

NFPA 13 FIRE SPRINKLER REQUIREMENTS THAT INFLUENCE FIRE ALARM SYSTEM DESIGN



Presented by:
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NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

Course Synopsis:

The NFPA 13 fire sprinkler standard has a significant influence on the design of fire alarm systems. While both NFPA 13 and 72 require the fire alarm to supervise and sometimes provide releasing functions, this educational presentation introduces a broader set of design considerations. It explores code intersections between the two standards, offering insights for designers, engineers, and code officials seeking minimum code compliance. Together we will explore the NFPA 13's fire alarm provisions related to remote sprinkler system testing, integration with High Volume Low Speed (HVLS) fans, code-permitted reductions in sprinkler water supplies, high-density electric mobile shelving systems, and sprinkler system activation local notification design options. Finally, the session highlights specific building code options where sprinkler coverage is omitted.

Presentation Material: The material will be presented in a PowerPoint format and available digitally/ paper afterwards.

Continuing Education Credits: This course is not manufacturer specific and is approved for self-reporting CEU's. In order to receive CEU & PDH credit, each participant must sign a check-in roster at the event and must attend the entire hour. Certificates are awarded after the confirmation of complete attendance and meeting the learning objectives.

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Our team of experts offers regular updates on life safety best practices, code modifications and more.



I have a diverse fire-focused background, but there's more to me than just fire...

Presenter

Jason Lupa, P.E. is a Business Development Engineer at Siemens Industry, specializing in fire alarm systems. He blends deep technical expertise with decades of experience to help create safer, smarter, and more resilient buildings. As a Business Development Engineer at Siemens Industry, he specializes in advanced fire alarm and life-safety solutions for commercial and industrial environments. With a B.S. in Fire Protection Engineering from the University of Maryland and service as a certified structural firefighter—Jason delivers high-performance applications that enhance both safety and business continuity. His work bridges firematic engineering principles with field-tested insight to implement practical systems which protect people, property, and operations. His expertise spans fire suppression, detection, mass notification, smoke control, deflagration venting, gas detection, hazard analysis, static fire barriers and crisis human behavior.

Actively involved in building code development, Jason has led teams in the design, implementation, and maintenance of complex fire protection systems across

Agenda

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This session explores how the NFPA 13 fire sprinkler system standards directly impact the design and integration of NFPA 72 fire alarm systems. We will review long-standing requirements for supervising sprinkler components, along with new requirements for suppression release systems automatic testing, integration with High Volume Low Speed (HVLS) fans, high-density electric mobile shelving systems and installation options for local sprinkler system audible activation signals.



"You're not allowed to use the sprinkler system to keep your audience awake."

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EXTRA BONUS just for you

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Identification of fire and smoke separation walls **SIEMENS**

Minimum 3 in. high with leg visible barrier

Sign or stenciling (minimum 20 ft intervals and within 12 ft of end of wall)

Concealed space

Floor or roof deck

Fire barrier (penetration barrier)

Ceiling

Fire

New Jersey 2010 IBC Transition from the 2009 IBC - Fire Alarm Applications Last Page 14

IBC states as follows:
Most MEP's writing this requirement into a 'Fire and Smoke Protection Identification' section in Division 07 with other fire related sections [07 9463]. This places it with other similar requirements, and leaves it up to the contractor as to whether it's painted, stenciled, or peel-n-stick signage.

Here's the IBC requirements:

§703.6 Marking and identification. Fire walls, fire barriers, fire partitions, smoke barriers and smoke partitions or any other wall required to have protected openings or penetrations shall be effectively and permanently identified with signs or stenciling. Such identification shall:

1. Be located in accessible concealed floor, floor-ceiling or attic spaces;
2. Be repeated at intervals not exceeding 30 feet (914 mm) measured horizontally along the wall or partition; and
3. Include lettering not less than 0.5 inch (12.7 mm) in height, incorporating the suggested wording: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS," or other wording.

Exception: Walls in Group R-2 occupancies that do not have a removable decorative ceiling allowing access to the concealed space.

SLIDE DECK

Comments during the presentation are exclusively the presenter opinions and do not reflect an official position of the International Code Council (ICC) or National Fire Protection Association (NFPA)

COMMENTARY

CODE REFERENCES

For your convince, I have all of today's material available for future reference. This includes both the slidedeck along with supporting research notes which contain more detailed code references.

State Board Administrative Code Adoption Process

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Model Code

The Template
National codes that serve as a base, providing the latest safety regulations and technology.

Amended Code

The Changes
Modifications made by the state's review board. These include local climate, geological, and administrative amendments.

Adopted Code

The Law
The finalized, legally binding, and enforced regulation as approved by the legislation.

Essentially, the Model Code is the foundation, Amendments are the tailoring and the Adopted Code is the legal enforced result.

The New Jersey Uniform Construction Code Building Subcode 2021

- The **BLUE** book
- Based on the International Building Code 2021 with amendments
- Used for new construction and installation requirements
- Existing building construction covered by a separate Rehabilitation code
- References NFPA 72, 2019 edition
- Enforced by the Fire Subcode Official
- NJAC 5:23-3

The New Jersey Uniform Fire Code Fire Prevention Code 2018

- The **RED** book
- Based on the International Fire Code 2018 with amendments
- Used for inspection, test and maintenance (ITM) requirements
- References NFPA 72, 2016 edition
- Enforced by the Fire Official or Fire Marshal
- NJAC 5:70-3

The New Jersey building code adoption process is governed by the Administrative Procedure Act (APA) and managed by the Department of Community Affairs (DCA).

- The NJ new construction building codes are currently on the amended IBC 2021 edition but existing construction is maintained under the amended 2018 edition of IFC.
- NJ's maintenance code was updated on April 15, 2025 (i.e new mulch regulations), but still follows the older 2018 edition.
- On **March 10, 2026** the NJ Division of Fire Safety's website will publish the new proposed amended Uniform Fire Code. They are based on the 2024 edition. The goal is to align both the construction and maintenance code with the same editions. There is a 60-day public review and comment period.



HOW NFPA 13 FIRE SPRINKLER CODES INFLUENCE FIRE ALARM DESIGNS



This presentation examines NFPA 13 fire sprinkler system design requirements and their direct impact on fire alarm system planning, coordination, and performance.

We will review key design considerations, interdisciplinary coordination strategies, and code-driven implications that influence both systems.

Let's begin with how a fire alarm system classifies events.

NFPA 13 codes heavily influence fire alarm design by mandating supervision of sprinkler components (valves, water flow), requiring specific alarms (exterior/interior), dictating smoke detection in sprinkler-omitted areas, and integrating suppression system status into the overall fire alarm system, requiring close coordination between NFPA 72 (Fire Alarm Code) and NFPA 13 (Sprinkler Code) for comprehensive fire protection. These requirements ensure the fire alarm system monitors the integrity of the sprinkler system, provides alerts for activation, and covers areas where sprinklers aren't installed, creating a unified response.

