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Fire Alarms – New Codes, Services and Technology that Drive RMR

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COURSE OBJECTIVES

- What significant changes have been made to the National Fire Alarm and Signaling Code for 2022?
- What changes have been made to Remote Access allowances and how does that relate to the changes and additions to Cyber Security?
- What changes will affect smoke detection in the future?
- What changes will be made to fire alarm system batteries?

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MEET THE SPEAKER

Larry D. Rietz, SET, CFPS
GLOBAL SERVICE LINE LEADER, FIRE DETECTION & ALARM
JENSEN HUGHES

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With grateful acknowledgement, some content herein was prepared by:
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Agenda

- Remote Access & Cybersecurity
- Smoke Detection Update
- Pathway Survivability
- Fire Alarm Batteries
- NFPA 1221 Update
- General Updates
- Questions / Discussion

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Remote Security & Cybersecurity

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Remote Access

Many organizations are remotely accessing fire alarm systems.

- Installation or modification of site-specific software
- Testing
- Diagnostics

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Remote Access

Challenges with fire alarm system installation, testing, and maintenance:

- Inadequate staffing
- Physical distance between shop and protected premises
- Travel costs
- Response time

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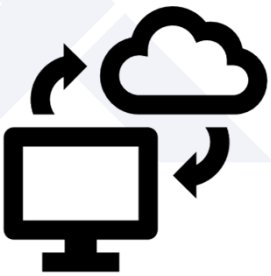
Remote Access

3.3.253* Remote Access. Communications between a remote device and a component of a fire alarm or signaling system.

A.3.3.252 Remote Access. Remote devices include but are not limited to laptop computers, cellular handheld devices, cloud-based systems, applications, and other similar equipment or software. Remote access communications are not intended to be used for supervising station alarm reporting system.



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Remote Access

14.4.2.6 Where changes are made to system executive software or site-specific software for control equipment or transmitting equipment from a remote location not on the protected premises, such changes shall not be made without an individual, meeting the qualifications of 10.6.3.2, 10.6.3.3, or 10.6.3.5, being at the protected premises to verify that testing is accomplished in accordance with 14.4.2.

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Remote Access

23.8.2.11 Remote Access.

23.8.2.11.1* Remote access to fire alarm or signaling systems shall be permitted in accordance with 23.8.2.11.

A.23.8.2.11.1 Remote access is achieved by, but not limited to, the use of cellular technology, internet-based technology, or radio frequency technology. Paragraph 23.8.2.11 is intended to address the following activities: testing, maintenance, diagnostics, and software upgrade performed through remote access.

23.8.2.11.2 Remote access shall not affect the operation or response of the fire alarm or signaling systems unless permitted by 23.8.2.11.3 or 23.8.2.11.5.

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Remote Access

23.8.2.11.3 Remote access shall be permitted for testing and maintenance activities, including resetting, silencing, or operation of emergency control functions provided all of the following are met:

(1)* The system shall provide a means to manually terminate the remote access connection at the remote device and at the fire alarm or signaling system control unit at any time.

(2)* Remote access shall be automatically terminated within a maximum of 1 hour of inactivity in the remote access mode.

(3) Resetting, silencing, or operation of emergency control functions shall be limited to portion(s) of the system taken out of service.

(4) Qualified personnel shall be on-site to enable resetting, silencing, and operation of emergency control functions at the affected system(s) by password or limited access.

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Remote Access

23.8.2.11.4* Remote access shall be permitted to be enabled remotely for the purposes of performing remote diagnostics when both of the following are met:

(1) The system shall provide a means to manually terminate the remote access connection at the remote device and at the fire alarm or signaling system control unit at any time.

(2) *Remote access shall be automatically terminated within a maximum of 1 hour of inactivity in the remote access mode.

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Remote Access

23.8.2.11.5 Remote access for the purposes of software updating shall be permitted when all of the following are met:

(1)*The system shall provide a means to manually terminate the remote access connection at the remote device and at the fire alarm or signaling system control unit at any time.

