**Chapter 23 Protected Premises Alarm and Signaling Systems**

23.1 Application

23.1.1\*

The application, installation, and performance of alarm and signaling systems within protected premises shall comply with the requirements of this chapter.

23.1.2

The requirements of Chapters 7, 10, 12, 14, 17, 18, 21, 24, and 26 shall apply unless otherwise noted in this chapter.

23.1.3

The requirements of this chapter shall not apply to Chapter 29 unless otherwise noted.

23.2 General

23.2.1\* Purpose

The systems covered in Chapter 23 shall be for the protection of life or property, or both, by indicating the existence of heat, fire, smoke, carbon monoxide, or other emergencies impacting the protected premises.

23.2.2 Software and Firmware Control

23.2.2.1

A record of installed software and firmware version numbers shall be prepared and maintained in accordance with Sections 7.5 and 7.7.

23.2.2.1.1\*

Software and firmware within the alarm and signaling system that interfaces to other required software or firmware shall be functionally compatible.

23.2.2.1.2\*

The compatible software or firmware versions shall be documented at the initial acceptance test and at any reacceptance tests.

23.2.2.2\*

All software and firmware shall be protected from unauthorized changes.

23.2.2.3

All changes shall be tested in accordance with 14.4.2.

23.2.3 Separate Systems

The requirements of this chapter shall not preclude the use of separate fire, carbon monoxide, or other life safety systems provided the systems do not generate simultaneous conflicting notification to the building occupants or conflicting actuation of safety functions.

23.3 System Features

The features required for a protected premises fire alarm system shall be documented as a part of the system design and shall be determined in accordance with 23.3.1 through 23.3.3.

23.3.1\* Required Systems

Features for required systems shall be based on the requirements of other applicable codes or statutes that have been adopted by the enforcing jurisdiction.

23.3.2\* Nonrequired (Voluntary) Systems and Components

The features for a nonrequired system shall be established by the system designer on the basis of the goals and objectives intended by the system owner.

23.3.2.1

Nonrequired protected premises systems and components shall meet the requirements of this Code.

23.3.2.2

Nonrequired systems and components shall be identified on the record drawings required in 7.2.1 (15).

23.3.3 Required Features

23.3.3.1\* Building Alarm and Signaling Systems

Protected premises systems that serve the alarm and signaling needs of a building or buildings shall include one or more of the following systems or functions:

Manual fire alarm signal initiation

Automatic fire alarm and supervisory signal initiation

Monitoring of abnormal conditions in fire suppression systems

Actuation of fire suppression systems

Actuation of emergency control functions

Actuation of fire alarm notification appliances

In-building fire emergency voice/alarm communications

Automatic carbon monoxide alarm and supervisory signal initiation

Actuation of carbon monoxide notification appliances

Guard's tour supervisory service

Process monitoring supervisory systems

Actuation of off-premises signals

Combination systems

23.3.3.2\* Dedicated Function Fire Alarm Systems

23.3.3.2.1

In facilities without a building fire alarm system, a dedicated function fire alarm system shall be permitted and shall not be required to include other functions or features of a building fire alarm system.

23.3.3.2.2

Where a dedicated function fire alarm system exists and a building fire alarm system is subsequently installed, the systems shall be interconnected and comply with 23.8.2.

23.4 System Performance and Integrity

23.4.1 Purpose

Section 23.4 provides information that shall be used in the design and installation of protected premises fire alarm systems for the protection of life and property.

23.4.2 Circuit Designations

Initiating device circuits, notification appliance circuits, and signaling line circuits shall be designated by class, depending on the circuit's capability to continue to operate during specified fault conditions as indicated in Sections 23.5 through 23.7.

23.4.2.1

Specified fault conditions shall result in the annunciation of a trouble signal at the protected premises within 200 seconds as required in Section 12.6.

23.4.2.2\*

Where the power to a device is supplied over a separate circuit from the signaling line circuit or initiating device circuit, the operation of the power circuit shall meet the performance requirements of the initiating device circuit or signaling line circuit, unless different performance requirements are established in accordance with the evaluation in 23.4.3 and approved by the authority having jurisdiction.

23.4.3 Pathway Classification

23.4.3.1

The class of pathways shall be determined from an evaluation based on the path performance as required by governing laws, codes, standards, and a site-specific engineering analysis.

23.4.3.2

When determining the integrity and reliability of the interconnecting signaling paths (circuits) installed within the protected premises, the following influences shall be considered:

Transmission media used

Length of the circuit conductors

Total building area covered by, and the quantity of initiating devices and notification appliances connected to, a single circuit

Effect of a fault in the fire alarm system that would hinder the performance objectives of the system that protects the occupants, mission, and property of the protected premises

Nature of hazards present within the protected premises

Functional requirements of the system necessary to provide the level of protection required for the system

Size and nature of the population of the protected premises

23.4.3.3

Results of the evaluation required by 23.4.3.1 shall be included with the documentation required by 7.3.9.

23.5 Performance of Initiating Device Circuits (IDCs)

The assignment of class designations to initiating device circuits shall be based on their performance capabilities under abnormal (fault) conditions in accordance with the requirements for Class A or Class B pathways specified in Chapter 12.

23.6 Performance of Signaling Line Circuits (SLCs)

The assignment of class designations to signaling line circuits shall be based on their performance capabilities under abnormal (fault) conditions in accordance with the requirements for Class A, Class B, Class N, or Class X pathways specified in Chapter 12.

23.6.1\* SLC Zones

A single fault on a pathway connected to the addressable devices shall not cause the loss of the devices in more than one zone.

23.6.1.1

For the purpose of this section, each floor of the building shall be considered a separate zone.

23.6.1.2

For the purpose of this section, if a floor of the building is subdivided into multiple zones by fire or smoke barriers and the fire plan for the protected premises allows relocation of occupants from the zone of origin to another zone on the same floor, each zone on the floor shall be considered a separate zone.

23.6.1.3\*

The requirements in 23.6.1 shall not apply to the following:

Circuits between enclosures containing transponders and control units regardless of the number of initiating devices, notification appliances, or control relays that might be connected to those control units

Circuits connecting short-circuit fault isolation modules to enclosures containing transponders and control units where the conductors are installed in metallic raceway or equivalently protected against mechanical injury and where the circuit does not exceed 3 ft (0.9 m) in length

\*Alterations or modifications made to an existing SLC not required to comply with 23.6.1 when originally installed

23.6.1.4

The loss of more than one zone shall be permitted on a documented performance-based design approach.