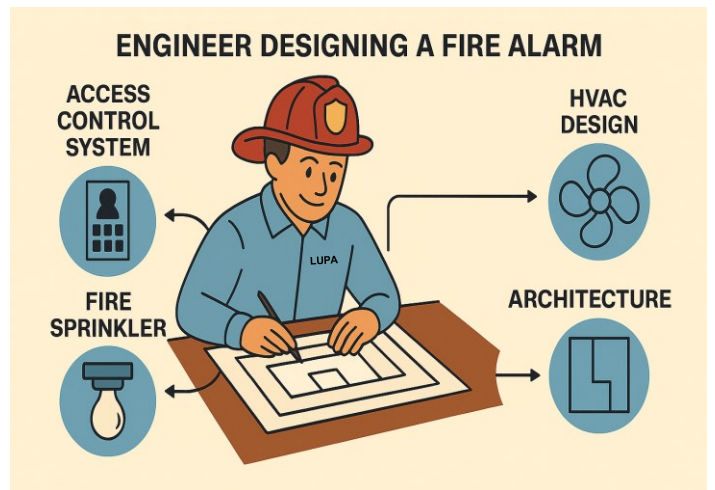
Designing a Fire Alarm System...

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The fire alarm system layout, equipment selection, and sequence of operations are all influenced by other disciplines.

The design options of other building systems and their governing codes can directly impact designs.

Additionally, building code trade-offs that increase or reduce life safety features play a significant role in shaping the final fire alarm system.



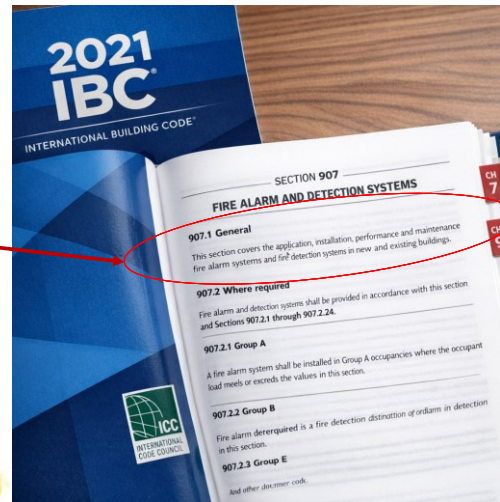
NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

SIEMENS Jason Lupa, PE - Page 12

Designing a fire alarm system involves meeting requirements from NFPA 72 (National Fire Alarm and Signaling Code), the International Building Code (IBC), local codes, and consulting your local Authority Having Jurisdiction (AHJ) like the Fire Marshal; design steps include assessing building type/hazards, selecting components (smoke/heat detectors, pull stations, horns/strobes), determining placement per code, ensuring proper wiring (NEC Article 760), and planning for testing/maintenance, all to ensure life safety and property protection.

The building code mandates the minimum requirements.

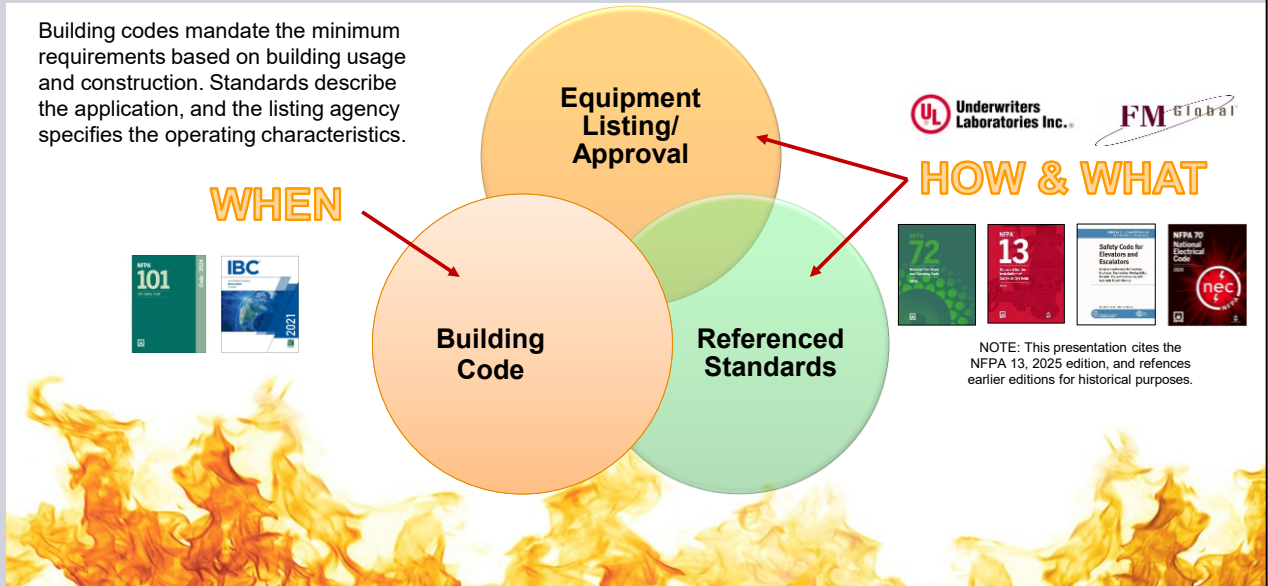
At first glance, they all appear to be in one location...but fire codes requirements are located in several different sections along with different referenced standards.



The International Building Code (IBC) is a building code developed by the International Code Council (ICC). The majority of states adopt and slightly modify one of the published editions. It applies to all buildings except one- and two-family dwelling units (those are covered in the International Residential Code [IRC]).

Chapter 9 of the IBC covers Fire Protection and Life Safety Systems, with Section 907 covering Fire Alarm and Detection Systems. This section outlines what type of fire alarm system is needed for given occupancies, including the detection type and occupant notification. The IBC has additional sections which also have fire alarm requirements.

Building codes mandate the minimum requirements based on building usage and construction. Standards describe the application, and the listing agency specifies the operating characteristics.



NOTE: This presentation cites the NFPA 13, 2025 edition, and references earlier editions for historical purposes.

The terms "code" and "standards" are commonly used to represent the same thing. However, the two terms stand for completely different meanings. Fire alarm codes are written rules and regulations that are then adopted as law for enforcement by an AHJ or Authority Having Jurisdiction. Fire alarm codes once put in place, are the minimum requirements that must be complied with to provide a reasonable degree of life safety. Codes are written based on standards. Fire alarm standards are generally produced by a consensus or technical committee to represent a minimum level of how to install certain types of protection. Standards are focused on one particular system component and give guidelines on the proper installation, maintenance and inspecting.