(2)* Remote access shall be automatically terminated within a maximum of 1 hour of inactivity in the remote access mode.

(3) Qualified personnel shall be on-site to enable software updating at the affected fire alarm or signaling system control unit by password or limited access.

(4) All software changes shall be tested in accordance with Section 14.4.

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Remote Access

26.6.2.3 Remote Programming of Transmitting Technologies.

- Requires a qualified person on-site
- Requires notification of AHJ
- Requires a test plan
- Requires risk mitigation
- Requires re-testing

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Cybersecurity

Cybersecurity is the practice of protecting systems, networks, and programs from digital attacks. These cyberattacks are usually aimed at accessing, changing, or destroying sensitive information; extorting money from users; or interrupting normal business processes.

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Cybersecurity

Targets of opportunity:

- Electrical utilities
- Municipal water supplies
- Gas utilities
- Food supply chain
- Military and government
- Health Care
- Transportation
- Financial Institutions
- Telecommunications

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Cybersecurity

Targeted systems:

- Banking/Financial
- Personal records (ID Theft)
- Industrial controls
- Life safety systems
- Building Automation Systems (BAS)

Reasons for attacks:

- Financial reward
- Identity theft
- Espionage
- Disgruntled employees
- Thrill seeking

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Cybersecurity

Why worry about fire alarm systems?

3.3.70
Cybersecurity.

The protection of systems from theft or damage of data, or damage to hardware or software, as well as from unauthorized command or control or access

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Cybersecurity

7.2.1 Where documentation is required by the authority having jurisdiction, the following …

(18) Where applicable, cybersecurity documentation.

Rationale: Adds cybersecurity to required documentation.

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Cybersecurity

11.1* Cybersecurity. Where required by governing laws, codes, or standards, or other parts of this Code, cybersecurity shall be provided for equipment, software, firmware, tools, installation methods, physical security of and access to equipment, data pathways, testing, and maintenance.

A.11.1 Cybersecurity is not required for every system or application; it is only required when other sections of this Code, authorities, or regulations mandate that cybersecurity be incorporated into the system(s). Generally, there are greater cybersecurity concerns when systems are connected to external networks.

Annex J

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Cybersecurity

Impacts on dwelling system technologies:

29.10.10 Cybersecurity.

29.10.10.1* All control units shall be designed for cybersecurity as determined by the manufacturer.

29.10.10.2 All devices that are connected wirelessly to a control unit and rely on the control unit for occupant notification activation shall not diminish the cybersecurity of the control unit.

29.10.10.3 All system or software updates required or initiated by the manufacturer shall not diminish the cybersecurity of the control unit.

29.10.10.4 * All alarms that use IP or cellular communication shall be designed for cybersecurity as determined by the manufacturer.

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Cybersecurity

Underwriters Laboratories

A.29.10.10.1

All control units that use IP or cellular communication to transmit off-site or have devices that are connected wirelessly have an increased risk and should be designed for cybersecurity as determined by the manufacturer. The cybersecurity should comply with, but not be limited to, one of the following:

(1) ANSI/ISA-62443, *Security for Industrial Automation and Control Systems Series*

(2) NIST *Framework for Improving Critical Infrastructure Cybersecurity*

(3) UL 2900-1, *Software Cybersecurity for Network-Connectable Products, Part 1: General Requirements*

(4) UL 2900-2-3, *Software Cybersecurity for Network-Connectable Products, Part 2-3: Particular Requirements for Security and Life Safety Signaling Systems*

(5) Other published cybersecurity standards

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Cybersecurity

A.29.10.10.4

IP or cellular communication increases the risk of attack, damage, or unauthorized access to the alarm or connected network. Any alarm that uses this type of communication should be designed for cybersecurity as determined by the manufacturer. While no alarm that uses these communications can be impervious to attacks, the manufacturer should consider cybersecurity during the design process.

