



# TechNotes

Editor - Roland Asp, CET

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This edition of TechNotes was written by John Swanson, Code and Standards Specialist for the NFSA.

## Fire Alarm and Fire Sprinklers – A Great Combination

Peanut butter and jelly. Salt and pepper. Eggs and bacon. NFPA 13 and NFPA 72...? While this combination may seem strange, the fact is, fire alarms and automatic sprinkler systems have complemented each other to protect occupants and enhance fire protection throughout the built environment for decades. Since many buildings today are required by model codes to be equipped with fire sprinklers and a fire alarm system, it's only appropriate that sprinklers and alarms are often mentioned in the same sentence when talking about fire protection.

## Fire Alarm System Basics

According to the International Fire Code (IFC), a fire alarm system is “A system or portion of a combination system consisting of components and circuits arranged to monitor and annunciate the status of fire alarm or supervisory signal-initiating devices and to initiate the appropriate response to the signals.” Components monitored by a fire alarm system include alarm initiating devices and supervisory devices. Alarm initiating devices include flow switches, smoke detectors, heat detectors, and other components capable of detecting fire. Supervisory signal initiating devices are designed to monitor the status of equipment or systems which are not directly a part of the fire alarm system. These can include sprinkler systems, smoke control systems, emergency generators, fire pumps, and others. Fire sprinkler components that should be monitored include tamper switches, low air alarms and other devices which, if activated, indicate that the system will not activate as needed.

Once a monitored alarm device detects a possible fire condition, a signal will be detected by the fire alarm control panel (FACP). The FACP will then initiate the appropriate response (Section 907 of the IFC delineates the appropriate response depending upon the type of occupancy being protected). If the building has an occupant notification system, the horn/strobes or voice evacuation system will activate. Emergency operations may also be initiated such as elevator recall, smoke control system activation, or preaction or deluge valve operation. Finally, in most cases, an alarm signal will be sent to a central station. NFPA 72 requires that the central station immediately notify the appropriate fire department of an alarm activation before contacting the building owner or designee.

A supervisory signal initiating device which activates does not indicate an alarm condition. However, it does indicate a condition which should be quickly remedied by the building owner or designee. A tamper switch activation may indicate that the sprinkler system water supply has been shut off. This will activate an alert on the FACP and send a supervisory signal to the central station. Upon receiving a supervisory signal, the building owner or designee will be contacted and is expected to respond to investigate and remedy the situation. In most cases, the fire department will not be called for a supervisory signal.

In addition to alarm and supervisory signals, a third type of signal – a trouble signal – may be generated. Whereas supervisory signals indicate a problem with a component or system monitored by the fire alarm system, a trouble signal indicates a problem with the fire alarm system, itself. Trouble conditions include low battery, loss of AC power, open circuits, or loss of communication. Like supervisory signals, these are typically directed to the building owner and not the fire department.

Not all FACPs are required to send a signal to a central station. Dedicated function fire alarm systems are designed to perform specific emergency functions. For example, a dedicated function system may be used to monitor the detection devices in an elevator shaft to initiate recall. A preaction control panel could also be considered a dedicated function system. (Although the preaction panel does not initiate a signal to a central station, it is monitored by the building's FACP, which will initiate a signal.)

One big misconception around the country is that since the code requires a sprinkler system to be monitored by a FACP (IFC Section 903.4), then horns and strobes are also required to notify the occupants of the building. This is not true. Section 903.2 of the IFC identifies where sprinkler systems are required. Section 907.2 identifies where fire alarm systems are required. If 907.2 does not specifically require occupant notification, none is needed.

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## Model Codes, Sprinklers and Fire Alarms

When the model codes require a building to be protected with fire sprinklers, they also require waterflow from a sprinkler system to be supervised by a listed fire alarm control unit. NFPA 72 refers to this as a dedicated function fire alarm system. This term was added to the 2007 edition of NFPA 72 to clarify when a full fire alarm system comprised of horn/strobes, detection, and manual pull stations must be installed vs. a fire alarm panel installed to monitor a specific function (such as sprinkler waterflow, duct detectors, or elevator control functions). The term dedicated function fire alarm system was added to NFPA 72 to clarify there are conditions when a fire alarm system with horns, strobes, detection and pull stations, are not required in a building. The intent is for Section 907 of the

International Building Code to outline when a fire alarm system is required and what the fire alarm system must do, activate a general evacuation signal, initiate emergency voice alarm communication system, detection in specific areas, etc.

