**Chapter 29 Single- And Multiple-Station Alarms and Household Signaling Systems**

29.1 Application

29.1.1\*

The performance, selection, installation, operation, and use of single- and multiple-station alarms and household alarm systems shall comply with the requirements of this chapter.

29.1.2\*

Alarms shall be installed in all occupancies where required by other governing laws, codes, or standards.

29.1.3

The requirements of Chapters 7, 10, 12, 14, 17, 18, 21, 23, 24, 26, and 27 shall not apply unless otherwise noted.

29.1.4\*

The requirements of this chapter shall not apply to installations in manufactured homes.

29.1.5

This chapter shall apply to the life safety of occupants and not to the protection of property.

29.2\* Purpose

29.2.1

Fire-warning equipment for residential occupancies shall provide a reliable means to notify the occupants of the presence of a threatening fire and the need to escape to a place of safety before such escape might be impeded by untenable conditions in the normal path of egress.

29.2.2

Carbon monoxide warning equipment for residential occupancies shall provide a reliable means to notify the occupants of the presence of carbon monoxide levels that constitute a potential life safety risk and the need for action as a consequence of those levels.

29.3 Basic Requirements

29.3.1

All devices, combinations of devices, and equipment to be installed in conformity with this chapter shall be approved or listed for the purposes for which they are intended.

29.3.2

Fire- and carbon monoxide (CO)-warning equipment shall be installed in accordance with the listing and manufacturer's published instructions.

29.3.3\*

The installation of smoke, heat, fire, or carbon monoxide (CO) alarms or systems, or combinations of these, shall comply with the requirements of this chapter and shall satisfy the minimum requirements for number and location of alarms or detectors by one of the following arrangements:

The required minimum number and location of detection devices shall be satisfied (independently) through the installation of alarms. The installation of additional alarms shall be permitted. The installation of additional system-based detectors, including partial or complete duplication of the alarms satisfying the required minimum, shall be permitted.

The required minimum number and location of detection devices shall be satisfied (independently) through the installation of system detectors. The installation of additional detectors shall be permitted. The installation of additional alarms, including partial or complete duplication of the detectors satisfying the required minimum, shall be permitted.

29.3.4

Supplementary functions, including the extension of an alarm beyond the residential occupancy, shall be permitted and shall not interfere with the performance requirements of this chapter.

29.4 Remote Annunciation

Remote annunciation from single- and multiple-station alarms shall be permitted, provided signals at the remote annunciator properly identify the hazard.

29.5 Notification

29.5.1\*

Unless otherwise permitted by 29.5.2, fire-warning equipment to be installed in residential occupancies shall produce the audible emergency evacuation signal described in ANSI/ASA S3.41, American National Standard Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI), whenever the intended response is to evacuate the building.

29.5.2

Where mechanically powered single-station heat alarms are used as supplementary devices, unless required by applicable laws, codes, or standards, such devices shall not be required to produce the emergency evacuation signal described in ANSI/ASA S3.41, American National Standard Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI).

29.5.3\*

29.5.3.1

Carbon monoxide alarms shall have a minimum rating of 85 dBA at 10 ft (3 m).

29.5.3.2

Carbon monoxide-warning equipment to be installed in residential occupancies shall produce the T-4 signal. After the initial 4 minutes of alarm, the 5-second "off" time of the alarm signal shall be permitted to be changed to 60 seconds ± 10 percent.

29.5.4

The audible emergency evacuation signal shall be permitted to be used for other devices as long as the desired response is immediate evacuation.

29.5.5\*

Fire-warning equipment producing the audible emergency evacuation signal shall be permitted to incorporate voice notification under either or both of the following conditions:

Where the voice message is contained completely within the 1.5-second pause period of the audible emergency evacuation signal

Where the voice message complies with 29.5.5(2)(a) and 29.5.5(2)(b) as follows:

The voice message is first preceded by a minimum of eight cycles of the audible emergency evacuation signal.

The voice message periodically interrupts the signal for no longer than 10 seconds, followed by a minimum of two cycles of the audible emergency evacuation signal between each voice message. The initial eight-cycle period shall not be required to be repeated.

29.5.6\*

Carbon monoxide-warning equipment producing the audible notification signal shall be permitted to incorporate voice notification under either or both of the following:

Where the voice message is contained completely within the 5-second pause period of the audible notification signal

Where the voice message complies with 29.5.6(2)(a) and 29.5.6(2)(b) as follows:

The voice message is first preceded by a minimum of 6 cycles of the audible notification signal.

The voice message periodically interrupts the signal for no longer than 10 seconds, followed by a minimum of two cycles of the audible notification signal between each voice message. The initial 6-cycle period shall not be required to be repeated.

29.5.7

All audible notification signals installed shall meet the performance requirements of 18.4.4, 18.4.6.1, 18.4.6.2, and 29.5.10.

29.5.8\*

Where visual appliances are provided, they shall meet the requirements of Section 18.5.

29.5.9

Since hearing deficits are often not apparent, the responsibility for advising the appropriate person(s) of the existence of this deficit shall be that of the party with hearing loss.

29.5.10

Notification appliances provided in sleeping rooms and guest rooms for those with hearing loss shall comply with 29.5.10.1 and 29.5.10.2, as applicable.

