



Second Revision No. 5095-NFPA 72-2023 [Detail]

Revise the heading of Section 11.7 to read: Network Connectable Equipment
Cybersecurity Software Updates

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Jul 25 10:00:18 EDT 2023

Committee Statement

Committee Statement: This revision is to align with the action taken to delete the definition 3.3.291.4 Cybersecurity Related Only Software.

Response Message: SR-5095-NFPA 72-2023



Second Revision No. 5068-NFPA 72-2023 [Section No. 1.4.1]

1.4.1

The ~~Unless otherwise permitted elsewhere in this Code, the~~ provisions of this document shall not be required to be applied to facilities, equipment, structures, or installations that were existing or approved for construction or installation prior to the effective date of the document.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 09:39:43 EDT 2023

Committee Statement

Committee Statement: The revision adds clarity to application of the requirement to new and existing buildings.

Response Message: SR-5068-NFPA 72-2023

[Public Comment No. 22-NFPA 72-2023 \[Section No. 1.4.1\]](#)



Second Revision No. 5069-NFPA 72-2023 [Section No. 2.2]

2.2 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2025 edition.

NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, 2023 edition.

NFPA 37, *Standard for the Installation and Use of Stationary Combustion Engines and Gas Turbines*, 2024 edition.

NFPA 70[®], *National Electrical Code*[®], 2023 edition.

NFPA 75, *Standard for the Fire Protection of Information Technology Equipment*, 2024 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2024 edition.

NFPA 101[®], *Life Safety Code*[®], 2024 edition.

NFPA 110, *Standard for Emergency and Standby Power Systems*, 2025 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2025 edition.

NFPA 170, *Standard for Fire Safety and Emergency Symbols*, 2024 edition.

NFPA 601, *Standard for Security Services in Fire Loss Prevention*, 2020 edition.

NFPA 715, *Standard for the Installation of Fuel Gases Detection and Warning Equipment*, 2023 edition.

NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*, 2023 edition.

NFPA 1031, *Standard for Professional Qualifications for Fire Inspector and Plan Examiner*, 2014 edition.

NFPA 1225, *Standard for Emergency Services Communications*, 2022 edition.

NFPA 1600[®], *Standard on Continuity, Emergency, and Crisis Management*, 2019 edition.

NFPA 1620, *Standard for Pre-Incident Planning*, 2020 edition.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 09:49:21 EDT 2023

Committee Statement

Committee Statement: NFPA 715 is the new standard for fuel gas detection. Several other PCs have been submitted to other sections of NFPA 72 to point to NFPA 715 for fuel gas detection. Therefore, it needs to be added to the referenced publications.

Response Message: SR-5069-NFPA 72-2023

[Public Comment No. 3-NFPA 72-2023 \[Section No. 2.2\]](#)



Second Revision No. 5155-NFPA 72-2023 [Sections 2.3, 2.4]

2.3 Other Publications.

2.3.1 ASA Publications.

Acoustical Society of America, 1305 Walt Whitman Road, Suite 110, Melville, NY 11747-4300.
ANSI/ASA S1.4/Part 4, *Electroacoustics — Sound Level Meters — Part 1: Specifications*, 2014.
ANSI/ASA S3.41, *Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI)*, 2015.

2.3.2 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191.
ASCE/SEI 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, 2022.

2.3.3 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.
ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*, 2019.

2.3.4 ICC Publications.

International Code Council, 500 New Jersey Avenue, NW, 6th Floor, Washington, DC 20001.
ICC/ANSI A117.1, *Accessible and Usable Buildings and Facilities*, 2017.

2.3.5 IEEE Publications.

IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854-4141.
IEEE 450, *Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications*, 2020.
IEEE 1106, *Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications*, 2015.
ANSI/IEEE C2, *National Electrical Safety Code*, ~~2017~~ 2023 .