23.6.1.5\*

Performance-based designs submitted to the authority having jurisdiction for review and approval shall include documentation, in an approved format, of each performance objective and applicable scenario, together with technical substantiation used in establishing the proposed zone performance.

23.6.2\* Class N Devices

Unless permitted in 23.6.2.1 or 23.6.2.2, no area or zone shall be served solely by a single device where Class N pathways are deployed, such that a single device failure resulting from a multiple ground-fault pathway failure would render an area or zone incapable of initiating input signals or receiving output signals.

23.6.2.1

Where a risk analysis shows that only one device is required and where acceptable to the authority having jurisdiction, the requirements of 23.6.2 shall not apply.

23.6.2.2

Multiple devices shall not be required in areas served by pathways not susceptible to ground faults, such as fiber or wireless pathways.

23.6.2.3\*

Where a device as referenced by 23.6.2is serviced by only a single pathway, it shall terminate that pathway with no ability to connect additional endpoint devices to the pathway.

23.6.2.4\*

A single fault on a Class N pathway shall not cause the loss of more than one addressable device.

23.6.3 Class N Shared Pathways

Class N pathways shall be required to use shared pathway Level 3 as specified in 12.5.4 except as permitted by 23.6.3.2.

23.6.3.1 Accessibility

Class N pathways shall not be accessible to the general public or building occupants for any purpose other than specified in the network design analysis, maintenance, and deployment plans.

23.6.3.2 Level 1 and Level 2

Shared pathways Levels 1 and 2 shall be permitted subject to approval of the authority having jurisdiction, based on documentation of the deployment, change control, maintenance plans, management organization, network design analysis, and a risk analysis as identified in 23.6.3.3 through 23.6.3.8.

23.6.3.3\* Deployment Plan

23.6.3.3.1

All equipment connected to shared pathways shall be documented in the deployment plan.

23.6.3.3.1.1

The documentation shall include manufacturer, model, listings, and intended purpose and reason for inclusion on the shared network.

23.6.3.3.1.2\*

The deployment plan shall identify how and where each piece of equipment is connected.

23.6.3.3.2\*

All connection ports, used or spare, where any unauthorized or unintended equipment could be added to the shared network, shall be identified as for use only by equipment consistent with the deployment plan.

23.6.3.3.3 Equipment Location

23.6.3.3.3.1

The requirements of 23.6.3.3.3.2 through 23.6.3.3.3.4 shall apply to all equipment rooms, equipment closets, telecommunication rooms, telecommunication enclosures, or the like, for which both Class N life safety network infrastructure and non-life safety network equipment resides.

23.6.3.3.3.2\*

Equipment rooms or enclosures shall be permitted to contain both Class N life safety networking cable, equipment, and associated infrastructure provided the deployment satisfies 23.6.3.3.3.3 through 23.6.3.3.3.4.

23.6.3.3.3.3

Class N life safety network cabling, equipment, and infrastructure shall be clearly segregated and identified as "Life Safety Network."

23.6.3.3.3.4

Equipment rooms or enclosures shall be accessible to only authorized personnel via a locked access or via an enclosure requiring the use of tools to open, as acceptable by the authority having jurisdiction.

23.6.3.4 Change Control Plan

Configuration upgrades and updates shall be governed by a change control plan that determines the policy and procedure of the change and ensures that all documentation is correspondingly updated.

23.6.3.5 Management Organization

23.6.3.5.1\*

An organization shall be established and maintained to manage the life safety network and shall perform the following:

Contain members appropriately certified by each manufacturer of the equipment and devices deployed on shared pathways to maintain such a network

Service and maintain all shared Class N pathways

Maintain the deployment and shared pathways plan for the lifetime of the shared pathways

23.6.3.5.2\*

Other service personnel, even when certified to service a specific system (i.e., fire alarm or MNS), shall be authorized and managed by this organization to ensure any outages of any system are planned, managed, and documented and appropriate steps are taken during outages to provide alternate protection of life and property.

23.6.3.6 Network Design Analysis

23.6.3.6.1\*

The analysis shall be performed to determine and document communications capability as follows:

Calculation of minimum required bandwidth such that all life safety systems can be guaranteed to operate simultaneously and within required time limits

Total bandwidth provided by the network

Future bandwidth requirements

Method of providing and maintaining the prioritization of life safety traffic over non-life safety traffic

23.6.3.6.2\*

The analysis shall determine and document the power distribution capability as follows:

The methods provided to maintain power to all shared pathway equipment

A calculation of power requirements of all connected equipment

Secondary power capacities provided to maintain all life safety equipment with minimum operational capacity in accordance with 10.6.7.2.1.2

Methods to disengage any non-life safety equipment in the event of emergency operation if required to support the minimum operational capacity requirements

23.6.3.7 Maintenance Plan

23.6.3.7.1\*

The maintenance plan shall identify policy and procedures to monitor, maintain, test, and control change of the shared pathways.

23.6.3.7.2\*

Written procedures shall be presented in maintenance plans to govern the following:

Physical access to all parts of the Class N network equipment (i.e., switches, ports, server, controllers, devices, or components)

Electronic access to all parts of the Class N network (i.e., passwords, addresses)

\*Service outage impairment process with notices of impairment and contingency plans for affected systems

Upgrade procedures

Change control procedures, with consideration given to require an updated risk analysis if necessary

Prioritization and/or segregation configuration information for life safety traffic

Maintenance and testing plans to ensure the minimum operational capacity with respect to secondary power is maintained

Other service, maintenance, or reconfiguration plans for any connected equipment

23.6.3.8\* Network Risk Analysis for Class N

23.6.3.8.1

Each application of a Class N deployment shall be specific to the nature and anticipated risks of each facility for which it is designed.

23.6.3.8.2

The risk analysis shall address both fire and non-fire emergencies when determining risk tolerances for the survivability of the network and the systems and devices it serves.

23.6.3.8.3

The detail and complexity of the risk analysis shall be commensurate with the complexity of the facility for which the network is to be installed.