The two largest building codes in the United States, the IBC and NFPA 101, both require that all fire alarm systems need to be installed in accordance with NFPA 72. Although it has the word 'CODE' in the title, NFPA 72 is not a code. It tells us how and what needs to be provided. It doesn't explain what type of equipment (pull stations, smoke detectors, duct detectors, waterflows, tampers) should be used. This information can be found in the specific jurisdiction's adopted building code.

Keep in mind that NFPA 72 tells us how to install fire alarm systems. It doesn't explain what type of equipment (pull stations, smoke detectors, duct detectors, waterflows, tampers) should be used. This information can be found in the specific jurisdiction's adopted building code.



Design engineers establish their minimum fire alarm criteria by initially looking in IBC section 907, there are many other sections of the building code and its referenced standards which contain fire alarm requirements.

There are 'special' occupancies with unique fire alarm application in Chapter 4.

Other parts of the IBC require fire alarm features based on the potential hazard, such as section 903.2 & 1207.5.4 903.2 which mandate automatic smoke or heat detection system for all energy storage systems, regardless of sprinkler protection.



Although NFPA 13 is specifically for fire sprinkler systems, it contains specific requirements for fire alarm systems based on the type of suppression system, potential hazard and design options. This requires fire alarm designers to have both knowledge of this code-requirements along with the specific fire sprinkler design options which affect their fire alarm designs.



There are multiple locations with fire alarm code requirements.

Fire Alarm Signals are Classified into Three Categories

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Per NFPA 72:



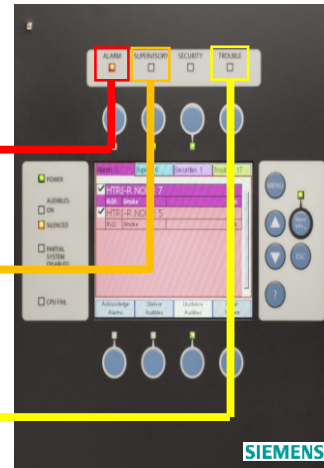
ALARM – A signal indicating a fire event



SUPERVISORY – A signal indicating an abnormal condition with another building life safety system



TROUBLE – A signal indicating a fire alarm system component fault which may impair the FACP's performance.



ALARMS

Dispatch the fire department and activate the evacuation notification appliances

SUPERVISORIES

Dispatch the facility maintenance staff to investigate and fix promptly

TROUBLES

Dispatch the fire alarm service technician to investigate and fix promptly

NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Your fire alarm system is your first line of defense against the danger of a fire. But, what many people don't know is that your fire alarm system does much more than just alert you of a fire. Instead, it has three broad signals, or capabilities: alarm, trouble, and supervisory.

Automated and Remote Inspection and Testing of Water-Based Fire Protection Systems

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When designs voluntarily utilize automated inspection devices for fire protection systems, NFPA 13 requires integration with the fire alarm.

- If the automated testing equipment must impair the normal operation of the suppression system, any faults of the testing equipment must report a **supervisory signal** on the fire alarm system.
- Any failure of the fire suppression system to pass an automated test must result in a **supervisory signal** on the fire alarm system.
- If the automated testing equipment experiences a failure, it must generate a **supervisory signal** on the fire alarm system.

See NFPA 13 [2025] 7.9



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Remote and automated inspection and testing has been gaining momentum in codes and standards as well as in the field over the past several years. The strict lockdowns during the COVID-19 pandemic pushed this trend to progress even faster as many more people realized its potential.

Automated and remote inspection (A&R) of water-based fire protection systems uses IoT, sensors, and video to perform checks from a distance, mimicking manual tasks like flow tests and pressure monitoring, significantly enhanced by new standards like NFPA 915 which guide these technologies for improved efficiency, reduced risk, and real-time data collection, complementing traditional NFPA 25 requirements for maintaining system readiness with both automated data and qualified human oversight.

In order to implement an A&R solution, certain system features must be incorporated to ensure minimum code compliance.

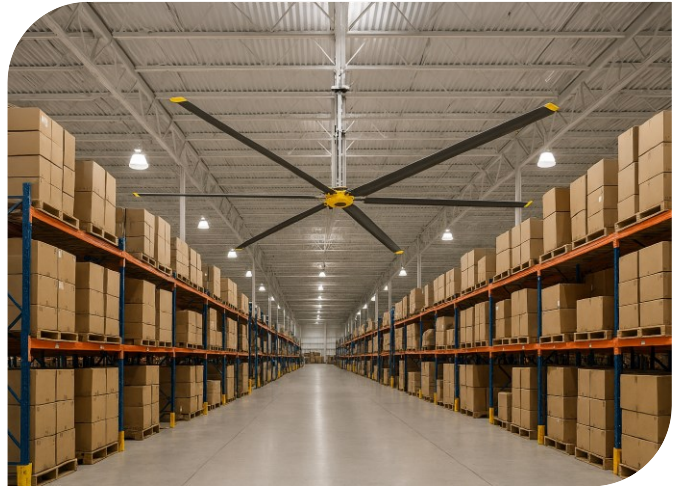
High Volume Low Speed (HVLS) Fans

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HVLS fans became popular in warehouses and manufacturing facilities in the early 2000's because they improve thermal comfort and energy efficiency.

However, their large diameter and airflow raised concerns about fire sprinkler performance, particularly:

- Delayed sprinkler activation
- Altered spray pattern
- Impact on smoke movement



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Delayed sprinkler activation: Strong airflow could cool the heat plume, slowing sprinkler response.

Altered spray pattern: Air movement might deflect water distribution, reducing coverage.

Impact on smoke movement: Fans could push smoke away from detectors or sprinklers.

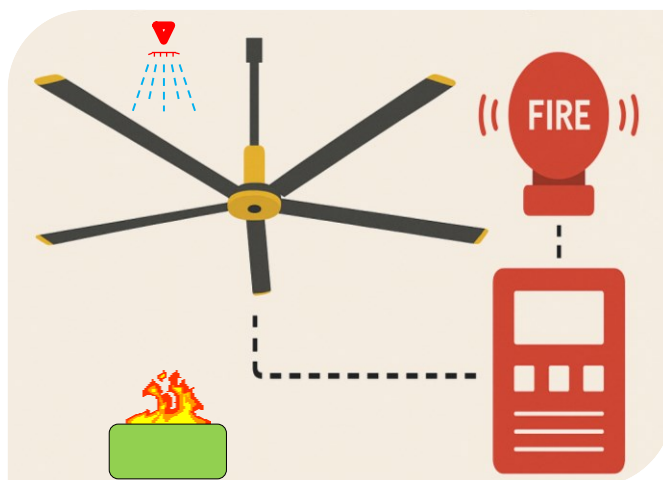
High Volume Low Speed (HVLS) Fans

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To address these concerns, NFPA conducted research and introduced new mandates. Beginning with the 2013 edition, NFPA 13 requires the fire alarm to provide automatic shutdown of all HVLS fans upon sprinkler waterflow within the active sprinkler zone.