2.3.6 ISA Publications.

International Society of Automation, 3252 S. Miami Boulevard, #102, Durham, NC 27703.
~~ANSI/ISA/IEC 62443-2-3, *Security for Industrial Automation and Control Systems, Part 2-3: Patch Management in the IACS Environment* , 2015.~~
ANSI/ISA/IEC 62443-3-3, *Security for Industrial Automation and Control Systems, Part 3-3: System Security Requirements and Security Levels*, 2013.
ANSI/ISA/IEC 62443-4-2, *Security for Industrial Automation and Control Systems, Part 4-2: Technical Security Requirements for IACS Components*, ~~2019~~ 2018 .

2.3.7 ISO Publications.

International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.
ISO 7731, *Ergonomics — Danger signals for public and work areas — Auditory danger signals*, 2003 (reconfirmed 2015).
ISO/IEC 27001, *Information ~~Security Management~~ security management systems* , ~~2013~~ 2022 .

2.3.8 NIST Publications.

National Institute of Standards and Technology, 100 Bureau Drive, ~~Stop 1070~~, Gaithersburg, MD 20899-1070.

~~NIST~~ “Framework for Improving Critical Infrastructure Cybersecurity,” Version 1.1, 2018.

2.3.9 ~~Telecordia~~ Ericsson Group Publications.

~~Telecordia Technologies, One Telecordia Drive, Piscataway, NJ 08854.~~ Ericsson Group, 6300 Legacy Drive, Plano, TX 75024.

~~GR-506-CORE, LATA Switching Systems Generic Requirements: Signaling for Analog Interface~~, 2011.

~~GR-909-CORE, Generic Criteria for Fiber in the Loop Systems~~, 2004.

2.3.10 TIA Publications.

Telecommunications Industry Association, 1310 North Courthouse Road, Suite 890, Arlington, VA 22201.

~~ANSI/TIA 568.3, Optical Fiber Cabling and Components Standard~~, ~~2016~~ 2022 .

2.3.11 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

~~UL 38, Manual Signaling Boxes for Fire Alarm Systems~~, ~~2008~~, revised ~~2018~~:

UL 217, *Smoke Alarms*, 2020, revised 2022.

UL 268, *Smoke Detectors for Fire Alarm Systems*, ~~2016~~, revised ~~2021~~ 2023 .

~~UL 521, Heat Detectors for Fire Protective Signaling Systems~~ , ~~1999~~, revised ~~2021~~:

UL 827, *Central-Station Alarm Services*, 2014, revised 2021.

UL 864, *Control Units and Accessories for Fire Alarm Systems*, ~~2014~~ 2022 , revised ~~2020~~ 2023 .

UL 985, *Household Fire Warning System Units*, 2015, revised ~~2018~~ 2022 .

~~UL 1484, Residential Gas Detectors~~ , ~~2016~~, revised ~~2022~~:

UL 1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*, ~~2017~~ 2023 .

UL 1730, *Smoke Detector Monitors and Accessories for Individual Living Units of Multifamily Residences and Hotel/Motel Rooms*, 2006, revised ~~2017~~ 2022 .

UL 1971, *Signaling Devices for the Hearing Impaired*, 2002, revised 2018.

UL 1981, *Central-Station Automation Systems*, 2014, revised ~~2019~~ 2023 .

UL 2017, *General-Purpose Signaling Devices and Systems*, 2008, revised 2018.

UL 2034, *Single and Multiple Station Carbon Monoxide Alarms*, 2017, revised ~~2018~~ 2022 .

UL 2075, *Gas and Vapor Detectors and Sensors*, 2013, revised ~~2021~~ 2023 .

UL 2525, *Two-way Way Emergency Communications Systems for Rescue Assistance*, 2020.

UL 2572, *Mass Notification Systems*, 2016, revised 2018.

~~CAN/UL 2900-1, Standard for Software Cybersecurity for Network-Connectable Products, Part 1: General Requirements~~ , ~~2020~~:

~~CAN/UL 2900-2-3, Software Cybersecurity for Network-Connectable Products, Part 2-3: Particular Requirements for Security and Life Safety Signaling Systems~~, 2020.

UL 60950-1, *Information Technology Equipment — Safety — Part 1: General Requirements*, 2007, revised 2019.

UL 62368-1, *Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements*, 2019, revised 2021.

2.3.12 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2020.