29.5.10.1\* Mild to Severe Hearing Loss

Notification appliances provided for those with mild to severe hearing loss shall comply with the following:

An audible notification appliance producing a low frequency alarm signal shall be installed in the following situations:

Where required by governing laws, codes, or standards for people with hearing loss

Where provided voluntarily for those with hearing loss

\* The low frequency alarm signal output shall comply with the following:

The waveform shall have a fundamental frequency of 520 Hz ± 10 percent.

The minimum sound level at the pillow shall be 75 dBA, or 15 dB above the average ambient sound level, or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater.

29.5.10.2\* Moderately Severe to Profound Hearing Loss

Visual notification appliances in accordance with the requirements of 18.5.5.8 and tactile notification appliances in accordance with the requirements of Section 18.10 shall be required for those with moderately severe to profound hearing loss in the following situations:

\* Where required by governing laws, codes, or standards for people with hearing loss

Where provided voluntarily for those with hearing loss

29.5.11

Signals from notification appliances shall not be required to be synchronized.

29.6 Assumptions

29.6.1\* Occupants

29.6.1.1

The requirements of this chapter shall assume that occupants are capable of self-rescue.

29.6.1.2

Occupants intimate with the ignition of a fire shall not be assumed to be protected by the requirements of this chapter.

29.6.2\* Escape Route

29.6.2.1

The requirements of this chapter shall assume that the occupants have an escape plan.

29.6.2.2

An escape route shall be assumed to be available to occupants and to be unobstructed prior to the fire or carbon monoxide (CO) event.

29.6.2.3\*

The escape route shall be along the normal path of egress for the occupancy.

29.6.3\* Equipment

The performance of fire- and carbon monoxide (CO)-warning equipment discussed in this chapter shall depend on such equipment being properly selected, installed, operated, tested, and maintained in accordance with the provisions of this Code and with the manufacturer's published instructions provided with the equipment.

29.7\* Carbon Monoxide Detection

The warning functions intended in this standard shall be performed by single or multiple-station alarms or by detectors connected to a control unit and associated equipment.

29.7.1 Required Detection

29.7.1.1\*

Where required by other governing laws, codes, or standards for a specific type of occupancy, listed carbon monoxide alarms or detectors shall be installed as follows:

Outside of each separate dwelling unit sleeping area, within 21 ft (6.4 m) of any door to a sleeping room, with the distance measured along a path of travel

On every occupiable level of a dwelling unit, including basements, excluding attics and crawl spaces

In all sleeping rooms and guest rooms containing installed fuel-burning appliances

Other locations where required by applicable laws, codes, or standards

29.7.1.2\*

Each alarm or detector shall be located on the wall, ceiling, or other location as specified in the manufacturer's published instructions that accompany the unit.

29.7.2 Carbon Monoxide Alarm Interconnection

Unless exempted by applicable laws, codes, or standards, carbon monoxide alarms used to provide a warning function, and where two or more alarms are installed within a dwelling unit, suite of rooms, or similar area, shall be arranged so that the operation of any carbon monoxide alarm causes all carbon monoxide alarms within these locations to sound.

29.8 Detection and Notification

The use of fire alarm system smoke detectors and notification appliances shall be permitted to meet the fire-warning requirements for smoke alarms specified in 29.8.1.

29.8.1\* Required Smoke Detection

29.8.1.1\*

Where required by other governing laws, codes, or standards for a specific type of occupancy, listed single- and multiple-station smoke alarms shall be installed as follows:

\* In all sleeping rooms and guest rooms

\* Outside of each separate dwelling unit sleeping area, within 21 ft (6.4 m) of any door to a sleeping room, with the distance measured along a path of travel

On every level of a dwelling unit, including basements

On every level of a residential board and care occupancy (small facility), including basements and excluding crawl spaces and unfinished attics

\* In the living area(s) of a guest suite

In the living area(s) of a residential board and care occupancy (small facility)

29.8.1.2

Where the area addressed in 29.8.1.1(2) is separated from the adjacent living areas by a door, a smoke alarm shall be installed in the area between the door and the sleeping rooms, and additional alarms shall be installed on the living area side of the door as specified by 29.8.1.1 and 29.8.1.3.

29.8.1.3

In addition to the requirements of 29.8.1.1(1) through 29.8.1.1(3), where the interior floor area for a given level of a dwelling unit, excluding garage areas, is greater than 1000 ft2 (93 m2), smoke alarms shall be installed per 29.8.1.3.1 and 29.8.1.3.2.

29.8.1.3.1\*

All points on the ceiling shall have a smoke alarm within a distance of 30 ft (9.1 m) travel distance or shall have an equivalent of one smoke alarm per 500 ft2 (46 m2) of floor area.

29.8.1.3.2

Where dwelling units include great rooms or vaulted/cathedral ceilings extending over multiple floors, smoke alarms located on the upper floor that are intended to protect the aforementioned area shall be permitted to be considered as part of the lower floor(s) protection scheme used to meet the requirements of 29.8.1.3.1.

29.8.2 Required Occupant Notification

29.8.2.1

Fire-warning equipment used to provide required or optional detection shall produce audible fire alarm signals that comply with 29.8.2.1.1 or 29.8.2.1.2.

29.8.2.1.1\* Interconnected Smoke and Heat Alarms

For other than mechanically powered single-station heat alarms and unless exempted by applicable laws, codes, or standards, smoke or heat alarms used to provide a fire-warning function, and where two or more alarms are installed within a dwelling unit, suite of rooms, or similar area, shall be arranged so that the operation of any smoke or heat alarm causes all alarms within these locations to sound.