23.6.3.8.4

The risk analysis shall be permitted to be limited in scope to address the requirements of an existing emergency response plan.

23.6.3.8.5

The risk analysis shall consider characteristics of the buildings, areas, spaces, campuses or regions, equipment, and operations that are not inherent in the design specifications.

23.6.3.8.6

Those elements that are not inherent in the design specifications, but that affect occupant behavior or the rate of hazard development, shall be explicitly identified and included in the risk analysis.

23.6.3.8.7

The risk analysis shall consider the following types of potential events, which are not all-inclusive but reflect the general categories that shall be considered in the risk analysis:

Natural hazards — geological events

Natural hazards — meteorological events

Human caused — accidental events

Human caused — intentional events

Technological — caused events

23.6.3.8.8

All other identified risks as required by the authority having jurisdiction shall be discussed and addressed in the analysis and maintenance plans.

23.7 Performance of Notification Appliance Circuits (NACs)

The assignment of class designations to notification appliance circuits shall be based on their performance capabilities under abnormal (fault) conditions in accordance with the requirements for Class A, Class B, or Class X pathways specified in Chapter 12.

23.8 System Requirements

23.8.1 General

23.8.1.1 \* Presignal Feature

23.8.1.1.1

Systems that have a presignal feature complying with 23.8.1.1 shall be permitted if approved by the authority having jurisdiction.

23.8.1.1.2

A presignal feature shall meet the following conditions:

The initial fire alarm signals sound only in department offices, control rooms, fire brigade stations, or other constantly attended central locations.

Where there is a connection to a remote location, the transmission of the fire alarm signal to the supervising station actuates upon the initial alarm signal.

Subsequent system operation is by either of the following means:

Human action that actuates the general fire alarm

A feature that allows the control equipment to delay the general alarm by more than 1 minute after the start of the alarm processing

23.8.1.2 Positive Alarm Sequence

23.8.1.2.1

Systems that have positive alarm features complying with 23.8.1.2 shall be permitted if approved by the authority having jurisdiction.

23.8.1.2.1.1

The positive alarm sequence operation shall comply with the following:

To initiate the positive alarm sequence operation, the signal from an automatic fire detection device selected for positive alarm sequence operation shall be acknowledged at the fire alarm control unit by trained personnel within 15 seconds of annunciation.

If the signal is not acknowledged within 15 seconds, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately actuated.

If the positive alarm sequence operation is initiated in accordance with 23.8.1.2.1.1(1), trained personnel shall have an alarm investigation phase of up to 180 seconds to evaluate the fire condition and reset the system.

If the system is not reset during the alarm investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately actuated.

If a second automatic fire detector selected for positive alarm sequence is actuated during the alarm investigation phase, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately actuated.

\*If any other fire alarm initiating device is actuated, notification signals in accordance with the building evacuation or relocation plan and remote signals shall be automatically and immediately actuated.

23.8.1.2.1.2\*

The system shall provide means for bypassing the positive alarm sequence.

23.8.2\* Alarm Control Units

23.8.2.1

Alarm and signaling systems shall be permitted to combine all detection, notification, and auxiliary functions in a single system or be a combination of component subsystems.

23.8.2.2

Except as permitted in 23.8.2.3, the alarm and signaling system components shall be permitted to share control equipment or shall be able to operate as stand-alone subsystems, but shall be arranged to function as a single system in accordance with 23.8.2.4 through 23.8.2.10.

23.8.2.3

Where the building is not served by a building fire alarm system, independent dedicated function fire alarm systems and/or releasing fire alarm systems shall not be required to be interconnected to function as a single system.

23.8.2.4

All component subsystems shall be capable of simultaneous, full-load operation without degradation of the required overall system performance.

23.8.2.5

The method of interconnection of fire alarm control units shall meet the monitoring requirements of Section 12.6 and NFPA 70, Article 760, and shall be achieved by the following recognized means:

Electrical contacts listed for the connected load

Data communications over a signaling line circuit(s) dedicated to the fire alarm or shared with other premises operating systems

Other listed methods

23.8.2.6

Where the signaling line circuit is shared by other premises operating systems, operation shall be in accordance with 23.8.4.

23.8.2.6.1

All signal control and transport equipment (such as routers and servers) located in a critical fire alarm or emergency control function interface device signaling path shall be listed for fire alarm service, unless the following conditions are met:

The equipment meets the performance requirements of 10.3.5.

The equipment is provided with primary and secondary power and monitored for integrity as required in Section 10.6, 10.6.9, Section 10.19, and Section 12.6.

All programming and configuration ensure a fire alarm system actuation time as required in 10.11.1.

System bandwidth is monitored to confirm that all communications between equipment that is critical to the operation of the fire alarm system or emergency control function interface devices take place within 10 seconds; failure shall be indicated within 200 seconds.

Failure of any equipment that is critical to the operation of the fire alarm system or emergency control function interface devices is indicated at the master fire alarm control unit within 200 seconds.

23.8.2.6.2

A listed barrier gateway, integral with or attached to each control unit or group of control units, as appropriate, shall be provided to prevent the other systems from interfering with or controlling the fire alarm system.

23.8.2.6.3

Where Class N is utilized for shared equipment, the requirements in 23.6.3 shall also apply.

23.8.2.7

Each interconnected alarm control unit shall be separately monitored for alarm, supervisory, and trouble conditions with supervised pathways that are in accordance with the manufacturers' published instructions.

23.8.2.7.1

Alarm conditions on interconnected alarm control units shall annunciate as alarm signals and initiate the evacuation signals.

23.8.2.7.2

Supervisory conditions on interconnected alarm control units shall annunciate as supervisory signals.

23.8.2.7.3

Trouble conditions on interconnected alarm control units shall annunciate as trouble signals.

23.8.2.7.4\*

Where supervised pathways between interconnected fire alarm control units is not achievable, a supervised annunciator shall be installed adjacent to control unit(s) to annunciate the status of the each control unit.

23.8.2.8

Interconnected fire alarm control unit alarm signals shall be permitted to be monitored by zone or by combined common signals.

23.8.2.9

Protected premises alarm control units shall be capable of being reset or silenced only from the protected premises, unless otherwise permitted by 23.8.2.10.