The HVLS fan controller may require contact closure, auxiliary PAM relay or 24VDC input from the fire alarm to signal a shutdown sequence.

See NFPA 13 [2025] 19.1.7 & 20.8



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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High volume low speed (HVLS) fans generate enough airflow to disrupt heat plumes, which can cause delayed activation of sprinklers or activation of sprinklers that are not located above the fire. They must be integrated and interlocked with the fire alarm system to shut down immediately upon a waterflow signal, preventing their airflow from delaying sprinkler activation or disrupting water patterns during a fire. This shutdown ensures sprinklers work effectively by not blowing heat away from detectors or obstructing water discharge, which is critical for fire control.

This is a mandatory requirement typically uses an interlocking mechanism (PAM relay) to be initiated by a fire sprinkler waterflow zone, ensuring fans stop within a specified time after a sprinkler activates.

Supplementary smoke detection in the HVLS is sometimes applied, while this is good practice, it is not required by code.

High Volume Low Speed (HVLS) Fans

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While insurance underwriters have required the building's fire alarm to be integrated with the building's sprinkler system for HVLS fans since the early 2000's, the prescriptive building code's referenced standards did not align until recently.

Fire Standard	Edition
NFPA 13	2013
NFPA 72	2019

This highlights that 'meeting code' requires a fire alarm designers to research several sources during the design phase.



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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NFPA 13 introduced specific requirements for High Volume Low Speed (HVLS) fans (like maximum diameter, clearance, and shutdown interlocks) in its 2013 Edition, based on research showing their impact on sprinkler operation. These rules, found in Sections 11.1.7 and 12.1.4, mandate fans be centered between sprinklers, maintain 3 feet of clearance, and shut down on water flow.

You will find no reference to HVLS fans in the 2013 or 2016 Editions of NFPA 72. This requirement was added to the NFPA 72 2019 edition in chapter 21.8 to match NFPA 13 because the responsibility to send the alarm signal to the fan is that of the fire alarm system. It introduced specific requirements for HVLS (High Volume Low Speed) fans, primarily mandating their shutdown upon fire sprinkler waterflow activation, in the 2019 Edition, incorporating and clarifying earlier guidance from NFPA 13 and FM Global. While NFPA 13 (Sprinkler Systems) detailed fan placement and clearances, NFPA 72 (Fire Alarm) brought the crucial requirement for fire alarm control units to monitor waterflow and control these fans via interlocks.

Preaction suppression systems are voluntary and primarily regulated by NFPA 13 for design, layout, components, and types (single/double interlock). They are ideal for protecting areas like computer rooms, museums, and areas where accidental water discharge would be catastrophic. Adding these systems requires the addition of detection devices and communication to the building FACP per NFPA 72.

Water release is a two-step process for preaction systems. The fire detection system must trigger the water to be released into the pipes by activation of smoke, heat or an aspirating smoke detector. The second step is for the fire sprinkler head to activate and suppress the fire. *See NFPA 13 [2025] 8.3.2*

The engineer's design documents should identify:



1. The type and location of detection devices.
2. A single or cross-zone detection sequence of operations.
3. The type of preaction system (non-interlock, single-interlock, or double-interlock).
4. Dedicated releasing panel monitored by building FACP or releasing circuit from the building FACP.

Detection Coverage Note:

The detection system shall serve all areas that the preaction system protects. The entire preaction zone must have full NFPA 72 smoke detection coverage.

See NFPA 13 [2025] 8.10.1.3

The engineer's design documents should identify fire alarm features. floorplans must identify fire sprinkler preaction zone and method of water release. The fire detection documents must identify locations of all fire alarm release units, smoke and heat detectors. The power drawings must identify the 120VAC breaker, which may only be used for fire alarm purposes.

Mobile Shelving Systems

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Powered mobile shelving systems must be integrated with the fire alarm system. Upon activation of either a smoke detector or fire sprinkler actuation within the zone, the shelves must automatically re-position to create nominal 6" openings between all mobile units. *See NFPA 13 [2025] 26.8.3.3*

These systems will require integration with the building FACP and possibly smoke detection.



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Automated Storage and Retrieval Systems (ASRS) and high-density electric mobile shelving systems (HEMS) are transforming warehousing and distribution centers. These systems provide denser storage with faster throughput, reducing the number of personnel required on the warehouse floor. However, they also alter the risks related to fire ignition, transmission, suppression, and extinguishment.

In 2006, FPRF published a report titled: "Evaluation of Sprinkler Performance in Protecting Gondola Type Shelf Storage", which studied automatic sprinkler protection of Class A commodities on solid gondola shelving. Full scale fire tests were performed and results were provided to the NFPA 13, Standard for the Installation of Sprinkler Systems Discharge Committee, which decided to revise existing definitions and develop new definitions of different shelf storage arrangements to clarify the different concepts between shelf storage and shelving on racks.

High-density electric mobile shelving systems can be designed to automatically reposition (open/shift) upon detection of a fire to improve sprinkler water distribution, notes NFPA 13-related literature. These systems are designed to initiate this movement within 60 seconds of a smoke detector or sprinkler activation.

Beginning with the 2007 edition, now under NFPA 13's *Special Designs of Storage*

Protection in Chapter 26, powered mobile shelving systems can automatically shift during a fire alarm by activating a "fire park" mode that creates a consistent clearance between carriages for better ventilation and sprinkler access. This automatic movement is triggered by building systems like smoke detectors or sprinklers, or directly by the fire alarm system itself, and must meet code requirements for maintaining a minimum aisle width (often 6 inches) for firefighter access and fire containment. The electrical motors used in the mobile shelving carriages are required to be listed and integrated into the systems for standard operations, but they do not need to have emergency power backup.