29.8.2.1.2 Household Fire Alarm System

Where a household fire alarm system is used to provide a fire-warning function, notification appliances shall be installed to meet the performance requirements of 29.5.7.

29.8.2.2\*

Unless otherwise permitted by the authority having jurisdiction, audible fire alarm signals shall sound only in an individual dwelling unit, suite of rooms, or similar area and shall not be arranged to operate fire-warning equipment or fire alarm systems outside these locations.

29.8.2.3

Remote annunciation shall be permitted.

29.9 Power Supplies

29.9.1 Smoke and Heat and Carbon Monoxide Alarms

Smoke and heat and carbon monoxide alarms shall meet the requirements of 29.8.2.1.1 and be powered by one of the following means:

A commercial light and power source along with a secondary power source that is capable of operating the device for at least 7 days in the normal condition, followed by 4 minutes of alarm. Carbon monoxide alarms shall have sufficient capacity to operate the alarm signal(s) for at least 12 continuous hours.

If a commercial light and power source is not normally available, a dependable, noncommercial ac power source along with a secondary power source that is capable of operating the device for at least 7 days in the normal condition, followed by 4 minutes of alarm for smoke and heat alarms or 12 hours of alarm for carbon monoxide alarms.

A nonrechargeable, nonreplaceable primary battery that meets the requirements of 29.9.2.

If a battery primary power supply is specifically permitted, a battery meeting the requirements of 29.9.7 or the requirements of 29.9.2.

A suitable spring-wound mechanism for the nonelectrical portion of a listed single-station alarm with a visible indication to show that sufficient operating power is not available.

29.9.2 Primary Power Source Nonreplaceable Primary Battery

If smoke, heat, or carbon monoxide alarms are powered by a nonrechargeable, nonreplaceable primary battery, the battery shall be monitored to ensure the following conditions are met:

All smoke alarm power requirements are met for at least 10 years of battery life, including required periodic testing.

All carbon monoxide alarm power requirements are met for the service life of the sensor life specified by the manufacturer's published instructions, not to exceed 10 years.

A distinctive audible trouble signal occurs before the battery is incapable of operating the device(s) for alarm purposes.

At the battery voltage at which a trouble signal is obtained, the unit is capable of producing a fire alarm signal for at least 4 minutes, or a carbon monoxide alarm signal for at least 12 continuous hours in accordance with 29.5.3, followed by not less than 7 days of trouble signal operation.

The audible trouble signal is produced at least once every minute for 7 consecutive days.

The trouble signal is allowed to be silenced for up to 12 hours.

A visible "power on" indicator is provided.

29.9.3 Household Fire and Carbon Monoxide Alarm Systems

Power for household alarm systems shall comply with the following requirements:

Household fire and carbon monoxide alarm systems shall have two independent power sources consisting of a primary source that uses commercial light and power and a secondary source that consists of a rechargeable battery.

The secondary source shall be capable of operating the household alarm system for at least 24 hours in the normal condition, followed by 4 minutes of fire alarm or 12 hours of carbon monoxide alarm.

Effective January 1, 2022, the secondary power source of the household carbon monoxide system shall be capable of operating the system for at least 12 hours of alarm in accordance with 29.5.3.

The secondary power source of a household carbon monoxide system shall not be required to operate the system for 12 hours of alarm if the power source of carbon monoxide detectors and carbon monoxide audible notification appliances incorporating a low-power radio (wireless) transmitter/transceiver is capable of providing at least 24 hours in the normal condition, followed by 12 hours of alarm.

The secondary power source shall be supervised and shall cause a distinctive audible and visible trouble signal upon removal or disconnection of a battery or a low-battery condition.

A rechargeable battery used as a secondary power source shall meet the following criteria:

Be automatically recharged by an ac circuit of the commercial light and power source

Be recharged within 48 hours

Provide a distinctive audible trouble signal before the battery is incapable of operating the device(s) for alarm purposes

Low-power wireless systems shall comply with the performance criteria of Section 23.16, except as modified by 29.10.8.1.1.

29.9.4 AC Primary Power Source

The ac power source specified in 29.9.1 and 29.9.3 shall comply with the following conditions:

A visible "power on" indicator shall be provided.

All electrical systems designed to be installed by other than a qualified electrician shall be powered from a source not in excess of 30 volts that meets the requirements for power-limited fire alarm circuits as defined in Article 760 of NFPA 70.

\*A restraining means shall be used at the plug-in of any cord-connected installation, unless the unit utilizes a secondary (standby) power source meeting the requirements of Section 29.6 and loss of the ac primary power source results in annunciation of an audible trouble signal meeting 29.7.6.4.

AC primary (main) power shall be supplied either from a dedicated branch circuit or the unswitched portion of a branch circuit also used for power and lighting.

Operation of a switch (other than a circuit breaker) shall not cause loss of primary (main) power. Alarms powered by branch circuits protected by arc-fault circuit-interrupters (AFCI) or ground-fault circuit-interrupters (GFCI) shall have a secondary power source.

Neither loss nor restoration of primary (main) power shall cause an alarm signal that exceeds 2 seconds.

Where a secondary (standby) battery is provided, the primary (main) power supply shall be of sufficient capacity to operate the system under all conditions of loading with any secondary (standby) battery disconnected or fully discharged.