23.8.2.9.1

Where multiple control units of the same manufacturer are interconnected in a network arrangement and serve the same protected premises, the control units shall be arranged to be reset or silenced from one location.

23.8.2.9.2

Where multiple control units of the different manufacturers are interconnected in accordance with 23.8.2.5 through 23.8.2.8 and serve the same protected premises, the control units shall be permitted to be reset or silenced individually at each control unit.

23.8.2.9.3

Resetting procedures shall be documented and permanently posted beside each control unit and annunciator.

23.8.2.10

Remote resetting and silencing of a fire alarm control unit from other than the protected premises shall be permitted with the approval of the authority having jurisdiction.

23.8.3 Protected Premises Alarm and Signaling Systems Interconnected With Dwelling Unit Fire and Carbon Monoxide Warning Equipment

23.8.3.1

A protected premises system shall be permitted to be interconnected to the household warning equipment for the purpose of actuating the notification appliances connected to the household warning equipment.

23.8.3.2

The actuation of dwelling unit warning equipment shall only be permitted to be displayed at the protected premises control unit and annunciators as supervisory signals.

23.8.3.3

If interconnected, an alarm condition at the protected premises system shall cause the alarm notification appliance(s) within the family living unit of the dwelling unit warning equipment to become energized and remain energized until the protected premises system is silenced or reset.

23.8.3.4

The interconnection circuit or path from the protected premises system to the dwelling unit warning equipment shall be monitored for integrity by the protected premises system in accordance with Section 12.6.

23.8.3.5

An alarm condition occurring at the dwelling unit fire warning equipment or the operation of any test switches provided as part of the dwelling unit warning equipment shall not cause an alarm condition at the protected premises system.

23.8.4 Combination Systems

23.8.4.1\*

Fire alarm systems shall be permitted to share components, equipment, circuitry, and installation wiring with non-fire alarm systems.

23.8.4.2 Building System Information Unit (BSIU)

23.8.4.2.1\*

A building system information unit (BSIU) shall be listed to product safety standard ANSI/UL 60950, Information Technology Equipment — Part 1: General Requirements, or ANSI/UL 62368-1 Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements, or equivalent.

23.8.4.2.2

Where a BSIU provides control of the fire alarm system, the requirements in 23.8.4.2.2.1 through 23.8.4.2.2.4 shall also apply.

23.8.4.2.2.1

A fire alarm control unit (FACU) controlling the fire alarm system shall be located within the same room as the BSIU.

23.8.4.2.2.2\*

The BSIU shall not be permitted to perform fire alarm system control features that cannot be accomplished by the FACU within the room.

23.8.4.2.2.3

The communication path from the FACU and the BSIU shall meet the requirements of 23.8.4.4.1 through 23.8.4.4.3.

23.8.4.2.2.4

The application software for the BSIU shall be listed to ANSI/UL 864, Control Units and Accessories for Fire Alarm Systems.

23.8.4.3

Operation of a non-fire system function(s) originating within a connected non-fire system shall not interfere with the required operation of the fire alarm system, unless otherwise permitted by this Code.

23.8.4.4\*

For non-fire alarm equipment listed to the performance requirements specified in 10.3.5, the requirements of 23.8.4.4.1 through 23.8.4.4.3 shall apply.

23.8.4.4.1

The equipment shall be permitted to be attached to a fire alarm circuit, either among the fire alarm devices or as a branch or extension of the fire alarm pathways, when the following requirements are met:

All the equipment and pathways shall meet the monitoring for integrity requirements of 10.6.9, Section 10.19, and Section 12.6.

All the equipment and pathways shall be maintained by a single service organization.

All the equipment and pathways shall be installed in accordance with the requirements of this Code.

All the equipment shall be listed as compatible with the fire alarm equipment or the equipment shall have an interface listed as compatible with the fire alarm equipment.

23.8.4.4.2

If the equipment is attached to the fire alarm system via separate pathways, then short circuits or open circuits in this equipment, or between this equipment and the fire alarm system pathways, shall not impede or impair the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.

23.8.4.4.3

Grounds in this equipment, or between this equipment and the fire alarm system pathways, shall be reported, annunciated, and corrected in the same manner as grounds in the rest of the fire alarm system.

23.8.4.5

For non-fire equipment not listed to the performance requirements specified in 10.3.5, the requirements of 23.8.4.5.1 through 23.8.4.5.3 shall apply

23.8.4.5.1

Short circuits or open circuits in the equipment, or between the equipment and the fire alarm system pathways, shall not impede or impair the monitoring for integrity of the fire alarm system or prevent alarm, supervisory, or fire safety control signal transmissions.

23.8.4.5.2

Grounds in this equipment, or between this equipment and the fire alarm system pathways, shall be reported, annunciated, and corrected in the same manner as grounds in the rest of the fire alarm system.

23.8.4.5.3

Removal, replacement, failure, maintenance procedures, or ground on this hardware, software, or circuits shall not impair the required operation of the fire alarm system.

23.8.4.6

Loudspeakers used as alarm notification appliances on fire alarm systems shall also be permitted to be used for emergency communications systems when installed in accordance with Chapter 24.

23.8.4.7\*

In combination systems, fire alarm signals shall be distinctive, clearly recognizable, and shall be indicated as follows in descending order of priority, except where otherwise required by other governing laws, codes or standards, or by other parts of this Code:

Signals associated with life safety

Signals associated with property protection

Trouble signals associated with life and/or property protection

All other signals

23.8.4.8

If the authority having jurisdiction determines that the information being displayed or annunciated on a combination system is excessive and is causing confusion and delayed response to a fire emergency, the authority having jurisdiction shall be permitted to require that the display or annunciation of information for the fire alarm system be separate from, and have priority in accordance with, 23.8.4.7, over information for the non-fire alarm systems.

23.8.4.9\* Carbon Monoxide Detector Signals

Unless otherwise permitted by 23.8.4.9.1, signals from carbon monoxide detectors and carbon monoxide detection systems transmitted to a fire alarm system shall be indicated as a carbon monoxide alarm signal.

23.8.4.9.1

When in accordance with the emergency response plan, evacuation plan, fire safety plan, or similar documentation, signals from carbon monoxide detectors and carbon monoxide detection systems transmitted to a fire alarm system shall be permitted to be supervisory signals.

