2.4.2

Smoke Detectors

- Pan or waffle ceilings, apply the following:
 - If beam depth is less than 10% of ceiling height, use selected spacing
 - Detectors may be placed either on the ceiling or on the beams
- Corridors up to 15' wide with ceiling beams or joists, use selected spacing, detectors on ceiling or beams

17.7.3.2.4.2

Smoke Detectors

- Peaked or shed ceilings, apply the following:
 - One row of detectors placed within 3' of peak or high side of ceiling
 - Additional detectors, if needed, spaced on the horizontal projection of the ceiling 17.7.3.3, .4

Smoke Detectors

- Spaces below raised floors and above suspended ceilings shall be treated as separate rooms for detector spacing. Detectors in these spaces shall not be used in lieu of providing detection within the room

17.7.3.5

Smoke Detectors

- Locate smoke detectors where air handling systems will not prevent operation of detectors
 - 3' from air supply diffusers
 - 3' from return air openings
 - Increase distance from air supply or return when opening is larger than common

17.7.4.1

Smoke Detectors

- Detectors placed in environmental air ducts or plenums shall not be used as a substitute for open area detectors. 17.7.4.3
- Detectors placed in environmental air ducts or plenums shall be permitted to be either supervisory or alarm initiating devices 17.7.4.4

Smoke Detectors

- To prevent the recirculation of dangerous quantities of smoke, a detector approved for air duct use shall be installed on the supply side of the air handling system as required by NFPA 90A, *Standard for the Installation of Air Conditioning and Ventilating Systems*

17.7.4.3.1

Initiating Devices

- Smoke detectors for air duct systems:
 - Mounted within duct
 - Mounted to the duct wall, with sensing element protruding into duct
 - Mounted outside duct with sampling tubes protruding into duct
 - Projected light beam through duct
 - Shall be accessible for cleaning

17.7.5.5.2, .3

Smoke Detectors for Door Release

- Door release service can be provided by an open area protection system covering the room, corridor, or enclosed space on each side of the smoke door 17.7.5.6.1
- Door release service can be provided by smoke detectors used exclusively for smoke door release service installed per the requirements of 17.7.5.6 17.7.5.6.2

Smoke Detectors for Door Release

- If doors are to be closed in response to smoke flowing in either direction, when distance from top of door to ceiling is $\leq 24"$, the detector requirements are:
 - One ceiling mount detector on either side, or
 - Two wall mount detectors, one on each side, or
 - One detector listed for door frame mounting, or detector integral to door closer used

17.7.5.6.5.1(A)

Smoke Detectors for Door Release

- If doors are to be closed in response to smoke flowing in either direction, when distance from the top of door to the ceiling is $> 24''$ on one side only, detector requirements are:
 - One ceiling mount detector on higher side, or
 - Two wall mount detectors, one on each side, or
 - One detector listed for door frame mounting, or detector integral to door closer used

17.7.5.6.5.1(B)

Smoke Detectors for Door Release

- If doors are to be closed in response to smoke flowing in either direction, when distance from the top of door to the ceiling is $> 24''$ on both sides, detector requirements are:
 - Two ceiling mount detectors, one on each side
 - Two wall mount detectors, one on each side
 - One detector listed for door frame mounting or detector integral to door closer used

17.7.5.6.5.1(C)

Smoke Detectors for Door Release

- If a detector is specifically listed for door frame mounting, only one detector shall be required if installed per the manufacturers listed instructions

17.7.5.6.5.1(D)

Smoke Detectors for Door Release

- If doors are to be closed in response to smoke flowing in one direction only, detector shall be located in the space in which smoke is to be confined, in accordance with the location requirements of 17.7.5.6.6

17.7.5.6.5.2

Smoke Detectors for Door Release

- If there are multiple doorways, and the separation between doorways exceeds 24", each doorway shall be treated separately
- Each group of three or more doorway openings shall be treated separately
- Each group of doorway openings that exceeds 20' in width shall be treated separately

17.7.5.6.5.3 (A), (B), (C)

Smoke Detectors for Door Release

- Detectors shall be located on the centerline of the doorway
 - Not more than 5' from door
 - No closer than 1' from door
 - At least (door to ceiling height) from door

17.7.5.6.6.1

Smoke Detectors

- Smoke detectors with an integral heat detector shall comply with Table 17.6.2.1 for maximum ceiling temperature 17.7.6.1.1
- Holes in the back of the detector shall be covered, and the detector mounted so that airflow from inside or around the housing does not prevent smoke entry during a fire or test condition 17.7.6.1.2

Smoke Detectors

- Smoke detectors shall not be located directly in the airstream of supply registers
- Spacing in high air movement areas shall comply with Table 17.7.6.3.3.2, which reduces spacing based on the number of air changes per hour
 - Except for air sampling or projected beam smoke detectors installed per mfg. instructions

17.7.6.3.2, 17.7.6.3.3

Smoke Detectors

- Video image smoke detection systems shall be listed for the purpose of smoke detection
17.7.7.1
- Video signals that are generated by camera components shall be permitted to be transmitted to other systems only through output connections provided specifically for that purpose by the video system manufacturer
17.7.7.3

Flame Detectors

- Video image flame detection systems shall be listed for the purpose of flame detection
17.8.5.1
- Video signals that are generated by camera components shall be permitted to be transmitted to other systems only through output connections provided specifically for that purpose by the video system manufacturer
17.8.5.3

Multisensor Detectors

- Combination detectors shall be listed for each sensor 17.9.2.1
- Multi-criteria detectors shall be listed for the primary function of the device 17.9.3.1
- Multi-sensor detectors shall be listed for each sensor 17.9.4.1

Initiating Devices

Waterflow

- Waterflow detectors shall activate within 90 seconds of flow equivalent to the smallest sprinkler head on the system 17.12.2
- Movement of water due to waste, surges or variable pressure shall not initiate an alarm signal 17.12.3

Initiating Devices

Pull Stations

- Manual pull stations shall be mounted at 42" to 48" from floor to operable part (limited to 4' by Michigan Building Code) 17.14.5
- Pull stations shall be conspicuous, unobstructed and accessible 17.14.8.2
- Maximum travel distance of 200' 17.14.8.5
- Mounted on both sides of group doors over 40' in width 17.14.8.6

Supervisory Initiating Devices

- Sprinkler valve supervisory switches shall activate when the valve is turned off, within the first two turns or 1/5 of the travel distance from the fully open position 17.16.1.2
- Water pressure supervisory switches shall activate when the pressure is +/- 10 psi of normal 17.16.2.2.1
- Same rule for air pressure supervisory switches 17.16.2.2.2

Supervisory Initiating Devices

- Water pressure tanks shall be supervised for both high and low water level - activating when the level is +/- 3" from normal
17.16.3.2.1
- Gravity feed water tanks shall be supervised for low water level, activating when the level falls 12" from normal
17.16.3.3

Supervisory Initiating Devices

- Temperature supervision shall be provided for water storage exposed to freezing temperatures, activating when the temperature falls below 40°F 17.16.4
- Room temperature supervision shall indicate when the temperature falls below 40°F 17.16.5

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Period 2

Reading Assignment for
Module 3 – NFPA 72 – Notification Appliances

Reading material associated with this
module: Chapter 18 of NFPA 72, *National Fire
Alarm Code*, 2013 edition