Suppression System Actuation: Electronic Disconnect Switch & Actuator Supervision

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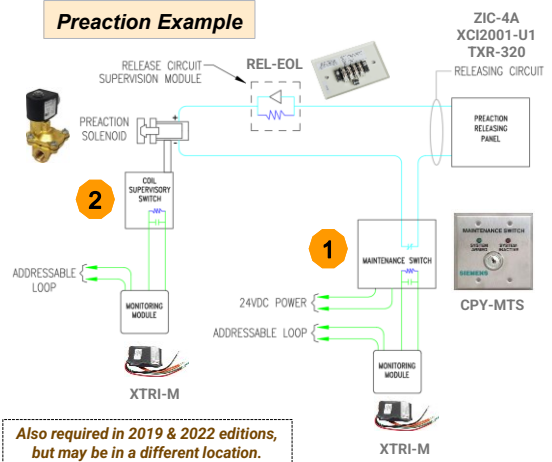
1 **Disconnect switch: all suppression system actuation**

NFPA 72 [2025] 23.11.5.1 – Operation of a physical maintenance disconnect switch must cause a supervisory signal at the releasing service fire alarm control panel. This requirement applies to kitchen hood, clean agent, preaction and deluge applications.

2 **Coil monitoring: preaction and deluge system actuation**

NFPA 13 [2025] 8.3.1.3 – The electric actuator (solenoid) must be supervised for physical removal from the valve and result in an audible and visual system notification at releasing control panel. This requirement applies only to preaction and deluge applications.

Remember: at minimum, dedicated suppression releasing panels must be monitored by the building fire alarm panel for general alarm/ trouble/ supervisory status



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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For many years contractors have removed or blocked suppression solenoids to perform maintenance or tests. If not restored properly this can inadvertently prevent the suppression system from activating.

The new requirements of NFPA 72 & NFPA 13 are extremely important. The supervised disconnect switch allows the fire alarm system contractor to perform maintenance or tests on the fire alarm system without inadvertently actuating the suppression system. The disconnect switch is required to be a physical switch and cannot be accomplished by software. Operation of the switch must provide a supervisory signal at the building FACU. This requirement minimizes the possibility of leaving the fire suppression system impaired after the testing of the fire alarm system is complete. Also see testing requirements for releasing systems in 14.2.6.

This actuator supervision requirement is new for the 2019 edition. When periodic tests of preaction systems are performed in accordance with NFPA 25 for the sprinkler system portion (and in accordance with NFPA 72 for the detection system), it has been common practice to disassemble the solenoid valve that actuates the preaction or deluge valve to prevent false alarms and trips. Unfortunately, the solenoid valves are not always reassembled after the test, resulting in a system impairment. NFPA 25 now requires that the entire system — including the detection system — be tested as a unit, which should help eliminate this problem. However, the NFPA 13 technical committees recognized the need to add an additional safeguard to the standard if the solenoid is disassembled for any reason by requiring an audible and visible indication of the condition at the releasing panel.

The effective date of the requirement was added to allow manufacturers time to design

a method to accomplish this new requirement and obtain a listing.

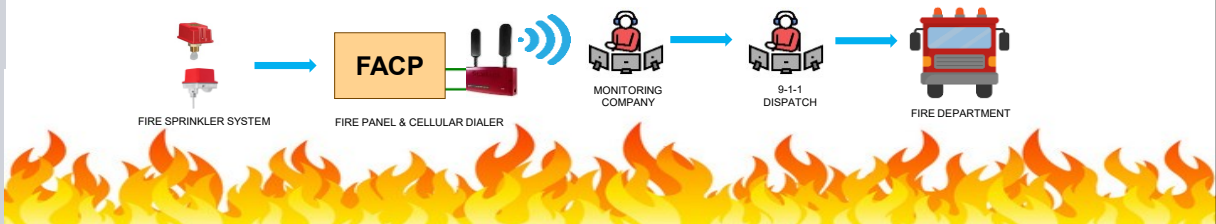
Relaxed Fire Sprinkler Design Requirements with Off-site Monitoring

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NEW

In the 2025 edition of NFPA 13, the longstanding system area limitations (sprinkler zone) was modified. The area limitations for light hazard wet pipe systems may be increased by 50 percent, when they are transmitted to a supervisory station in accordance with NFPA 72.

System Protection Area Limitations:	
Light Hazard	52,000 sq ft
Light Hazard – Wet System - Supervised	78,000 sq ft



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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An area is classified as a light hazard occupancy under NFPA 13 when the quantity and combustibility of the contents are minimal, resulting in a low expected rate of heat release from a fire. This classification applies to spaces like offices, residential areas, hospitals, and educational facilities, and is based on the lowest fire severity potential compared to other occupancies.

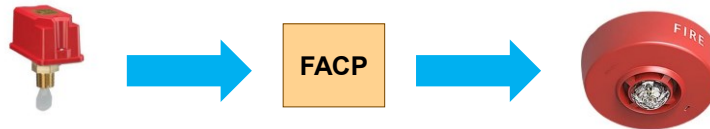


Does NFPA 13 require a sprinkler waterflow to activate the building fire alarm system?

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No. NFPA 13 Section 16.11.2 and 29.2.3.1.1 do not mandate the activation of a building's fire alarm evacuation signals when the sprinkler system is activated.

This requirement would be found in either the project specification's sequence of operations or required by the project's referenced building code.



NFPA 13 only requires a waterflow alarm device to result in an audible alarm on the premises!
See NFPA 13 [2025] 7.7



Which was invented first: Fire alarms or fire sprinklers???

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Fire Alarm Systems

- ↙ **17th century** – The first fire alarm systems were watchman who would ring bells to warn the community.
- ↙ **1851** – Werner von Siemens designed the first fire alarm system that wasn't a person. Installed in Berlin, Germany, the electric pointer telegraph and fire buzzers were located on city streets to dispatch the fire department. A more user-friendly pull handle was added in 1852.
- ↙ **1852** – Dr. William F. Channing and Moses Farmer consisting of similar fire alarm boxes with a telegraphic key, transmitting a signal to the fire department.
- ↙ **1890** – Thomas Edison's associate Francis Robbins Upton, patented the 'Portable Electric Fire-Alarm' the world's first building pull station.



Fire Sprinkler Systems

- ↙ **15th Century** – Leonardo da Vinci designed a sprinkler system for a client's kitchen, although it was allegedly too effective, flooding the kitchen with water.
- ↙ **1723** – Ambrose Godfrey, a German-born phosphorus manufacturer, created the first successful automated sprinkler system, using gunpowder to release a tank of fluid to extinguish a fire.
- ↙ **1812** – Architect William Congreve installed the first modern fire sprinkler system in the Theatre Royal, Drury Lane in London, consisting of a series of pierced pipes connected to a large container of water.
- ↙ **1870** – Philip Pratt invented the first automatic sprinkler system, which was later improved by Henry Parmalee and perfected by Frederick Grinnell in the 1890's.

After several decades...
NFPA 13 has NEW
requirements for the
fire sprinkler's local audible signal.

While not a high-cost impact item,
this topic does lead to many last-
minute field changes and delays in
issuing the building's
certificate of occupancy

Let's first explore it's purpose,
previous and current compliance
methods with the building codes.



Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

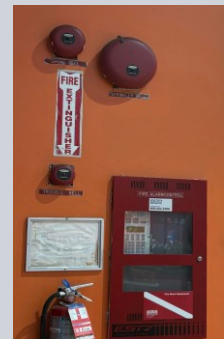
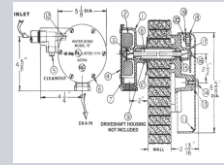
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Automatic sprinkler systems were invented prior to fire alarm systems. Early designs relied on mechanical devices, such as water motor gongs, to provide audible alerts when a sprinkler system activated. It is still utilized today.

The water motor gong is a non-electric, mechanically operated alarm device. When a sprinkler head activates, water flows through a dedicated alarm line to a water motor. This motor spins an impeller, which drives a striker to ring a large gong—typically mounted on the building's exterior.

This audible warning helps draw attention to an emergency, prompts people to contact the fire department, and can also be used by firefighters to locate the building's water supply control. Some jurisdictions, like NYC even incorporated different sizes bells into their local codes.

While bells are the traditional method of signaling a fire sprinkler activation, the national codes and standards only reference an 'audible device.'



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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The audible alarm, sometimes referred to as the “outside ringer” or “water-motor gong,” sounds when the sprinkler system has activated.

The "original" fire sprinkler water motor gong is a non-electric, mechanically operated alarm that uses a building's fire sprinkler water flow to sound a loud, continuous alarm. Water from an activated sprinkler system flows through a small pipe to a water motor, which turns a paddle wheel or impeller. This motion drives a striker that rings a large gong, often mounted on an exterior wall, alerting people to a fire and guiding the fire department

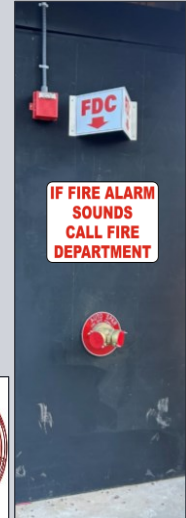
Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

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For several editions, the NFPA 13 and the building code have required an **approved audible** signal located at an **approved location** which sound continuously while the sprinkler system is actively flowing water. IBC [2021] 903.4.2.

The local waterflow alarm is a supplementary signal to help identify sprinkler water is flowing inside the building from a fire sprinkler activation or pipe break. Some jurisdictions adopt a local ordinance to add a visual signal and may even require a unique color such as blue, to assist the responding fire department with quickly establishing fire suppression movement upon arrival.



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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The audible alarm device may be electrically operated or it may be a true water-motor gong operated by a paddle-wheel-type attachment to the sprinkler system riser that responds to the flow of water in the piping. Though no longer the alarm device of choice, water-motor gongs do have the advantage of not being subject to power failures within or outside the protected building (see Sections 6.9 and 8.17 of NFPA 13 for further information on these devices). The alarm must be installed on the exterior of the building in a location approved by the fire code official. This location is often in close proximity to the fire department connection (FDC), serving a collateral function of helping the responding fire apparatus engineer more promptly locate the FDC.

Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

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Type of approved audible signal

Neither the IBC or NFPA mandate a specific type of audible signal. It may be a mechanical bell or an electric appliance per NFPA 13 16.11.1. Bells are the traditional signal used to indicate sprinkler water movement and can be distinguished from the interior horn or speaker audibles. They are often supplied with a bird guard and signage. Here are the most common audible device application methods:

- **Water motor gong** – A mechanical operated bell that is pipped from the fire sprinkler system. It is activated by water flowing through the sprinkler pipes via a paddle-wheel-type attachment. This apparatus is supplied by sprinkler installer, no fire alarm connection.
- **120-volt AC weather-proof fire bell or horn** – An electric operated audible device. Local 120VAC power is circuited through the normally open contacts of the sprinkler's main waterflow switch (typically two DPST contacts are available) then to the exterior 120VAC signal. NEC requires breaking the hot (power) and always maintaining a connected neutral. A dedicated branch, circuit supervision or emergency power is not mandated. Supplied by sprinkler installer, no fire alarm connection.
- **24-volt DC weather-proof bell or horn** – These 24VDC power-limited appliances are supported by the building's fire alarm control panel. They are supervised, have secondary power and must be programmed on a dedicated non-silenceable notification appliance circuit. Supplied by the fire alarm installer.

NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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The alarm is not intended to be an evacuation alarm. The requirement is also not intended to be an indirect requirement for a fire alarm system. Unless a fire alarm system is required by some other code provision, only the exterior alarm device is required. However, when a fire alarm system is installed, the sprinkler system must be interconnected with the fire alarm system so that when the sprinkler system actuates, it sounds the evacuation alarms required for the fire alarm system.

Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

SIEMENS

Alarm Bypass of approved audible signal

A new requirement in the 2019 edition for either a mechanical or electric local waterflow alarm was an alarm by-pass. It must be provided to silence the sprinkler audible during annual inspections. Common methods:

- **Water motor gong** – The alarm bypass test connection for wet, dry pipe, preaction, and deluge valves shall be made on the water supply side of the system. Provided a control valve and drain for the alarm piping. An additional check valve is required for dry pipe systems. NFPA 13 [2025] 16.11.5.1.
- **120-volt AC weather-proof fire bell or horn** – A local disconnect switch for the 120-volt audible. When in bypass mode, a continuous positive indication via a conspicuous light located in the vicinity of the riser. NFPA 13 [2019] A.16.11.7
- **24-volt DC weather-proof bell or horn** – disconnect switch at the local alarm or FACP button that will silence the power-limited audible. When in bypass mode, the FACP must display a supervisory status of the event. A continuous positive indication must be displayed via a conspicuous light located in the vicinity of the riser or alarm control panel. NFPA 13 [2025] A.16.11.7



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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The audible alarm, sometimes referred to as the “outside ringer” or “water-motor. The primary purpose of the exterior alarm is to notify people outside the building that the sprinkler system is in operation. Originally, it was to act as a supplemental alert so that passersby could notify the fire department of the condition. However, because the code now requires electronic supervision of sprinkler systems, that function is mostly moot. The exterior notification now primarily serves the function of alerting the arriving fire department of which building or sprinkler system is in operation before staging fire-fighting activities for the building.