2.4 References for Extracts in Mandatory Sections.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2025 edition.

NFPA 70[®], *National Electrical Code*[®], 2023 edition.

NFPA 101[®], *Life Safety Code*[®], 2024 edition.

NFPA 654, *Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids*, 2020 edition.

NFPA 715, *Standard for the Installation of Fuel Gases Detection and Warning Equipment*, 2023 edition.

NFPA 1225, *Standard for Emergency Services Communications*, 2022 edition.

NFPA 5000[®], *Building Construction and Safety Code*[®], 2024 edition.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Aug 01 15:38:33 EDT 2023

Committee Statement

Committee Statement: This revision updates references in accordance with the Reference Policy.

Response Message: SR-5155-NFPA 72-2023



Second Revision No. 5153-NFPA 72-2023 [Section No. 3.3.2]

3.3.2 Accessible (as applied to wiring methods).

Capable of being removed or exposed without damaging the building structure or finish or not permanently closed in or blocked by the structure, other electrical equipment, other building systems, or finish of the building. [70, 2023] (SIG-FUN)

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Aug 01 14:40:06 EDT 2023

Committee Statement

Committee Statement: This revision updates extracted text in accordance with the Extract Policy.

Response Message: SR-5153-NFPA 72-2023



Second Revision No. 5070-NFPA 72-2023 [Section No. 3.3.188]

3.3.190* Network Connectable Equipment.

System components that connect to the internet or external systems through wired or wireless pathways using various protocols.

A.3.3.190 Network Connectable Equipment.

Examples of external systems include, but are not limited to, building controls and elevator controls.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 10:06:02 EDT 2023

Committee Statement

Committee Statement: The new annex material provides an example of external systems described by the definition.

Response Message: SR-5070-NFPA 72-2023

Public Comment No. 107-NFPA 72-2023 [Section No. 3.3.188]



Second Revision No. 5094-NFPA 72-2023 [Section No. 3.3.291.4]

~~3.3.293.4 Cybersecurity-Related Only Software:~~

~~Software that is included in a system element that is arranged such that its inclusion or exclusion in no way affects the executive or site-specific software execution and whose purpose is to reduce the vulnerability of the system to cybersecurity attacks. (SIG-FUN)~~

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Jul 25 09:50:01 EDT 2023

Committee Statement

Committee Statement: Based on the public comment from the Correlating Committee, the definition has been deleted so that a single definition for cybersecurity-related software is used in the standard. The definition for cybersecurity software should remain under the purview of SIG-FUN.

Response Message: SR-5094-NFPA 72-2023

[Public Comment No. 24-NFPA 72-2023 \[Global Input\]](#)



Second Revision No. 5072-NFPA 72-2023 [New Section after 7.3.4.6]

7.3.4.7

Design documentation for restricted audible mode operation (RAMO) notification, including the definition of the protected space, sound pressure levels, and staff requirements, shall comply with 18.4.8 .

7.3.4.8

Design documentation for maximum public mode audible levels, including the definition of the protected space and design sound pressure levels, shall comply with 18.4.1.9.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 10:12:06 EDT 2023

Committee Statement

Committee Statement: Section 18.4.1.8 on restricted audible mode operation (RAMO) notification was added to the standard at the first draft stage and these new requirements in Chapter 7 provide clarity for application by the user.

Response Message: SR-5072-NFPA 72-2023

Public Comment No. 250-NFPA 72-2023 [New Section after 7.3.4.6]



Second Revision No. 5084-NFPA 72-2023 [New Section after 7.6.6]

7.6.7 Network Connectable Equipment Maintenance Plan.

7.6.7.1 Electronic Access Credentials.

7.6.7.1.1* _

Maintenance plans for network connectable equipment shall identify all accounts, personnel, and organizations with electronic access credentials that could be used by a cybersecurity threat actor.

A.7.6.7.1.1 _

Maintaining cybersecurity includes performing due diligence to ensure the trustworthiness of installers, maintenance people, and users. Background checks are an obvious example, but also important is management of credentials, separation of duties, least privilege, need-to-know, and account maintenance. A former employee who has been terminated and is disgruntled might cause significant damage to systems if their access privileges are not promptly revoked.