29.9.5 Secondary (Standby) Power Source

Where alarms include a battery that is used as a secondary power source, the following conditions shall be met:

The secondary power source shall be supervised and shall cause a distinctive audible or visible trouble signal upon removal or disconnection of a battery or a low-battery condition.

Acceptable replacement batteries shall be clearly identified by the manufacturer's name and model number on the unit near the battery compartment.

A rechargeable battery used as a secondary power source shall meet the following criteria:

Be automatically recharged by the primary power source

Be recharged within 4 hours where power is provided from a circuit that can be switched on or off by means other than a circuit breaker, or within 48 hours where power is provided from a circuit that cannot be switched on or off by means other than a circuit breaker

Provide a distinctive audible trouble signal before the battery is incapable of operating the device(s) for alarm purposes

At the battery condition at which a trouble signal is obtained, be capable of producing a fire alarm signal for at least 4 minutes or the carbon monoxide signal for 12 continuous hours, followed by not less than 7 days of trouble signal operation

Produce an audible trouble signal at least once every minute for 7 consecutive days

Where required by law for disposal reasons, rechargeable batteries shall be removable.

29.9.6 Visual Notification Appliance (With Single- or Multiple-Station Alarm)

If a visual notification appliance is used in conjunction with a single- or multiple-station alarm for compliance with 29.5.8, the notification appliance shall not be required to be supplied with a secondary power source.

29.9.7 Primary Replaceable Battery, Sole Power Source (Nonrechargeable)

If alarms are powered solely by a replaceable primary battery, the battery shall be monitored to ensure the following conditions are met:

All power requirements are met for at least 1 year of battery life, including weekly required periodic testing.

A distinctive audible trouble signal before the battery is incapable of operating the device(s) for alarm purposes.

For a system-connected unit employing a lock-in alarm feature, automatic transfer is provided from alarm to a trouble condition when the unit has insufficient power to support an alarm condition.

At the battery voltage at which a trouble signal is obtained, the unit is capable of producing a fire alarm signal for at least 4 minutes or a carbon monoxide alarm signal for at least 12 continuous hours, followed by not less than 7 days of trouble signal operation.

The audible trouble signal is produced at least once every minute for 7 consecutive days.

Acceptable replacement batteries are clearly identified by the manufacturer's name and model number on the unit near the battery compartment.

A noticeable, visible indication is displayed when a primary battery is removed from the unit.

29.9.8 Primary Power Source (Rechargeable Battery)

If alarms are powered by a rechargeable battery, the following conditions shall be met:

The battery shall, with proper charging, be able to power the alarm for a life of 1 year.

The battery shall be automatically recharged by a circuit of the commercial light and power source.

The battery shall be recharged within 4 hours where power is provided from a circuit that can be switched on or off by means other than a circuit breaker or within 48 hours where power is provided from a circuit that cannot be switched on or off by means other than a circuit breaker.

A distinctive audible trouble signal shall sound before the battery is incapable of operating the device(s) for alarm purposes.

For a unit employing a lock-in alarm feature, automatic transfer shall be provided from alarm to a trouble condition.

At the battery condition at which a trouble signal is obtained, the unit shall be capable of producing a fire alarm signal for at least 4 minutes or a carbon monoxide alarm signal for 12 continuous hours, followed by not less than 7 days of trouble signal operation.

The audible trouble signal shall be produced at least once every minute for 7 consecutive days.

The battery shall be nonremoveable, or a noticeable and visible indication shall be displayed when the battery is removed from the unit.

29.9.9 Secondary (Standby) Non-Battery Power Source

Where alarms include a secondary power source (non-battery), the following conditions shall be met:

The secondary power source shall be supervised and shall cause a distinctive audible or visible trouble signal upon depletion or failure.

A distinctive audible trouble signal shall be provided before the power source is incapable of operating the device(s) for alarm purposes.

At a power source condition at which a trouble signal is obtained, the power source shall be capable of producing a fire alarm signal for at least 4 minutes or a carbon monoxide alarm signal for at least 12 continuous hours, followed by not less than 7 days of trouble signal operation.

The audible trouble signal shall be produced at least once every minute for 7 consecutive days.

A rechargeable secondary power source shall meet the following criteria:

Be automatically recharged

Be recharged within 4 hours where power is provided from a circuit that can be switched on or off by means other than a circuit breaker or within 48 hours where power is provided from a circuit that cannot be switched on or off by means other than a circuit breaker

29.10 Equipment Performance

29.10.1 Self-Diagnostic

Any failure of any nonreliable or short-life component that renders the detector inoperable shall result in a trouble signal or otherwise be apparent to the occupant of the living unit without the need for test.

29.10.2\* Smoke Alarms, System Smoke Detectors, and Other Non-Heat Fire Detectors

Each device shall detect abnormal quantities of smoke or applicable fire signature, shall operate in the normal environmental conditions, and shall be in compliance with applicable standards such as ANSI/UL 268, Standard for Smoke Detectors for Fire Alarm Systems, or ANSI/UL 217, Standard for Single and Multiple Station Smoke Alarms.

29.10.3 Carbon Monoxide Alarms and Detectors

29.10.3.1\*

Each carbon monoxide alarm shall be in compliance with ANSI/UL 2034, Standard for Single and Multiple Station Carbon Monoxide Alarms.