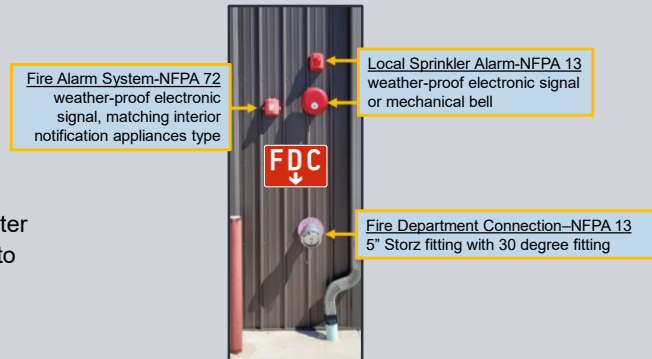
Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

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Location of approved audible signal

A fire department connection (FDC) is required for most automatic sprinkler systems. Fire apparatus can connect supply hoses to the FDC to pump additional water/ pressure into the sprinkler system. While the IBC does not have a prescriptive location for the exterior fire sprinkler audible signal, it is usually near the FDC because:

1. FDCs must be visible, accessible and unobstructed.
2. The local sprinkler alarm can help guide firefighters to the FDC.
3. The sprinkler service entrance is a good installation location for either a mechanical water motor gong or an electronic signal connected to the sprinkler's main waterflow switch.



Audible Fire Sprinkler Activation Signal: Local Waterflow Alarm

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The NFPA 13 requirements for local audibles on waterflow alarms changed in the 2019 edition and was maintained in the 2022 and 2025 editions. When the building has a fire alarm system, NFPA 13 has removed the option to provide a local electric exterior sprinkler audible powered by 120VAC. It must be powered from the fire alarm control panel, unless the sprinkler contractor is supplying a mechanical water motor gong.

Buildings **without** a fire alarm system, supply one of the following:

- ↳ Mechanically operated: water motor gong, supplied by sprinkler installer.
 - *NFPA 13 [2025] 16.11.8.*
- ↳ Electrically operated: 120-volt AC weather-proof fire bell, supplied by sprinkler installer
 - *NFPA 13 [2025] 16.11.7.2.*

Buildings **with** a fire alarm system, supply one of the following:

- ↳ Mechanically operated: water motor gong, supplied by sprinkler installer.
 - *NFPA 13 [2025] 16.11.8.*
- ↳ Electrically operated 24-volt DC weather-proof bell or horn, supplied by fire alarm installer.
 - *NFPA 13 [2025] 16.11.7.1*

NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Most new construction projects fire sprinkler systems supervised by fire alarm systems. There are some minor exceptions listed in IBC [2021] 903.4. This means most buildings will use either a water motor gong or a dedicated fire alarm appliance for their local waterflow alarm.

The electrical and mechanical engineer must coordinate their design to indicate the method of meeting the IBC's local sprinkler waterflow audible requirements. This will determine the hardware selection and installation trade. Design-build contracts should provide performance specifications listing the preferred application method. Without specific direction, contractors will exclude any optional mandates and list 'supplied by others' in their proposals. Resulting in either scope gap or duplications.

Exterior Fire Sprinkler Activation Signal: Local Waterflow Alarm Signal– Who Provides???

SIEMENS



With some minor exceptions, most buildings have a fire alarm system. The only options are to use either a water motor gong or a dedicated fire alarm appliance for their local waterflow alarm.

The electrical and mechanical engineer must coordinate their design to indicate the method of meeting the IBC's local sprinkler waterflow audible requirements. This will determine the hardware selection and installation trade. Design-build contracts should provide performance specifications listing the preferred application method. Without specific direction, contractors will exclude any optional mandates and list 'supplied by others' in their proposals. Resulting in either scope gap or duplications.



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Exterior Fire Sprinkler Activation Signal: Siemens Solution – Weatherproof Electronic Bell

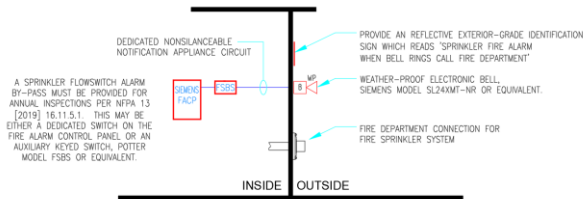


The Siemens multi-tone SL2 series of NEMA-rated outdoor notification appliances is the perfect choice to comply with the new NFPA 13 code. It provides a more cost-effective solution than a hard-piped sprinkler water-motor gong and requires less maintenance.



While mechanical bells are still available, the multi-tone horns provide selectable tones, to accommodate AHJ requests. The WP SL2 series has eight (8) field selectable tones, including BELL tone.

They can also be ordered with optional colored LED strobes.



EXTERIOR FIRE SPRINKLER WATERFLOW ACTIVATION SIGNAL PER IBC [2021] 903.4.2 AND NFPA 13 [2019] 16.11.7.1. INSTALL NEAR THE FIRE DEPARTMENT CONNECTION (FDC). THE LOCAL WATERFLOW ALARM IS A SUPPLEMENTARY SIGNAL TO HELP IDENTIFY SPRINKLER WATER IS FLOWING INSIDE THE BUILDING FROM A FIRE SPRINKLER ACTIVATION OR PIPE BREAK.

PROVIDE A WEATHER-PROOF 24 VDC MULTI-TONE HORN, PROGRAMMED TO SOUND AN ELECTRONIC BELL TONE. THE APPLIANCE SHALL BE 4X, IP54 AND IP66 RATED FOR DUST, WATER, AND HUMIDITY. TEMPERATURE RANGE: -40° F TO 150° F. HOUSING SHALL BE RED COLOR, RESISTANT TO CORROSION AND ICE FORMATION. IF REQUIRED BY THE AHJ, ADD A BLUE VISUAL SIGNAL FOR ESTABLISHING FIRE SUPPRESSION MOVEMENT. CLEAR STROBES SHALL ONLY BE USED FOR EVACUATION PER NFPA 72 [2019] 18.5.3.5.

EXTERIOR FIRE SPRINKLER ACTIVATION SIGNAL: ELECTRIC BELL
NOT DRAWN TO SCALE-FOR INSTALLER'S REFERENCE

A Final Thought: Building Code Sprinkler Exempt Areas and Smoke Detection

SIEMENS

Did you know that a
sprinkler designer can DELETE
suppression protection from
'electrically sensitive' areas,
but then the fire alarm designer must
ADD smoke detection?

Who is
responsible for
meeting code?

**JERRY
SPRINGER.**



NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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Building Code: Sprinkler Exempt Areas and Smoke Detection

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Due to potential water-electric hazards, NFPA 13 sprinkler coverage in certain areas may be eliminated when fire alarm detection is added. Removing the fire sprinklers will require additional detection devices. The IBC 2024 and earlier editions provides additional options for designers in Sections 903.3.1.1.1 through 903.3.1.1.3.

1. Areas where the application of water, constitutes a serious hazard, when approved AHJ.
2. Generator and transformer rooms with 2-hour fire separation.
3. Noncombustible rooms with wholly noncombustible contents.
4. Fire service access elevator machine rooms.
5. Occupant evacuation elevators machine rooms.