7.6.7.1.2 _

Personnel or organizations with electronic access credentials shall be reviewed annually to maintain least privilege access or to eliminate access where it is no longer required.

7.6.7.2 Access Logs.

7.6.7.2.1* _

The owner shall maintain access logs for network connectable equipment that supports remote access.

A.7.6.7.2.1 _

Logs and audit trails are critically important to establishing whether a system has been attacked, who the attacker might be, or the avenue of attack. For example, changes to a system configuration or software version could be legitimate or illegitimate; unless it is known when and who made these changes, it can be very difficult to assess the intent. Also, if particular credentials are being used inappropriately, information contained in logs and audit trails are often necessary to properly respond. In this context, logs and audit trails themselves require appropriate protection. Individuals and accounts with privileges that are being tracked should not also have privileges to access and change the logs or audit trails.

7.6.7.2.2 _

The owner shall review access logs at least annually and compare them to the access credentials used in the maintenance records to ensure previous access has been approved.

Submitter Information Verification

Committee: SIG-FUN

Submission Date: Mon Jul 24 14:49:55 EDT 2023

Committee Statement

Committee Statement: A significant number of cybersecurity incidents occur via attacking credentials and this section provides means to document access to the system.

Response Message: SR-5084-NFPA 72-2023

[Public Comment No. 119-NFPA 72-2023 \[New Section after A.11.3\]](#)

[Public Comment No. 120-NFPA 72-2023 \[New Section after A.11.3\]](#)



Second Revision No. 5074-NFPA 72-2023 [Section No. 7.7.2.3]

7.7.2.3*

All record documentation shall comply with the following:

Stored in the documentation cabinet

Not stored in the control unit

7.7.2.3.1

All record documentation shall be stored in a dedicated documentation cabinet.

7.7.2.3.2

Record documentation shall not be stored in any control unit enclosure.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
Chapter_7_7_7_2_3_SR-5074.docx	Chapter_7_7_7_2_3_SR-5074	

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 10:22:31 EDT 2023

Committee Statement

Committee Statement: The requirements have been written in two separate statements that comply with the Manual of Style and provide additional clarity on record storage.

Response Message: SR-5074-NFPA 72-2023

Public Comment No. 26-NFPA 72-2023 [Section No. 7.7.2.3]



Second Revision No. 5098-NFPA 72-2023 [Section No. 10.4.4]

10.4.4*

~~Unless otherwise permitted by the authority having jurisdiction, control~~ Control unit displays, visible indicators, or controls shall be mounted to comply with both of the following unless otherwise permitted by the authority having jurisdiction :

- (1) The distance to the highest switch, lamp, or top of any textual display does not exceed 6 ft (1.8 m) above the finished floor.
- (2) The distance to the lowest switch, lamp, or bottom of any textual display is not within 15 in. (375 mm) of the finished floor.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Jul 25 17:21:45 EDT 2023

Committee Statement

Committee Statement: The revision clarifies that the lowest line of text in not to be less than 15 inches from the floor and not higher than 6 feet above the floor. The term centerline can result in different heights depending on the size of the display.

Response Message: SR-5098-NFPA 72-2023

[Public Comment No. 194-NFPA 72-2023 \[Section No. 10.4.4\]](#)



Second Revision No. 5078-NFPA 72-2023 [Section No. 10.21.1]

10.21.1

The system owner or the owner's designated representative shall be notified within 8 hours when a system or part thereof is impaired.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 11:43:19 EDT 2023

Committee Statement

Committee Statement: It is necessary to specify the amount of time in which the notification of the owner must occur.

Response Message: SR-5078-NFPA 72-2023

Public Comment No. 77-NFPA 72-2023 [Section No. 10.21.1]



Second Revision No. 5079-NFPA 72-2023 [Section No. 11.2]

11.2* Network Connectable Equipment Software Development and Production Environments.