## Fire Sprinklers and Occupant Notification

When Section 907 of the International Building Code (IBC) requires a fire alarm system with occupant notification, the fire alarm notification appliances (horns, speakers, strobes, etc.) must activate upon one or more of the following:

- Automatic sprinkler system waterflow devices
- Automatic fire detectors
- Manual pull stations
- Automatic fire-extinguishing systems (IBC Section 904)

The 2022 edition of NFPA 13 revised Section 7.7 addressing waterflow alarm devices by separating the requirements based on the type of waterflow alarm device, mechanical or electrical. For many years NFPA 13 has required an audible alarm sound at the premises within 5 minutes after waterflow begins from a single sprinkler. This requirement has caused some confusion when comparing NFPA 25 and NFPA 72's requirement for a waterflow alarm to activate within 90 seconds. The intent of NFPA 13's 5-minute requirement is for buildings with mechanical alarms that do not have a fire alarm system and is intended to accommodate fluctuation in the water flow. Keep in mind, however, that Section 903.4 of the IBC requires waterflow to be supervised by a listed fire alarm control unit. A fire alarm control unit installed only to monitor for sprinkler waterflow is referred to as a dedicated function fire alarm system based on NFPA 72. Since NFPA 72 defines a dedicated function fire alarm as a "fire alarm system", a building built to the IBC or IFC is required to be equipped with a listed fire alarm control unit for supervising waterflow (dedicated function fire alarm system). NFPA 72 also states the waterflow alarm device has an additional ten seconds, after the initial 90 seconds, for the waterflow alarm to activate the building notification (horn/strobes) in the building, for a total of 100 seconds. NFPA 13 did clarify this criterion in Section 7.7.2 of the 2022 edition of NFPA 13 for buildings equipped with a fire alarm system, including dedicated function fire alarm systems, and for any system utilizing electrically activated local alarm bells.

## Fire Sprinkler Control Valve Supervision

There has been some confusion between the IBC requirement, Section 903.4, to electrically supervise valves, and other components, versus the requirements in NFPA 13 Section 16.9.3.3.1 to chain and lock control valves. It's important to clarify the IBC addresses this scenario in Section 102.4.1 and 102.4.2. Section 102.4.1 states when a conflict occurs between the code and a referenced standard, the code applies. Even when there is no apparent conflict, Section 102.4.2 further clarifies this by saying, when a referenced code or standard includes subject matter that is

within the scope of this code...the provisions of the code take precedence over the referenced standard. In other words, since the IBC addresses supervision in Section 903.4, the IBC requirement for a listed fire alarm control unit takes precedence over the four conditions listed in NFPA 13, Section 16.9.3.3.1.



## Special Rules for Hospitals

Hospitals offer unique challenges for fire alarm and sprinkler system designers. Because most of the patients in these facilities are unable to self-evacuate, the IBC requires that floors be subdivided into at least two smoke compartments separated by smoke barriers. In the event of a fire, hospital staff will move patients from the smoke compartment involved in fire to an adjacent compartment where they will be protected. IBC Section 407.5.1 limits the size of each smoke compartment to 22,500 square feet in most cases.

NFPA 99 Healthcare Facilities Code, Section 16.9.1.3, 2021 edition, requires in all facilities where patients are not expected to automatically evacuate that sprinkler zones coincide with smoke compartment boundaries unless another option is provided in the facility fire plan. Section 16.7.4.3.1 provides similar requirements for fire alarm system zones. The reason for these provisions is to ensure that essential life safety functions remain active in areas where patients are located in the event that they are shut off within a compartment after the fire or are damaged due to the fire. The result of this sprinkler provision is that sprinkler zones within healthcare facilities will be significantly smaller than the 52,000 square feet area allowed for light hazard occupancies in NFPA 13.

## Elevator, Sprinkler and Fire Alarm Requirements

Fire protection requirements for elevator shafts has been a point of consternation for elevator inspectors, fire sprinkler installers, and fire alarm technicians alike. The need to balance requirements between ASME A17.1, International Building Code, NFPA 13, and NFPA 72 has led to confusion and questions for when sprinklers and detection are required in the elevator shaft.

NFPA 13 requires a sidewall sprinkler not more than 2 feet above the floor of the pit in the elevator hoistway when hydraulic fluids are present in the space. A proposal has been submitted for the 2025 edition of NFPA 13 to allow sprinklers to be omitted from all elevator hoistways. However, that proposal is waiting final approval through the NFPA standards development process. Sprinkler protection is not required in the hoistway for traction type elevators when the conditions outlined in Section 9.3.6.3 are met.

ASME A17.1 requires Phase I emergency recall for nearly all elevators. When Phase I recall is required, fire alarm detection must be provided in the elevator hoistway when sprinklers are installed in the hoistway. Since NFPA 13 requires sprinkler protection at the bottom of the hoistway for hydraulic elevators, a fire alarm detection device must also be placed in close proximity to the sprinkler. Where sprinklers are located above the lowest level of recall, the fire alarm initiating device must be located at the top of the hoistway. Where sprinklers are located in the pit, the fire alarm initiating device must be placed within 24 inches of each sprinkler. When heat detectors are installed to shut down the elevator power prior to sprinkler operation, the heat detector must have a lower temperature rating and a higher sensitivity compared to the sprinkler. According to ASME A17.1, smoke detectors are not permitted to be used to (1) activate sprinklers in the hoistway (preaction system), or (2) disconnect the main line power supply to the elevator equipment.



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