23.8.4.9.2\*

Fire alarm system processing for and occupant response to carbon monoxide alarm signals shall be in accordance with the emergency response plan, evacuation plan, fire safety plan, or similar documentation.

23.8.4.9.3

Where carbon monoxide warning equipment is connected to a protected premises fire alarm system, receipt of signals shall initiate the signal required by Section 18.4.

23.8.4.9.4

Operation of carbon monoxide alarms or detectors shall not cause fire alarm or combination control units to actuate either protected premises or supervising station fire alarm signals.

23.8.4.10\*

Signals from a fire extinguisher electronic monitoring device or fire extinguisher monitoring system transmitted to a fire alarm system shall be permitted to be supervisory signals.

23.8.5 Fire Alarm System Inputs

23.8.5.1 General

23.8.5.1.1

All initiating devices shall be installed in accordance with Chapter 17 and tested in accordance with Chapter 14.

23.8.5.1.2\*

Where connected to a supervising station, fire alarm systems employing automatic fire detectors or waterflow detection devices shall include a manual fire alarm box to initiate a signal to the supervising station.

23.8.5.1.3

Fire alarm systems dedicated to elevator recall control and supervisory service as permitted in Section 21.3 shall not be required to meet 23.8.5.1.2.

23.8.5.2 Fire Alarm Signal Initiation — Manual

Manual fire alarm signal initiation shall comply with the requirements of Section 17.15.

23.8.5.2.1

If signals from manual fire alarm boxes and other fire alarm initiating devices within a building are transmitted over the same signaling line circuit, there shall be no interference with manual fire alarm box signals when both types of initiating devices are operated at the same time.

23.8.5.2.2

Provision of the shunt noninterfering method of operation shall be permitted for this performance.

23.8.5.3 Fire Alarm Signal Initiation — Initiating Devices With Separate Power and Signaling Wiring

23.8.5.3.1

Automatic fire alarm signal initiating devices that have integral trouble signal contacts shall be connected to the initiating device circuit so that a trouble condition within a device does not impair alarm transmission from any other initiating device, unless the trouble condition is caused by electrical disconnection of the device or by removing the initiating device from its plug-in base.

23.8.5.3.2\*

Automatic fire alarm signal initiating devices that use a nonintegral device to monitor the integrity of the power supply wiring to the individual initiating devices shall have the nonintegral device connected to the initiating device circuit so that a fault on the power supply wiring does not impair alarm transmission from any operational initiating device.

23.8.5.4 Fire Alarm Signal Initiation — Detection Devices

23.8.5.4.1\*

Systems equipped with alarm verification features shall be permitted under the following conditions:

The alarm verification feature is not initially enabled, unless conditions or occupant activities that are expected to cause nuisance alarms are anticipated in the area that is protected by the smoke detectors. Enabling of the alarm verification feature shall be protected by password or limited access.

A smoke detector that is continuously subjected to a smoke concentration above alarm threshold does not delay the system functions of Sections 10.7 through 10.17, or 21.2.1 by more than 1 minute.

Actuation of an alarm-initiating device other than a smoke detector causes the system functions of Sections 10.7 through 10.17, or 21.2.1 without additional delay.

The current status of the alarm verification feature is shown on the record of completion [see Figure 7.8.2(a), item 4.3].

23.8.5.4.2

If automatic drift compensation of sensitivity for a fire detector is provided, the fire alarm control unit shall identify the affected detector when the limit of compensation is reached.

23.8.5.4.3

Systems that require the operation of two automatic detectors to initiate the alarm response shall be permitted, provided that the following conditions are satisfied:

The systems are not prohibited by the authority having jurisdiction.

At least two automatic detectors are in each protected space.

The alarm verification feature is not used.

23.8.5.4.4

For systems that require the operation of two automatic detectors to initiate emergency control functions or to actuate fire extinguishing or suppression systems, the detectors shall be installed at the spacing determined in accordance with Chapter 17.

23.8.5.4.5

For systems that require the operation of two automatic detectors to actuate public mode notification, the detectors shall be installed at a linear spacing not more than 0.7 times the linear spacing determined in accordance with Chapter 17.

23.8.5.4.6 Signal Initiation — Duct Smoke Detectors

23.8.5.4.6.1

Where duct smoke detectors are required to be monitored and a building fire alarm system is installed, a duct detector activation signal shall meet the requirements of 21.7.4.

23.8.5.4.6.2

Where duct smoke detectors are connected to a protected premises fire alarm system, the operation of the power circuit shall meet the requirements of 23.4.2.2.

23.8.5.4.6.3\*

Where duct smoke detectors with separate power and signal wiring are installed and connected to a protected premises fire alarm system, they shall meet the requirements of 23.8.5.3.

23.8.5.4.6.4

Where duct smoke detectors are not resettable from the protected premises fire alarm system, a listed alarm/ supervisory indicator with an integral reset switch shall be provided in an accessible location.

23.8.5.5\* Fire Alarm Signal Initiation — Sprinkler Systems

23.8.5.5.1

Where required by other governing laws, codes, or standards to be electronically monitored, waterflow alarm-initiating devices shall be connected to a dedicated function fire alarm control unit designated as "sprinkler waterflow and supervisory system" and permanently identified on the control unit and record drawings.

23.8.5.5.2

Waterflow alarm-initiating devices connected to a building alarm system shall not be required to meet the requirements of 23.8.5.5.1.

23.8.5.5.3\*

The number of waterflow alarm-initiating devices permitted to be connected to a single initiating device circuit shall not exceed five.

23.8.5.5.4

If a valve is installed in the connection between a sprinkler system and an initiating device, the valve shall be supervised in accordance with 17.17.1.

23.8.5.6\* Supervisory Signal Initiation — Sprinkler Systems

23.8.5.6.1

Where required by other governing laws, codes, or standards to be electronically monitored, supervisory signal-initiating devices shall be connected to a dedicated function fire alarm control unit designated as "sprinkler waterflow and supervisory system" and permanently identified on the control unit and record drawings.

23.8.5.6.2

Supervisory signal-initiating devices connected to a building alarm system shall not be required to meet the requirements of 23.8.5.6.1.