29.10.3.2

Each carbon monoxide detector shall be in compliance with ANSI/UL 2075, Standard for Gas and Vapor Detectors and Sensors, and shall meet the sensitivity testing and alarm thresholds of ANSI/UL 2034, Standard for Single and Multiple Station Carbon Monoxide Alarms.

29.10.3.3

All signals produced from periodic testing of carbon monoxide alarms or detectors shall be identical to the signal produced when the unit is in alarm.

29.10.3.4

Trouble signals shall be distinctive from alarm signals.

29.10.3.5

Unless otherwise recommended by the manufacturer's published instructions, carbon monoxide alarms and detectors shall be replaced when they fail to respond to tests.

29.10.4\* Heat Detectors and Heat Alarms

29.10.4.1

Each heat detector and heat alarm, including a heat detector or heat alarm integrally mounted on a smoke detector or smoke alarm, shall detect abnormally high temperature or rate-of-temperature rise, and all such detectors shall be listed for not less than 50 ft (15.2 m) spacing.

29.10.4.2\*

Fixed-temperature detectors or alarms shall have a temperature rating at least 25°F (14°C) above the normal ambient temperature and shall not be rated 50°F (28°C) higher than the maximum anticipated ambient temperature in the room or space where installed.

29.10.5 Operability

Single- and multiple-station alarms, including heat alarms, shall be provided with a convenient means for testing its operability by the occupant, system owner, or other responsible parties.

29.10.6 Control Unit

29.10.6.1

The control unit shall be automatically restoring upon restoration of electrical power.

29.10.6.2\*

The control unit shall be of a type that "locks in" on an alarm condition.

29.10.6.3

Smoke detection circuits shall not be required to lock in.

29.10.6.4

If a reset switch is provided, it shall be of a self-restoring (momentary operation) type.

29.10.6.5

A means for silencing the trouble notification appliance(s) shall be permitted only if the following conditions are satisfied:

The means is key-operated or located within a locked enclosure, or arranged to provide equivalent protection against unauthorized use.

The means transfers the trouble indication to an identified lamp or other acceptable visible indicator, and the visible indication persists until the trouble condition has been corrected.

29.10.6.6

A means for turning off actuated alarm notification appliances shall be permitted only if the following conditions are satisfied:

The means is key-operated or located within a locked cabinet or arranged to provide equivalent protection against unauthorized use.

The means includes the provision of a visible alarm silence indication.

The silenced position is indicated by a distinctive signal.

The switch is a momentary or self-restoring switch.

29.10.6.7

Initiating devices and notification appliances connected to household control units shall be monitored for integrity so that the occurrence of a single open or single ground fault in the interconnection, which prevents normal operation of the interconnected devices, is indicated by a distinctive trouble signal.

29.10.6.8

The control unit shall be in compliance with applicable standards such as ANSI/UL 985, Standard for Household Fire Warning System Units, ANSI/UL 1730, Standard for Smoke Detector Monitors and Accessories for Individual Living Units of Multifamily Residences and Hotel/Motel Rooms, or ANSI/UL 864, Standard for Control Units and Accessories for Fire Alarm Systems.

29.10.6.9

Any data exchange between the control unit and separate independent devices via remote access shall not compromise the integrity of the fire alarm system.

29.10.6.10

Remote resetting and silencing of a control unit from other than the protected premises shall be inhibited for a minimum of 4 minutes from the initial activation of the fire alarm signal.

29.10.6.11

Each electrical carbon monoxide detection system shall have an integral test means to allow testing of the system operation.

29.10.7 Combination System

29.10.7.1

If designed and installed to perform additional functions, fire- and carbon monoxide-warning equipment shall operate reliably and without compromise to its primary functions.

29.10.7.2

Fire signals shall take precedence over any other signal or functions, even if a non-fire signal is actuated first.

29.10.7.3

Fire and carbon monoxide signals shall be distinctive so that a fire or carbon monoxide signal can be distinguished from all other signals.

29.10.7.4

The use of a common audible notification appliance shall be permitted as long as distinctive signals are generated.

29.10.7.5

Faults in other systems or components shall not affect the operation of the fire alarm system.

29.10.7.6

Where common wiring is employed for a combination system, the equipment for other than the fire and carbon monoxide alarm system shall be connected to the common wiring of the system so that short circuits, open circuits, grounds, or any fault in this equipment or interconnection between this equipment and the fire and carbon monoxide alarm system wiring does not interfere with the supervision of the fire and carbon monoxide alarm system or prevent alarm or trouble signal operation.

29.10.7.7

Audible notification signals shall be provided in the following priority order:

Fire alarm

Carbon monoxide

Other

29.10.7.8\*

Installations that include the connection of single- or multiple-station alarms with other input or output devices shall be permitted.

29.10.7.8.1

An open, ground fault, or short circuit of the wiring connecting input or output devices to the single- or multiple-station alarms shall not prevent operation of each individual alarm.

29.10.7.8.2

Single- or multiple-station smoke alarms shall be permitted to be connected to system control equipment located within the dwelling unit.

29.10.7.8.3

When connected, the actuation of a single- or multiple-station smoke alarm shall initiate an alarm signal at the system control equipment located within the dwelling unit.

29.10.7.8.4

A sprinkler waterflow alarm initiating device shall be permitted to be connected to the multiple-station alarms or household fire alarm system to actuate an alarm signal.

29.10.8 Wireless Devices

29.10.8.1 Wireless Systems

Household fire alarm systems utilizing low-power wireless transmission of signals within the protected dwelling unit shall comply with the requirements of Section 23.16, except as modified by 29.10.8.1.1.