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Smoke Detection Update

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Smoke Detection Performance

Flaming Polyurethane Foam Test

UL217 8th Edition
- Section 51.4 Flaming Polyurethane Foam Test

UL 268 7th Edition
- Annex 12 Flaming Polyurethane Foam Test

Smoldering Polyurethane Foam Test

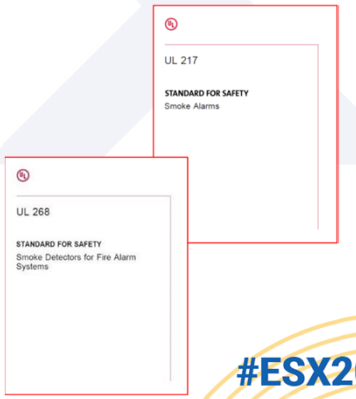
UL217 8th Edition
- Section 53 Smoldering Polyurethane Foam Test

UL 268 7th Edition
- Annex 13 Smoldering Polyurethane Foam Test

Cooking Nuisance Smoke Test

UL217 8th Edition
- Section 54 Cooking Nuisance Smoke Test

UL 268 7th Edition
- Annex 14 Cooking Nuisance Smoke Test



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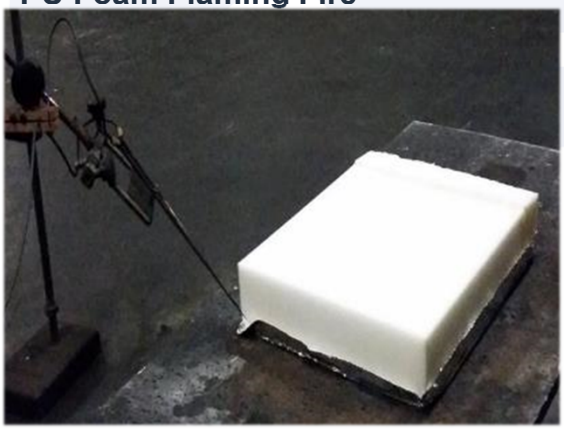
Smoke Detection Performance

PU Foam Flaming Fire



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Smoke Detection Performance

PU Foam Smoldering Fire

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Smoke Detection Performance

Pre-Test

In Test

Post-Test

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Smoke Detection Performance

Pre-Test

Post-Test

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Smoke Detector Performance

- Slipping Dates…
  - Original date was **May 29, 2020**
  - Extended to **June 30, 2021**
  - Extended again to **June 30, 2022**
  - "UL has decided to extend the IFR (Industry File Review) dates for these Standards to **June 30, 2024**."
- "UL has established a new engineering cutoff date of **July 1, 2023**. This is the date in which all projects must be opened, and samples received at UL to ensure that there will be sufficient time for UL to complete all projects by the new effective date."
- References in 2022 as well as 2019 NFPA 72:
  - UL 217, Smoke Alarms, 8th edition, 2015, revised 2016
  - UL 268, Smoke Detectors for Fire Alarm Systems, 7th edition, 2016

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Pathway Survivability

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What is Pathway Survivability?

The ability of any conductor, optic fiber, radio carrier, or other means for transmitting system information to remain operational during fire conditions.

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NFPA 72 - 2010

- New Chapter 12 – Circuits and Pathways

Required Performance Criteria	Pathway Survivability			
	Level 0 (12.4.1)	Level 1 (12.4.2)	Level 2 (12.4.3)	Level 3 (12.4.4)
Per NFPA 72 sections 12.2.3.3 and 12.4, all pathways to comply with *NFPA 70* applicable requirements	YES	YES	YES	YES
Wiring methods permitted are installed in accordance with manufacturer's published instructions (12.2.3.3)	YES	YES	YES	YES
Building is fully protected by an automatic sprinkler system in accordance with *NFPA 13*		YES		YES
Any interconnecting conductors, cables, or other physical pathways protected by metal raceways or metal armored cables		YES		
One or more of the following: (1) 2-hour fire-rated circuit integrity (CI) or fire-resistive cable (2) 2-hour fire-rated cable system [electrical circuit protective system(s)] (3) 2-hour fire-rated enclosure or protected area (4) Performance alternative approved by the AHJ			YES	YES