23.8.5.6.3\*

The number of supervisory signal-initiating devices permitted to be connected to a single initiating device circuit shall not exceed 20.

23.8.5.6.4\*

If a valve is installed in the connection between a sprinkler system and an initiating device, the valve shall be supervised in accordance with 17.17.1 unless the valve is arranged to cause operation of the supervisory signal initiating device when it is in its off-normal position.

23.8.5.7 Alarm Signal Initiation — Fire Suppression Systems Other Than Sprinklers

23.8.5.7.1

Where required by other governing laws, codes, or standards to be monitored and a building fire alarm system is installed, the actuation of a fire suppression system shall annunciate an alarm or supervisory condition at the building fire alarm control unit.

23.8.5.7.2

The integrity of each fire suppression system actuating device and its circuit shall comply with 12.6.1, 12.6.2, and other applicable NFPA standards.

23.8.5.7.3

If a valve is installed in the connection between a suppression system and an initiating device, the valve shall be supervised in accordance with 17.17.1.

23.8.5.8\* Supervisory Signal Initiation — Fire Suppression Systems Other Than Sprinklers

23.8.5.8.1

Where required to be monitored and a building fire alarm system is installed, an off-normal condition of a fire suppression system shall annunciate a supervisory condition at the building fire alarm control unit.

23.8.5.8.2

Supervisory signals that latch in the off-normal state and require manual reset of the system to restore them to normal shall be permitted.

23.8.5.8.3

If a valve is installed in the connection between a suppression system and an initiating device, the valve shall be supervised in accordance with 17.17.1.

23.8.5.9 Signal Initiation — Fire Pump

23.8.5.9.1

Where fire pumps are required to be monitored and a building fire alarm system is installed, a pump running signal shall be permitted to be a supervisory or alarm signal.

23.8.5.9.2

Where fire pumps are required to be monitored and a building fire alarm system is installed, signals other than pump running shall be supervisory signals.

23.8.5.10 Fire Alarm and Supervisory Signal Initiation — Releasing Fire Alarm Systems

23.8.5.10.1

Releasing service fire alarm control units shall be connected to the protected premises fire alarm system.

23.8.5.10.2

Fire alarm and supervisory signals generated at the releasing service fire alarm control unit shall be annunciated at a protected premises fire alarm unit.

23.8.5.10.3

Where required by other governing laws, codes, or standards, actuation of any suppression system connected to a releasing service fire alarm control unit shall be annunciated at the protected premises fire alarm control unit, even where the system actuation is by manual means or otherwise accomplished without actuation of the releasing service fire alarm control unit.

23.8.5.10.4

If a valve is installed in the connection between a suppression system and an initiating device, the valve shall be supervised in accordance with Chapter 17.

23.8.5.10.5

In facilities that are not required to install a protected premises fire alarm system, the alarm and supervisory devices shall be connected to the releasing service fire alarm control unit, and their actuation shall be annunciated at the releasing service control unit.

23.8.5.11 Trouble Signal Initiation

23.8.5.11.1

Automatic fire suppression system alarm-initiating devices and supervisory signal-initiating devices and their circuits shall be designed and installed so that they cannot be subject to tampering, opening, or removal without initiating a signal.

23.8.5.11.2

Covers of junction boxes inside of buildings shall not be required to meet the requirements of 23.8.5.11.1.

23.8.5.11.3

The requirements of 23.8.5.11.1 shall apply to junction boxes and device covers installed outside of buildings to facilitate access to the initiating device circuit unless tamper-resistant screws or other approved mechanical means are used for preventing access.

23.8.5.11.4

The integrity of each fire suppression system actuating device and its circuit shall be supervised in accordance with 12.6.1 and 12.6.2 and with other applicable NFPA standards.

23.8.5.12 Disconnect Switches and Disable Functions

Operation of any disconnect switch or disable function associated with the fire alarm system, when in the off-normal condition, shall be indicated at the building fire alarm control unit or at a dedicated function(s) fire alarm control unit if provided.

23.8.6 Alarm System Notification Outputs

23.8.6.1 Occupant Notification

23.8.6.1.1

Fire alarm systems provided for evacuation or relocation of occupants shall have one or more notification appliances listed for the purpose in each notification zone of the building and be so located that they have the characteristics described in Chapter 18 for public mode or private mode, as required.

23.8.6.1.2

Except as permitted in 23.8.6.1.3, occupant notification of carbon monoxide systems shall be throughout the protected premises.

23.8.6.1.3

Where carbon monoxide alarm signals are transmitted to a constantly attended on-site location or off-premises location in accordance with this chapter, selective public mode occupant notification shall be permitted to be limited to the notification zone encompassing the area where the carbon monoxide alarm signal was initiated.

23.8.6.2\* Notification Appliances in Exit Stair Enclosures, Exit Passageways, and Elevator Cars

Notification appliances shall not be required in exit stair enclosures, exit passageways, and elevator cars in accordance with 23.8.6.2.1 through 23.8.6.2.4 unless required by other codes and standards.

23.8.6.2.1

Visual signals shall not be required in exit stair enclosures and exit passageways.

23.8.6.2.2

Visual signals shall not be required in elevator cars.

23.8.6.2.3

The emergency evacuation signal specified in 18.4.2 shall not be required to automatically operate in exit stair enclosures and exit passageways.

23.8.6.2.4

The emergency evacuation signal specified in 18.4.2 shall not be required to automatically operate in elevator cars.

23.8.6.3 Notification Zones

Upcodes Diagrams

23.8.6.3.1

Notification zones shall be consistent with the emergency response or evacuation plan for the protected premises.

23.8.6.3.2

The boundaries of fire alarm notification zones shall be coincident with building outer walls, building fire or smoke compartment boundaries, floor separations, or other fire safety subdivisions.

23.8.6.3.3\*

The boundaries of carbon monoxide alarm notification zones shall be coincident with the area where the alarm initiation originated and other notification zones in accordance with the building's emergency response plan.

23.8.6.4 Circuits for Addressable Notification Appliances

23.8.6.4.1

Circuit configuration for addressable notification appliances shall comply with the applicable performance requirements for notification zones.

23.8.6.4.2

Where there are addressable notification appliances on a signaling line circuit that serves different notification zones, a single open, short-circuit, or ground on that signaling line circuit shall not affect operation of more than one notification zone.