29.10.8.1.1

The requirements of 23.16.4.2 shall not apply where periodic monitoring for integrity complies with all of the following:

Each low-power transmitter/transceiver shall transmit check-in signals at intervals not exceeding 80 minutes.

Any transmission interruption between a low-power radio transmitter/transceiver and the receiver/fire alarm control unit exceeding 4 hours shall cause a latching trouble signal at the household fire alarm control unit/ operator interface.

Low-power transmitters/transceivers shall be limited to serving a single initiating device; however, a single initiating device shall be permitted to send multiple types of alarm signals.

Redundant retransmission devices (repeaters) shall be provided such that disconnecting or failure of any single retransmission device (repeater) does not interrupt communications between any low-power transmitter/transceiver and the receiver/fire alarm control unit.

29.10.8.2 Nonsupervised Wireless Interconnected Alarms

29.10.8.2.1\*

To ensure adequate transmission and reception capability, nonsupervised, low-power wireless alarms shall be capable of reliably communicating at a distance of 100 ft (30.5 m) indoors as tested to an equivalent open area test distance, DEOAT, between two devices in accordance with Equations 29.10.8.2.1a and 29.10.8.2.1b.

where:

Lb = the building attenuation factor

where:

Lw = attenuation value of a wall

= 2 × L1 + L2

Lf = attenuation value of a floor

= L1 + L2 + L3 + L4

L1 = frequency-dependent attenuation value for 1/2 in.

(13 mm) drywall

L2 = frequency-dependent attenuation value for 11/2 in.

(38 mm) structural lumber

L3 = frequency-dependent attenuation value for 3/4 in.

(19 mm) plywood

L4 = frequency-dependent attenuation value for 1/2 in.

(13 mm) glass/tile floor

29.10.8.2.2

Fire alarm signals shall have priority over all other signals.

29.10.8.2.3

The maximum allowable response delay from activation of an initiating device to receipt and alarm/display by the receiver/control unit shall be 20 seconds.

29.10.8.2.4\*

Wireless interconnected smoke alarms (in receive mode) shall remain in alarm as long as the originating unit (transmitter) remains in alarm.

29.10.8.2.5

The occurrence of any single fault that disables a transceiver shall not prevent other transceivers in the system from operating.

29.10.9 Supervising Stations

29.10.9.1\*

Household alarm systems shall be permitted to be supervised by a supervising station or by a public emergency alarm reporting system.

29.10.9.1.1

Transmission of signals from single- and multiple-station alarms to a constantly attended supervising station or public emergency alarm reporting system shall be processed by a household alarm system.

29.10.9.1.2

Where off-premises supervision is provided, the system shall transmit at least a general alarm signal.

29.10.9.1.3

Transmission of trouble signals and supervisory signals shall be permitted.

29.10.9.2\*

Supervising station systems and services shall meet the requirements of Chapter 26 for the type of system and type of service selected, except as modified by 29.10.9.5 through 29.10.9.10.

29.10.9.3

Public emergency alarm reporting systems shall meet the requirements of Chapter 27, except as modified by 29.10.9.7 through 29.10.9.10.

29.10.9.4

Public emergency alarm reporting systems shall transmit signals to an emergency services communications system meeting the requirements of NFPA 1221.

29.10.9.5

Supervising station systems shall not be required to comply with requirements for indication of central station service in 26.3.4.

29.10.9.6

Alarm, supervisory, and trouble signals shall be permitted to be received at a listed central supervising station.

29.10.9.7\*

Alarm signals shall be permitted to be verified prior to reporting them to the fire service, provided that the verification process does not delay the reporting by more than 90 seconds.

29.10.9.8

Household fire alarm systems shall be programmed by the manufacturer to generate at least a monthly test of the communication or transmission means.

29.10.9.9

The activation of a keypad fire alarm signal shall require a manual operation of two simultaneous or sequential operations.

29.10.9.10

Communications methods shall comply with 29.10.9.10.1 through 29.10.9.10.6.

29.10.9.10.1

Where a digital alarm communicator transmitter (DACT) is used, the DACT serving the protected premises shall only require a single telephone line and shall only require a call to a single digital alarm communicator receiver (DACR) number.

29.10.9.10.2

Where a DACT is used, the DACT test signals shall be transmitted at least monthly.

29.10.9.10.3

Where a communication or transmission means other than DACT is used, only a single communication technology and path shall be required to serve the protected premises.

29.10.9.10.4

Where a communication or transmission means other than DACT is used, all equipment necessary to transmit an alarm signal shall be provided with a minimum of 24 hours of secondary power capacity and shall report a trouble condition indicating loss of primary power.

29.10.9.10.5

Failure of the communication path referenced in 29.10.9.10.3 shall be annunciated at the supervising station and at the protected premises within not more than 7 days of the failure.

29.10.9.10.6

A dedicated cellular telephone connection shall be permitted to be used as a single means to transmit alarms to a constantly attended remote monitoring location.

29.11 Installation

29.11.1 General

29.11.1.1

All equipment shall be installed in accordance with the manufacturer's published instructions and applicable electrical standards.

29.11.1.2

All devices shall be so located and mounted that accidental operation is not caused by jarring or vibration.

29.11.1.3

All equipment shall be mounted so as to be supported independently of its attachment to wires.