NFPA 72 2010 EDITION
NATIONAL FIRE ALARM and SIGNALING CODE

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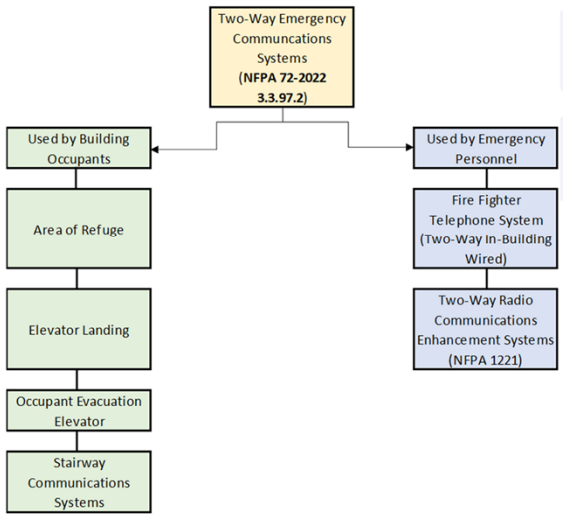
NFPA 72 -2022



Amended Definition of Two-Way Communications

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NFPA 72 -2022

Required Performance Criteria	Pathway Survivability Level 0 (12.4.1)	Level 1 (12.4.2)	Level 2 (12.4.3)	Level 3 (12.4.4)	Level 4 (12.4.5)
Per NFPA 72 sections 12.2.3.3 and 12.4, all pathways to comply with *NFPA 70* applicable requirements	YES	YES	YES	YES	YES
Wiring methods permitted are installed in accordance with manufacturer's published instructions (12.2.3.3)	YES	YES	YES	YES	YES
Building is fully protected by an automatic sprinkler system in accordance with *NFPA 13*		YES		YES	
Any interconnecting conductors, cables, or other physical pathways protected by metal raceways or metal armored cables		YES			
One or more of the following: (1) 1-hour fire-rated fire-resistive cable (2) 1-hour fire-rated cable system [electrical circuit protective system(s)] (3) 1-hour fire-rated enclosure or protected area (4) Performance alternative approved by the AHJ					YES
One or more of the following: (1) 2-hour fire-rated circuit integrity (CI) or fire-resistive cable (2) 2-hour fire-rated cable system [electrical circuit protective system(s)] (3) 2-hour fire-rated enclosure or protected area (4) Performance alternative approved by the AHJ			YES	YES	

New Level 4 Pathway Survivability

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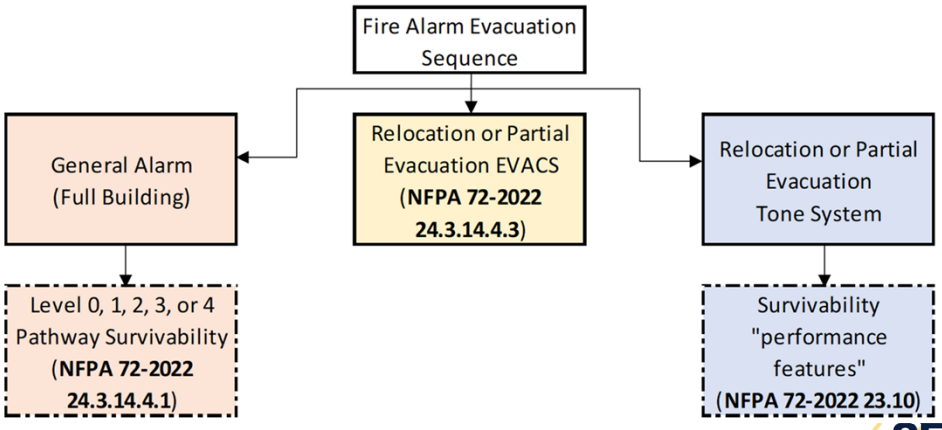
NFPA 72 -2022