23.8.6.4.3

Riser conductors installed in accordance with 24.4.8.6.3 that are monitored for integrity shall not be required to operate in accordance with 23.8.6.4.2.

23.9 In-Building Emergency Voice/Alarm Communications

23.9.1

In-building fire emergency voice/alarm communications shall meet the requirements of Chapter 24.

23.9.2

Where a voice/alarm communications system is installed for the purpose of occupant notification related to carbon monoxide detection, it shall meet the requirements of Section 24.4 excluding the requirements of 24.4.8.6.

23.9.3

All live voice communications systems shall meet the requirements of Chapter 24.

23.9.4 Two-Way Communication Service

Two-way communication service shall meet the requirements of Chapter 24.

23.10 Fire Alarm Systems Using Tone

23.10.1

The requirements of Section 23.10 shall apply to tone and visual notification appliance circuits.

23.10.2\*

Fire alarm systems used for partial evacuation and relocation shall be designed and installed such that attack by fire within a notification zone shall not impair control and operation of the notification appliances outside that notification zone.

23.10.3

Performance features provided to ensure survivability shall be described and technical justification provided in the documentation submitted to the authority having jurisdiction with the evaluation required in 23.4.3.1.

23.10.4

Loudspeakers that transmit tone signals shall be permitted to be used as fire alarm notification appliances.

23.11 Suppression System Actuation

23.11.1

Releasing service fire alarm control units used for automatic or manual activation of a fire suppression system shall be listed for releasing service.

23.11.2

Releasing devices for suppression systems shall be listed for use with releasing service control units.

23.11.3

Each releasing device (e.g., solenoid, relay) shall be monitored for integrity (supervised) in accordance with applicable NFPA standards.

23.11.4

The installation wiring shall be monitored for integrity in accordance with the requirements of Section 12.6.

23.11.5

Releasing service fire alarm systems used for fire suppression-releasing service shall be provided with a disconnect switch to allow the system to be tested without actuating the fire suppression systems.

23.11.5.1

Operation of a disconnect switch or a disable function shall cause a supervisory signal at the releasing service fire alarm control unit.

23.11.5.2

The disconnect shall be a physical switch and not be accomplished by using software.

23.11.5.3

Software disconnects, even if actuated by dedicated buttons or key switches, shall not be permitted as a method to secure a suppression system from inadvertent discharge.

23.11.6

Sequence of operation shall be consistent with the applicable suppression system standards.

23.11.7\*

Each space protected by an automatic fire suppression system actuated by the fire alarm system shall contain one or more automatic fire detectors installed in accordance with Chapter 17.

23.11.8

Suppression systems or groups of systems shall be controlled by a single releasing service fire alarm control unit that monitors the associated initiating device(s), actuates the associated releasing device(s), and controls the associated agent release notification appliances.

23.11.9

If the configuration of multiple control units is listed for releasing device service, and if a trouble condition or manual disconnect on either control unit causes a trouble or supervisory signal, the initiating device on one control unit shall be permitted to actuate releasing devices on another control unit in lieu of 23.11.8.

23.11.10

If the releasing service fire alarm control unit is located in a protected premises having a separate fire alarm system, it shall be monitored for alarm, supervisory, and trouble signals, but shall not be dependent on or affected by the operation or failure of the protected premises fire alarm system.

23.11.11

Releasing fire alarm systems performing suppression system releasing functions shall be installed in such a manner that they are effectively protected from damage caused by activation of the suppression system(s) they control.

23.12 Off-Premises Signals

23.12.1

Systems requiring transmission of signals to continuously attended locations providing supervising station service (e.g., central station, proprietary supervising station, remote supervising station) shall also comply with the applicable requirements of Chapter 26.

23.12.2

Relays or modules providing transmission of trouble signals to a supervising station shall be arranged to provide failsafe operation.

23.12.3

Means provided to transmit trouble signals to supervising stations shall be arranged so as to transmit a trouble signal to the supervising station for any trouble condition received at the protected premises control unit, including loss of primary or secondary power.

23.12.4\*

It shall be permitted to provide supplementary transmission of real-time data from the fire system to off-premises equipment.

23.12.4.1

Transmission of real-time data off-premises shall not affect the operation or response of the fire alarm control unit.

23.12.4.2

Any data transmitted shall be consistent with the data generated by the system.

23.13 Guard's Tour Supervisory Service

23.13.1

Guard's tour reporting stations shall be listed for the application.

23.13.2

The number of guard's tour reporting stations, their locations, and the route to be followed by the guard for operating the stations shall be approved for the particular installation in accordance with NFPA 601.

23.13.3

A permanent record indicating every time each signal-transmitting station is operated shall be made at a protected premises fire alarm control unit.

23.13.4

Where intermediate stations that do not transmit a signal are employed in conjunction with signal-transmitting stations, distinctive signals shall be transmitted at the beginning and end of each tour of a guard.

23.13.5

A signal-transmitting station shall be provided at intervals not exceeding 10 intermediate stations.

23.13.6

Intermediate stations that do not transmit a signal shall be capable of operation only in a fixed sequence.

23.14 Suppressed (Exception Reporting) Signal System

23.14.1

The suppressed signal system shall comply with the provisions of 23.13.2.

23.14.2

The system shall transmit a start signal to the signal-receiving location.

23.14.3

The start signal shall be initiated by the guard at the start of continuous tour rounds.

23.14.4

The system shall automatically transmit a delinquency signal within 15 minutes after the predetermined actuation time if the guard fails to actuate a tour station as scheduled.

23.14.5

A finish signal shall be transmitted within a predetermined interval after the guard's completion of each tour of the premises.

23.14.6

For periods of over 24 hours during which tours are continuously conducted, a start signal shall be transmitted at least every 24 hours.

23.14.7

The start, delinquency, and finish signals shall be recorded at the signal-receiving location.

23.15 Protected Premises Emergency Control Functions

23.15.1 Emergency Elevator Operations

Emergency elevator operations shall meet the requirements of Sections 21.3, 21.4, 21.5, and 21.6.

23.15.2 HVAC Systems

HVAC systems shall meet the requirements of Section 21.7.

23.15.3 Door Release Service

Door release service shall meet the requirements of Section 21.9.