29.11.1.4

The supplier or installing contractor shall provide the system owner or other responsible parties with the following:

An instruction booklet illustrating typical installation layouts

Instruction charts describing the operation, method, and frequency of testing and maintenance of the warning equipment

Printed information for establishing an emergency evacuation plan

Printed information to inform system owners where they can obtain repair or replacement service, and where and how parts requiring regular replacement, such as batteries or bulbs, can be obtained within 2 weeks

Information noting both of the following:

Unless otherwise recommended by the manufacturer's published instructions, smoke alarms shall be replaced when they fail to respond to tests.

Smoke alarms shall not remain in service longer than 10 years from the date of manufacture unless otherwise provided by manufacturer's published instructions.

The instructions required in 29.14.2 and 29.14.4

29.11.2 Interconnection of Multiple-Station Alarms

29.11.2.1\*

The interconnection of alarms shall comply with the following:

Alarms shall not be interconnected in numbers that exceed the manufacturer's published instructions.

In no case shall more than 18 initiating devices be interconnected (of which 12 can be smoke alarms) where the interconnecting means is not supervised.

In no case shall more than 64 initiating devices be interconnected (of which 42 can be smoke alarms) where the interconnecting means is supervised.

Alarms of different manufacturers shall not be interconnected unless listed as being compatible with the specific model.

When alarms of different types are interconnected, all interconnected alarms shall produce the appropriate audible response for the phenomena being detected or remain silent.

29.11.2.2

A single fault on the interconnecting means between multiple-station alarms shall not prevent single-station operation of any of the interconnected alarms.

29.11.2.3

Remote notification appliance circuits of multiple- station alarms shall be capable of being tested for integrity by activation of the test feature on any interconnected alarm.

29.11.2.4

Activation of the test feature shall result in the operation of all interconnected notification appliances.

29.11.3\* Smoke Alarms and Smoke Detectors

Smoke alarms, smoke detectors, devices, combination of devices, and equipment shall be installed in accordance with the manufacturer's listing and published instructions, and, unless specifically listed for the application, shall comply with requirements in 29.11.3.1 through 29.11.3.4.

29.11.3.1\* Peaked Ceilings

Smoke alarms or smoke detectors mounted on a peaked ceiling shall be located within 36 in. (910 mm) horizontally of the peak, but not closer than 4 in. (100 mm) vertically to the peak.

29.11.3.2\* Sloped Ceilings

Smoke alarms or smoke detectors mounted on a sloped ceiling having a rise greater than 1 ft in 8 ft (1 m in 8 m) horizontally shall be located within 36 in. (910 mm) of the high side of the ceiling, but not closer than 4 in. (100 mm) from the adjoining wall surface.

29.11.3.3\* Wall Mounting

Smoke alarms or smoke detectors mounted on walls shall be located not farther than 12 in. (300 mm) from the adjoining ceiling surface.

29.11.3.4 Specific Location Requirements

The installation of smoke alarms and smoke detectors shall comply with the following requirements:

Smoke alarms and smoke detectors shall not be located where ambient conditions, including humidity and temperature, are outside the limits specified by the manufacturer's published instructions.

Smoke alarms and smoke detectors shall not be located within unfinished attics or garages or in other spaces where temperatures can fall below 40°F (4.4°C) or exceed 100°F (38°C).

\* Where the mounting surface could become considerably warmer or cooler than the room, such as a poorly insulated ceiling below an unfinished attic or an exterior wall, smoke alarms and smoke detectors shall be mounted on an inside wall.

\* Smoke alarms and smoke detectors shall not be installed within an area of exclusion determined by a 10 ft (3.0 m) radial distance along a horizontal flow path from a stationary or fixed cooking appliance, unless listed for installation in close proximity to cooking appliances. Smoke alarms and smoke detectors installed between 10 ft (3.0 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be equipped with an alarm-silencing means or use photoelectric detection.

Smoke alarms or smoke detectors that use photoelectric detection shall be permitted for installation at a radial distance greater than 6 ft (1.8 m) from any stationary or fixed cooking appliance when both of the following conditions are met:

The kitchen or cooking area and adjacent spaces have no clear interior partitions or headers.

The 10 ft (3.0 m) area of exclusion would prohibit the placement of a smoke alarm or smoke detector required by other sections of this Code.

Effective January 1, 2022, smoke alarms and smoke detectors installed between 6 ft (1.8 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be listed for resistance to common nuisance sources from cooking.

\* Smoke alarms and smoke detectors shall not be installed within a 36 in. (910 mm) horizontal path from a door to a bathroom containing a shower or tub unless listed for installation in close proximity to such locations.

Smoke alarms and smoke detectors shall not be installed within a 36 in. (910 mm) horizontal path from the supply registers of a forced air heating or cooling system and shall be installed outside of the direct airflow from those registers.

\* Smoke alarms and smoke detectors shall not be installed within a 36 in. (910 mm) horizontal path from the tip of the blade of a ceiling-suspended (paddle) fan unless the room configuration restricts meeting this requirement.

Where stairs lead to other occupiable levels, a smoke alarm or smoke detector shall be located so that smoke rising in the stairway cannot be prevented from reaching the smoke alarm or smoke detector by an intervening door or obstruction.

For stairways leading up from a basement, smoke alarms or smoke detectors shall be located on the basement ceiling near the entry to the stairs.