Chapter 24 Requirements



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Fire Alarm Batteries

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Fire Alarm Batteries

ITEM	DESCRIPTION	STANDBY CURRENT PER UNIT (AMPS)		QTY		TOTAL STANDBY CURRENT PER ITEM	ALARM CURRENT PER UNIT (AMPS)		QTY		TOTAL ALARM CURRENT PER ITEM
FACU	Fire Alarm Control Unit	0.1000	X	1	=	0.1000	0.2000	X	1	=	0.2000
SD	Smoke Detector	0.0010	X	20	=	0.0200	0.0500	X	20	=	1.0000
HD	Heat Detector	0.0000	X	6	=	0.0000	0.0000	X	6	=	0.0000
RLY	Relay (failsafe)	0.0500	X	0	=	0.0000	0.0000	X	1	=	0.0000
RLY	Relay (not failsafe)	0.0000	X	15	=	0.0000	0.0500	X	15	=	0.7500
HS	Horn-Strobe	0.0000	X	18	=	0.0000	0.0750	X	10	=	0.7500
DH	Door Holder	0.0650	X	4	=	0.2600	0.0000	X	0	=	0.0000
ANN	Annunciator	0.1000	X	1	=	0.1000	0.2000	X	1	=	0.2000
MS	Manual Station	0.0000	X	8	=	0.0000	0.0000	X	5	=	0.0000
WF	Waterflow Switch	0.0000	X	6	=	0.0000	0.0000	X	4	=	0.0000
TS	Tamper Switch	0.0000	X	6	=	0.0000	0.0000	X	4	=	0.0000
0	0	0.0000	X	0	=	0.0000	0.0000	X	0	=	0.0000
0	0	0.0000	X	0	=	0.0000	0.0000	X	0	=	0.0000
				TOTAL SYSTEM STANDBY CURRENT (AMPS)		0.4800			TOTAL SYSTEM ALARM CURRENT (AMPS)		2.9000

Prepared for:									
REQUIRED STANDBY TIME (HRS) NFPA 72-2002 4.4.1.5.3.1		TOTAL SYSTEM STANDBY CURRENT (AMPS)		REQUIRED STANDBY CAPACITY (AMP-HOURS)	REQUIRED ALARM TIME (HOURS) NFPA 72-2002 4.4.1.5.3.1		TOTAL SYSTEM ALARM CURRENT (AMPS)		REQUIRED ALARM CAPACITY (AMP-HOURS)
24	X	0.4800	=	11.5200	0.083	X	2.9000	=	0.2407

Prepared by:								
REQUIRED STANDBY CAPACITY (AMP-HOURS)		REQUIRED ALARM CAPACITY (AMP-HOURS)		TOTAL CAPACITY (AMP-HOURS)	TOTAL CAPACITY (AMP-HOURS)		SAFETY FACTOR		ADJUSTED BATTERY CAPACITY (AMP-HOURS)
11.52	+	0.2407	=	11.7607	11.7607	X	120%	=	14

- Modified **10.6.7.2.14** – Increase battery safety factor on calculations from 20% to 25% (1.25 times total load).
- Section **10.6.7.2 Capacity** – Section reformatted for one requirement per paragraph (e.g., Quiescent load length, Alarm load length, etc.)

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Fire Alarm Batteries

10.6.10.1.3* Effective **January 1, 2024**, rechargeable batteries for the secondary power supply used in control units, devices, and accessories shall be listed or component recognized by a nationally recognized testing laboratory.

Examples of listing standards are UL 1989, Standby Batteries, and UL 2054, Household and Commercial Batteries.