23.15.4 Electrically Locked Doors

Door-unlocking devices shall meet the requirements of Section 21.10.

23.15.5 Exit Marking Audible Notification Systems

Exit marking audible notification systems shall meet the requirements of Section 21.11.

23.15.6 Carbon Monoxide

Where provided, carbon monoxide control functions shall comply with the requirements of 21.7.6.

23.16\* Special Requirements for Low-Power Radio (Wireless) Systems

23.16.1\* Listing Requirements

Compliance with Section 23.16 shall require the use of low-power radio equipment specifically listed for the purpose.

23.16.2\* Power Supplies

A primary battery(s) (dry cell) that meet the requirements of 23.16.2.1 or 23.16.2.2 shall be permitted to be used as the sole power source for devices incorporating a low-power radio transmitter/transceiver.

23.16.2.1

The following conditions shall be met when one or more primary batteries are utilized and a catastrophic (open or short) single battery failure affects the alarm operation of the device:

Each transmitter/transceiver shall serve only one device and shall be individually identified at the system control unit.

The battery(s) shall be capable of operating the low-power radio transmitter/transceiver and its associated device for not less than 1 year before the battery depletion threshold is reached.

A low battery signal shall be transmitted before the device is no longer capable of providing 7 days of trouble signal operation followed by the signaling of a single nontrouble response.

The low battery signal shall be distinctive from alarm, supervisory, tamper, and trouble signals, shall visibly identify the affected low-power radio transmitter/transceiver, and, when silenced, shall automatically re-sound at least once every 4 hours.

Catastrophic (open or short) battery failure shall cause a trouble signal identifying the affected low-power radio transmitter/transceiver at the system control unit. When silenced, the trouble signal shall automatically re-sound at least once every 4 hours.

Any mode of failure of a primary battery in a low-power radio transmitter/transceiver shall not affect any other low-power radio transmitter/transceiver.

23.16.2.2

The following conditions shall be met when multiple batteries are utilized and a catastrophic (open or short) single battery failure does not affect the alarm operation of the device:

Two or more batteries shall be provided.

The combined batteries shall be capable of operating the low-power radio transmitter/transceiver and its associated device for not less than 1 year before the battery depletion threshold in 23.16.2.2(3) is reached.

A low battery signal shall be transmitted before the device is no longer capable of providing 7 days of trouble signal operation followed by the signaling of a single nontrouble response.

Each individual battery, primary and secondary, shall be separately monitored for the battery depletion threshold, and a low battery signal shall be transmitted when an individual battery has reached the battery depletion threshold.

Following the failure of a single battery, the remaining battery(s) shall be capable of operating the low-power radio transmitter/transceiver and its associated device for not less than 7 days when the battery depletion threshold in 23.16.2.2(3) is reached.

The low battery signal shall be distinctive from alarm, supervisory, tamper, and trouble signals, shall visibly identify the affected low-power radio transmitter/transceiver, and, when silenced, shall automatically re-sound at least once every 4 hours.

Catastrophic (open or short) failure of any individual battery shall cause a trouble signal identifying the affected low-power radio transmitter/transceiver at the system control unit. When silenced, the trouble signal shall automatically re-sound at least once every 4 hours.

Each transmitter/transceiver shall be permitted to serve more than one device and shall be individually identified at the system control unit.

23.16.3 Alarm Signals

23.16.3.1\*

When a wireless initiating device is actuated, its low-power radio transmitter/transceiver shall comply with 23.16.3.1.1 through 23.16.3.1.4.

23.16.3.1.1

It shall automatically transmit an alarm signal and be identified at the fire alarm system.

23.16.3.1.2

To ensure the receipt of an alarm signal by the control unit, the low-power radio transmitter/transceiver shall automatically repeat alarm transmissions at intervals not exceeding 60 seconds until the transmitter/transceiver receives a signal confirming receipt of the alarm signal by the control unit.

23.16.3.1.3\*

Signals shall have priority in accordance with 23.8.4.7.

23.16.3.1.4

Response time shall be in accordance with 10.11.1.

23.16.3.1.5\*

An alarm signal from a low-power radio transmitter/transceiver shall latch at the fire alarm control system until manually reset and shall identify the particular initiating device in alarm.

23.16.3.1.6

Sixty seconds after the conclusion of resetting the fire alarm system, a non-restored actuated low-power radio transmitter/transceiver shall be identified at the fire alarm systems.

23.16.4 Monitoring for Integrity

23.16.4.1

The low-power radio transmitter/transceiver shall be specifically listed as using a communication method that is highly resistant to misinterpretation of simultaneous transmissions and to interference (e.g., impulse noise and adjacent channel interference).

23.16.4.2

The occurrence of any single fault that disables communication between any low-power radio transmitter/ transceiver and the receiver/transceiver system control unit shall cause a latching trouble signal within 200 seconds at the system control unit that individually identifies the affected device.

23.16.4.3

A single fault on the signaling channel shall not cause an alarm signal.

23.16.4.4

The periodic communication required to comply with 23.16.4.2 shall ensure successful alarm transmission capability.

23.16.4.5

Removal of a low-power radio transmitter/transceiver from its installed location shall cause immediate transmission of a distinctive trouble signal that indicates its removal and individually identifies the affected device.

23.16.4.6

Reception of any unwanted (interfering) transmission by a retransmission device or by the receiver system control unit for a continuous period of 20 seconds or more shall cause an audible and visible trouble indication at the system control unit.

23.16.4.7

The indication required by 23.16.4.6 shall identify the specific trouble condition as an interfering signal.

23.16.5 Output Signals From a Wireless Receiver/Transceiver of a Control Unit

Where a wireless receiver/transceiver of a control unit is used to actuate remote devices, such as notification appliances and relays, by wireless means, the remote devices shall meet the following requirements:

Power supplies shall comply with Chapter 10 or the requirements of 23.16.2.

All monitoring for integrity requirements of Chapters 10, 12, 23, and 23.16.4 shall apply.

Response time shall be in accordance with .

Each wireless receiver/transceiver of a shall automatically repeat actuated response signals associated with life safety events at intervals not exceeding 60 seconds or until confirmation that the output device has received the alarm signal.

The remote devices shall continue to operate (latch-in) until manually reset at the system control unit.