\* For tray-shaped ceilings (coffered ceilings), smoke alarms and smoke detectors shall be installed on the highest portion of the ceiling or on the sloped portion of the ceiling within 12 in. (300 mm) vertically down from the highest point.

Smoke alarms and detectors installed in rooms with joists or beams shall comply with the requirements of 17.7.3.2.4.

Heat alarms and detectors installed in rooms with joists or beams shall comply with the requirements of 17.6.3.

29.11.4\* Heat Detectors and Heat Alarms

29.11.4.1\*

On smooth ceilings, heat detectors and heat alarms shall be installed within the strict limitations of their listed spacing.

29.11.4.2\*

For sloped ceilings having a rise greater than 1 ft in 8 ft (1 m in 8 m) horizontally, the detector or alarm shall be located within 36 in. (910 mm) of the peak.

29.11.4.3

The spacing of additional detectors or alarms, if any, shall be based on a horizontal distance measurement, not on a measurement along the slope of the ceiling.

29.11.4.4\*

Heat detectors or alarms shall be mounted on the ceiling at least 4 in. (100 mm) from a wall or on a wall with the top of the detector or alarm not less than 4 in. (100 mm), nor more than 12 in. (300 mm), below the ceiling.

29.11.4.5

Where the mounting surface could become considerably warmer or cooler than the room, such as a poorly insulated ceiling below an unfinished attic or an exterior wall, the detectors or alarms shall be mounted on an inside wall.

29.11.4.6

In rooms with open joists or beams, all ceiling-mounted detectors or alarms shall be located on the bottom of such joists or beams.

29.11.4.7\*

Detectors or alarms installed on an open-joisted ceiling shall have their smooth ceiling spacing reduced where this spacing is measured at right angles to solid joists; in the case of heat detectors or heat alarms, this spacing shall not exceed one-half of the listed spacing.

29.11.5 Wiring and Equipment

The installation of wiring and equipment shall be in accordance with the requirements of Article 760 of NFPA 70.

29.11.6 Installation and Inspection Record

Where a form is required by the AHJ to document the installation and inspection of a household alarm system or single- or multiple-station alarms, 7.8.2 (3) shall be used to document the record of completion and inspection.

29.12 Optional Functions

The following optional functions of fire-warning equipment shall be permitted:

Notification of the fire department, either directly or through an alarm monitoring service

Monitoring of other safety systems, such as fire sprinklers for alarm or proper operating conditions

Notification of occupants or others of potentially dangerous conditions, such as the presence of fuel gases or toxic gases such as carbon monoxide

Notification of occupants or others of the activation of intrusion (burglar alarm) sensors

Any other function, safety related or not, that could share components or wiring

29.13 Inspection, Testing, and Maintenance

29.13.1

Fire and carbon monoxide alarm equipment shall be maintained and tested in accordance with the manufacturer's published instructions and per the requirements of 14.4.5 and 14.4.6.

29.13.2

All fire and carbon monoxide alarm equipment shall be restored to a normal condition after each alarm or test.

29.14 Markings and Instructions

29.14.1 Alarms

All alarms shall be plainly marked with the following information on the unit:

Manufacturer's or listee's name, address, and model number

A mark or certification that the unit has been listed

Electrical rating (where applicable)

Manufacturer's published operating and maintenance instructions

Test instructions

Replacement and service instructions

Explanation of signal indicators, including identification of lights, switches, meters, and similar devices, regarding their function, unless their function is obvious

Distinction between alarm and trouble signals on units employing both

The sensitivity setting for an alarm having a fixed setting (For an alarm that is intended to be adjusted in the field, the range of sensitivity shall be indicated. The marked sensitivity shall be indicated as a percent per foot obscuration level. The marking shall include a nominal value plus tolerance.)

Reference to an installation diagram and system owner's manual

Date of manufacture in the format YEAR (in four digits), MONTH (in letters), and DAY (in two digits) located on the outside of the alarm

29.14.1.1

Where space limitations prohibit inclusion of 29.14.1(4) and 29.14.1(6), it shall be permitted to include this information in the installation instructions instead.

29.14.2 Carbon Monoxide Alarm and Detector Markings

In addition to 29.14.1, carbon monoxide alarms or detectors shall be marked with the following information:

Statement that indicates the unit is not suitable as a fire detector

Electrical rating (if applicable)

Warning that carbon monoxide is odorless, colorless, and tasteless

Emergency actions to be taken

Recommended replacement date

29.14.3 Household Alarm Control Unit

Unless otherwise permitted by 29.14.4, all household alarm control units shall be plainly marked with the following information on the unit:

Manufacturer's or listee's name, address, and model number

A mark or certification that the unit has been listed

Electrical rating (where applicable)

Identification of all user interface components and their functions (such as, but not limited to, lights, switches, and meters) located adjacent to the component

Manufacturer's published operating and maintenance instructions

Test instructions

Replacement and service instructions

Reference to an installation wiring diagram and homeowner's manual, if not attached to control unit, by drawing number and issue number and/or date

29.14.4

29.14.5 Carbon Monoxide Instructions

The following information shall be included in the instructions provided with carbon monoxide alarms and detectors:

Installation instructions

Operating instructions

Testing instructions

Maintenance instructions

Replacement and service instructions

Statement indicating that smoke might not be present during a carbon monoxide alarm condition

\*Information on the actions to be taken in case of an alarm

Minimum and recommended distances from fuel-burning appliances