- Power Sonic
- Eagle Picher
- Yuasa

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Fire Alarm Batteries

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Fire Alarm Batteries

14.4.3.2(9) VRLA (valve regulated lead-acid) battery and charger

1) Temperature Test – Upon initially opening the cabinet door, measure the internal ***ambient temperature of the enclosure***. Measure the temperature of each battery cell/unit at the negative terminal with an infrared thermometer. Replace any battery cell/unit if its temperature is greater than 18°F (10°C) above the measured ***internal ambient temperature of the enclosure***.

4) Ohmic test – With the battery fully charged, measure the internal ohmic value of each battery cell/unit. Record the test date and ohmic value on each cell/unit. Replace the battery when the ohmic measurement of any cell/unit ***deviates from the established baseline by 30% or more for conductance, or 40% or more for resistance or impedance***. Where the battery or test equipment manufacturer's baseline ohmic values are used, replace the battery when any cell/unit has an internal ohmic value outside of the acceptable range.

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General Items

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Chapter 7 - Documentation

Design Documents must include:

- Pathway Class designations per Section 12.3 (7.3.3.6)
- Pathway Survivability designations per Section 12.4 (7.3.3.7)
- Must show Pathway Class and Pathway Survivability on shop drawing floor plans and riser diagrams (7.4.5 and 7.4.6)

FIRE ALARM SYSTEM WIRING REQUIREMENTS		
TYPE OF CIRCUIT	CLASS OF CIRCUIT	PATHWAY SURVIVABILITY LEVEL
SIGNALLING LINE CIRCUIT (SLC)	CLASS B	LEVEL 1
INITIATING DEVICE CIRCUIT (IDC)	CLASS B	LEVEL 1
NOTIFICATION APPLIANCE CIRCUITS (NAC)	CLASS B	LEVEL 1
REMOTE UNIT INTERFACE (RUI)	CLASS A	LEVEL 1
NETWORK COMMUNICATIONS	CLASS X	LEVEL 1

ALL FIRE ALARM CIRCUITS SHALL BE IN METALLIC CONDUIT, UNLESS SPECIFICALLY NOTED OTHERWISE. CONDUIT SHALL BE RED OR LABELED EVERY 10 FEET WHERE ACCESSIBLE.

- **7.3.5.5 Carbon Monoxide Detectors** – Must include CO detector design documentation in accordance with Section 17.12

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Chapter 7 - Documentation

Site-Specific Software:

- 7.5.7.1.1 For all software that connects to and is part of the building life safety network components, the software security access or the means of obtaining the software security access shall be provided to the owner or the owner's designated representative.

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Chapter 10 - Fundamentals

10.4.7 Abandoned Fire Alarm Equipment.

- **10.4.7.1** Abandoned fire alarm equipment shall be removed.
- **10.4.7.2** Abandoned fire alarm equipment shall be marked “not in service” until removed.

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Chapter 10 - Fundamentals

10.4.5.2 – Protection of Control Equipment

- Where a risk analysis shows that early warning fire detection (i.e., smoke detection) is not required AND where acceptable to the AHJ, **10.4.5** (detection at control units) shall not apply.

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Chapter 14 - ITM

14.2.2.2 Impairments.

- Where an automatic function of a fire alarm or signaling system is taken out of service for testing and a manual means or other compensatory measures are unavailable, the system or portion thereof is impaired and shall comply with the requirements of Section 10.21 until the automatic function is restored.

14.2.2.3 Deficiencies.

- **14.2.2.3.1** System deficiencies shall be corrected.
- **14.2.2.3.2** If a deficiency is not corrected at the conclusion of system inspection, testing, or maintenance, the system owner or the owner's designated representative shall be informed of the deficiency in writing within 24 hours.
- **14.2.2.3.3** In the event that any equipment is observed to be part of a recall program, the system owner or the system owner's designated representative shall be notified in writing.