NFPA 13 Fire Sprinkler Requirements That Influence Fire Alarm System Design

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The IBC does not mandate the omission of sprinklers in all electrical equipment rooms. It provides a design option to remove them in select areas and add fire alarm detection based on qualifying conditions. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance-rated construction or contains electrical equipment.

903.3.1.1.1 Exempt locations.

Automatic sprinklers shall not be required in the following rooms or areas where such rooms or areas are protected with an *approved* automatic fire detection system in accordance with Section 907.2 that will respond to visible or invisible particles of combustion. Sprinklers shall not be omitted from any room merely because it is damp, of fire-resistance-rated construction or contains electrical equipment.

1. A room where the application of water, or flame and water, constitutes a serious life or fire hazard.
2. A room or space where sprinklers are considered undesirable because of the nature of the contents, when approved by the fire code official.
3. In rooms or areas that are of noncombustible construction with wholly noncombustible contents.
4. Fire service access elevator machine rooms and machinery spaces.
5. Machine rooms and machinery spaces associated with occupant evacuation elevators designed in accordance with Section 3008 of the International Building Code.
6. Elevator machine rooms, elevator machinery spaces, control spaces, or hoistways of traction elevators that comply with NFPA 13.

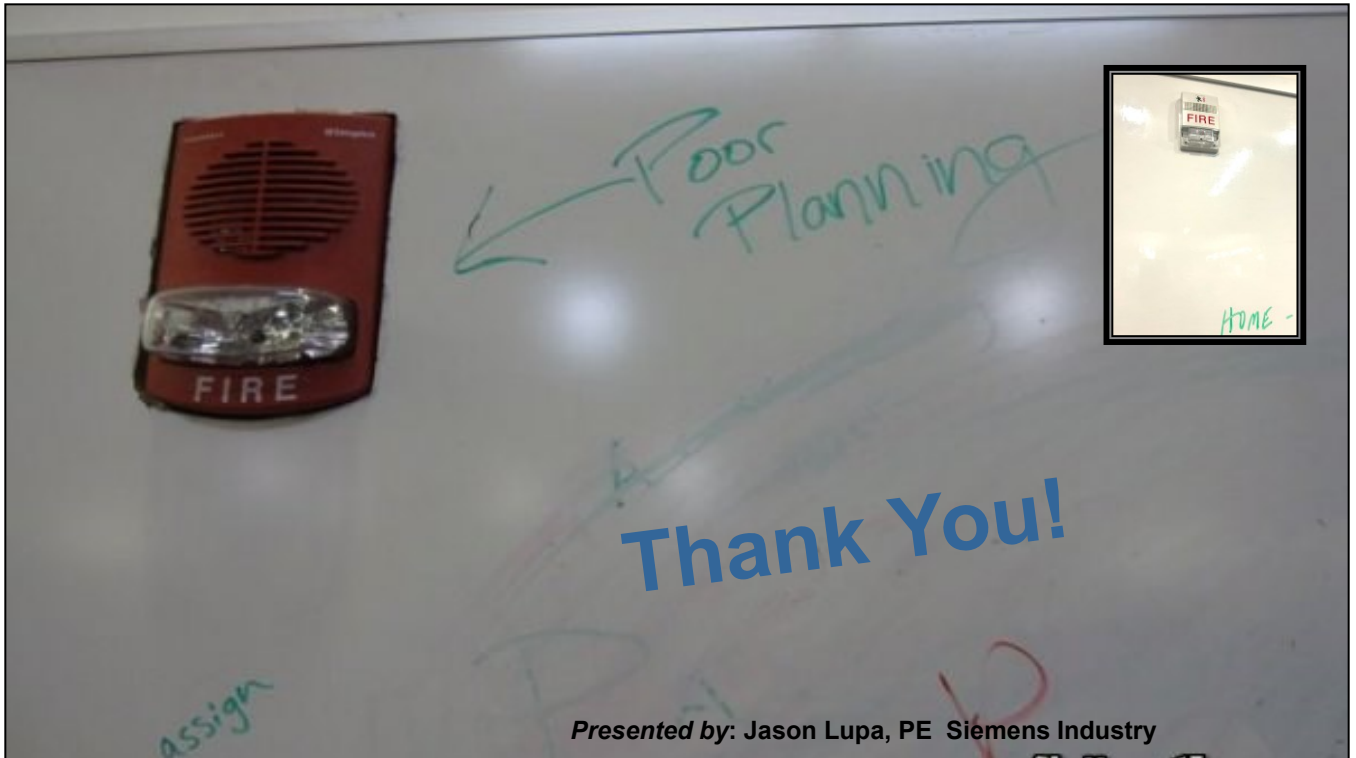
When designing a fire alarm system, it is important to coordinate the design with the fire sprinkler system. Key topics to investigate:

1. Is the building protected by automatic fire sprinklers? If yes, then:
 1. Is a water-motor gong supplied or should the FACP provide the sprinkler audible?
2. Are there automated or remote inspection testing equipment being provided?
3. Are there any building trade-offs that reduce sprinkler coverage or require off-site monitoring?
4. Are there any High Volume Low Speed (HVLS) fans?
5. Are there any preaction suppression systems? If yes, then:
 1. The type of preaction system (non-interlock, single-interlock, or double-interlock).
 2. Dedicated releasing panel monitored by building FACP or releasing circuit from the building FACP.
6. Are there powered mobile shelving systems?

The code has already mandated the use of low frequency 520 Hz signals for sleeping rooms, to improve the waking effectiveness of all occupants. Initially the code only required these low frequency signals be initiated by the building's fire alarm system, in areas intended to wake sleeping occupants. 120VAC smoke single and multi-station alarms were exempt.

Changes to the 2021 editions of IBC and IFC, strive to make the use of low frequency evacuation notification requirements more consistent throughout all sleeping areas. They mandate new hotels, motels, dormitories, condominiums, and apartments use low frequency audible notification signals activated by both the smoke detection in the dwelling unit and the general building fire alarm system. These new requirements apply to all R-1 and R-2 occupancies, not just units designated as ADA or hearing-impaired units.

One of the challenges with low frequency 520 Hz alarms is that they require additional electrical power which has made the development of low frequency battery-operated alarms difficult. Currently, there is no listed smoke alarm capable of emitting that sound available on the market. However, there are a number of alternative solutions. One option is to use smoke detectors with integral sounder bases, another option is to use fire alarm system horns, and another option is to connect speakers to an in-building fire alarm emergency voice alarm communication (EVAC) system. Hopefully, there will soon be a commercially available smoke alarm capable of emitting the low frequency sound that has proven to be more effective in waking high risk groups. Until then, an alternative design approach would need to be used.



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