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Chapter 14 - ITM

14.2.2.4 Observations.

- **14.2.2.4.1** If observations are noted, they shall be permitted to be communicated to the system owner.
- **14.2.2.4.2** The system owner shall not be required to address such observations unless the observations become an impairment or deficiency.

Observation – New definition to support Chapter 14. "An observation is a suggestion for improvement or enhancement of the fire alarm system that if not performed, it would result in an impairment or code deficiency."

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Chapter 17 – Initiating Devices

17.4.4 Initiating devices shall be supported independently of their attachment to the circuit conductors

17.4.7 Where a detector's alarm indicator is not visible, must use a remote indicator. (Removed 10 feet above floor.)

17.4.7.4 Remote alarm and supervisory indicators shall be labeled to indicate their function and any device or equipment associated with each detector.

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Chapter 17 – Initiating Devices

17.12.3*

Carbon monoxide detectors that are installed in air duct systems shall not be used as a substitute for open area protection.

TC Statement: "The Technical Committee agrees with the concept that duct type detectors are not to be used in lieu of area detectors."

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Chapter 18 – Notification Appliances

18.3.3.4 In situations where existing notification appliances previously used exclusively for fire alarm signaling and marked with the word 'FIRE' are to be used for signaling other than fire, field modification to the marking shall be permitted provided that it is accomplished by one of the following methods:

(1) In accordance with manufacturers' published instructions

(2) Installation of a permanent sign directly adjacent or below the notification appliance indicating that it is multipurpose and will operate for fire and other emergency conditions

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Chapter 18 – Notification Appliances

18.3.7 Notification Appliance Circuits.

18.3.7.1* A notification appliance circuit shall comply with Chapter 12.

18.3.7.2 The selection of wire size and material shall meet the performance requirements of this chapter and Chapter 14.

3.3.300 Supervised ***Notification Appliance*** Control Circuit.

- An output circuit that is monitored for integrity and used exclusively to activate control equipment for notification appliance circuits.
- Committee statement: "Added "Notification Appliance" to the term to distinguish it from other control circuits. Adding control equipment and notification appliance circuits to better define the usage of this application."

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Chapter 18 – Notification Appliances

18.5.5.5* The minimum mounting height of a visual notification appliance listed for ceiling mounting shall be 80 in. (2.03 m) above the finished floor or the actual ceiling height, whichever is less.

18.5.5.6* Obstructions.

18.5.5.6.1 Ceiling mount visual notification appliances shall be mounted such that the effect of the appliance is not blocked by obstructions.

18.5.5.6.2 The effect of obstructions on distribution of light from wall-mounted appliances shall be considered when determining the location of appliances.

18.5.5.6.3 The effect of obstructions on the direct viewing of corridor appliances shall be considered when determining the location of appliances.

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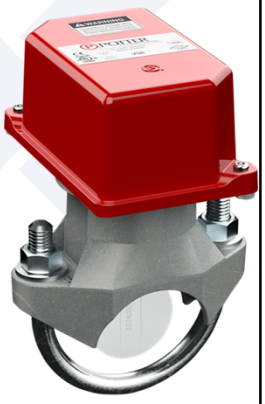
Chapter 21 – Elevator Interface

21.3.3.2

A waterflow switch shall be permitted to initiate Elevator Phase I Emergency Recall Operation upon activation of a sprinkler installed at the bottom of the elevator hoistway (the elevator pit), provided the waterflow switch and pit sprinkler are installed on a separately valved sprinkler line dedicated solely for protecting the elevator pit.



TC Statement:

Elevator recall does not require a waterflow switch without time delay (as elevator power shut down would). Therefore, clarifying the intent of a waterflow switch provided for a pit sprinkler as a device permitted to have a time delay capability. This will resolve the potential issue of elevator recall upon water supply pressure fluctuations.

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Chapter 23 – Protected Premises

23.8.1.2.1.3 Manually actuated alarm-initiating devices shall be permitted to be included in a positive alarm sequence where specifically approved by the authority having jurisdiction.

TC Statement: Due to the potential use of manually actuated alarm-initiating devices (e.g., fire alarm boxes) being used in active shooter or hostile intruder situations, the owner should have a means by which existing installed manual pull stations can be placed in a positive alarm sequence in accordance with the ***facilities' emergency response plan***. This language allows the AHJ to review and approve the addition of manual alarms to a positive alarm sequence. An owner and the system vendor would have to provide substantiation that their system and procedures would allow for approval of the installation

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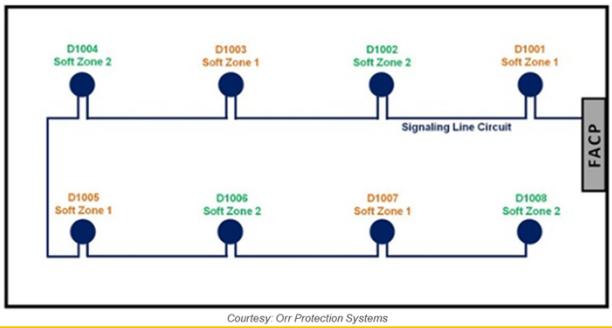
Chapter 23 – Protected Premises

23.8.5.4.3(4) The specific sequence of operations is detailed in the design documents as defined by Chapter 7.

Cross-zoning of detectors needs to have specific sequence of operation detailed on the shop drawings.



Courtesy: Orr Protection Systems

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Chapter 24 – Emergency Communications

24.4.8.3.2* When the message is recorded, the repeated message sequence of 24.4.8.3.1 shall itself be repeated after a pause of 180 seconds maximum, or other time as established by the building safety fire plan and approved by the authority having jurisdiction, until automatically silenced or reset by emergency personnel.

- 24.4.8.3.1 is the "sequence" – the alert tone followed by the message(s) that is repeated at least three times in the signaling zone.

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Chapter 24 – Emergency Communications

24.10 Two-Way Emergency Communications Systems for Rescue Assistance

- **24.10.1:** Must be listed to (such as) UL 2525 (Two-way Emergency Communications Systems for Rescue Assistance)
- **24.10.2.1:** Secondary power for 24 hours quiescent load and then 4 hours with all remote stations activated and all master control stations annunciating.
- **24.10.2.2:** Must be capable of monitoring additional power supplies for off-premises communications.
- Other changes including call sequencing, signage, and training.

IFC 2024 will require compliance with UL 2525 and NFPA 72!

Courtesy: Cornell Communications

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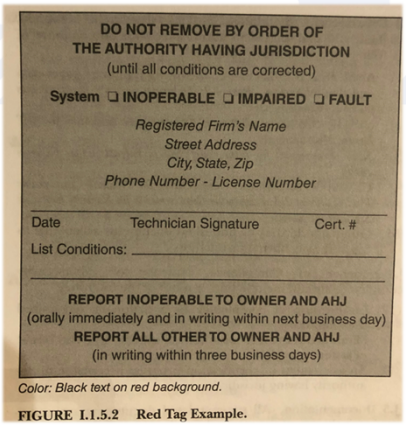
Annex I – Color-Coded Tagging Program

Completely new Annex to outline a fire alarm system tagging process for AHJs, owners, and service providers.

- *White*
- *Blue*
- *Yellow*
- *Red*



DO NOT REMOVE BY ORDER OF
THE AUTHORITY HAVING JURISDICTION
(until all conditions are corrected)

System ❑ INOPERABLE ❑ IMPAIRED ❑ FAULT

Registered Firm's Name
Street Address
City, State, Zip
Phone Number - License Number

Date Technician Signature Cert. #

List Conditions: _____

REPORT INOPERABLE TO OWNER AND AHJ
(orally immediately and in writing within next business day)
REPORT ALL OTHER TO OWNER AND AHJ
(in writing within three business days)

Color: Black text on red background.

FIGURE I.1.5.2 Red Tag Example.

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