Development and production environments used to develop and manufacture network connectable equipment shall employ cybersecurity safeguards that are consistent with one or more of the following ~~standards~~ :

- (1) NIST's ~~Cybersecurity~~ "Framework for Improving Critical Infrastructure Cybersecurity"
- (2) ISO/IEC 27001, ~~Information Security Management~~ security management systems
- (3) IASME Consortium Cyber Essentials
- (4) Other equivalent standards acceptable to a ~~Nationally Recognized Testing Laboratory~~ nationally recognized testing laboratory.
- (5)* Other applicable laws and regulations

A.11.2(5)

Other agencies using this Code might be required to meet specific laws and regulations pertaining to cybersecurity when installing any fire alarm or signaling systems. Therefore, system manufacturers, designers, and installers should be aware of any additional requirements needed to meet the specific laws and regulations.

A.11.2

The security practices for the design, development, production, and service of network connectable equipment includes the overall cybersecurity posture of the manufacturing company itself. For example, it does not matter how well a system is designed or deployed from a cybersecurity perspective if the manufacturer does not adequately secure its own development, manufacturing, and patch/update distribution systems. Threat actors can compromise products by installing covert back doors during initial development, or during the development and distribution of software updates.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 12:13:08 EDT 2023

Committee Statement

Committee Statement: The current section does not address federal laws and regulations. The technical committee revised the requirement to recognize all other applicable laws and standards pertaining to cybersecurity.

All the requirements of Chapter 11 currently apply to the systems themselves, except 11.2 which applies to the manufactures. The new annex material provides context as to why the connection between securing the manufactures operations is important to securing the systems themselves.

Response SR-5079-NFPA 72-2023

Message:

[Public Comment No. 116-NFPA 72-2023 \[New Section after A.11.1.2\]](#)

[Public Comment No. 242-NFPA 72-2023 \[Section No. 11.2\]](#)



Second Revision No. 5081-NFPA 72-2023 [Section No. 11.3]

11.3* Security Levels for Network Connectable Equipment.

All interfaces used to communicate with network connectable equipment shall be protected using the following minimum security levels:

- (1) For non-internet-facing wired interfaces that do not employ internet protocol, ANSI/ISA/IEC 62443-4-2/3-3 Security Level 1 or CAN/ UL 2900-2-3 Security Level 1 or ~~the equivalent a~~ comparable level associated with Section 11.2(4)
- (2) For all cellular, Bluetooth, wireless interfaces, and other accessible interfaces that do not employ internet protocol, IEC 62443-4-2/3-3 Security Level 2 or CAN/ UL 2900-2-3 Security Level 2 or ~~the equivalent a comparable~~ level associated with Section 11.2(4)
- (3) For all non-internet-facing wired interfaces and those non-internet-facing wireless interfaces that employ internet protocol, ANSI/ISA/IEC 62443-4-2/3-3 Security Level 2 or CAN/ UL 2900-2-3 Security Level 2 or ~~the equivalent a comparable~~ level associated with Section 11.2(4)
- (4) For all wired or wireless internet- facing interfaces or publicly accessible networks, ANSI/ISA/IEC 62443-4-2/~~2-3~~ 3-3 Security Level 3 or CAN/ UL 2900-2-3 Security Level 3 or ~~the equivalent a comparable~~ level associated with Section 11.2(4)

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 14:24:05 EDT 2023

Committee Statement

Committee Statement: Security Levels from 62443-4-3 and 62443-3-3 are not equivalent to security levels in UL 2900. So, it would be impractical to consider another standard, only if its security levels were equivalent to these two examples. This change is intended to modify an unattainable requirement to become a practical requirement. A typographical error in list item #4 has been corrected.

Response Message: SR-5081-NFPA 72-2023

[Public Comment No. 110-NFPA 72-2023 \[Section No. 11.3\]](#)



Second Revision No. 5082-NFPA 72-2023 [New Section after 11.4]

11.5 Network Connectable Equipment Using Shared Pathways.

11.5.1

Network connectable equipment using the security levels required by Section 11.3 (2) through Section 11.3 (4) shall comply with 23.6.3.3 through 23.6.3.5 and 7.6.7 .

11.5.2

Network connectable equipment using Shared Pathway Level 0, Shared Pathway Level 1, or Shared Pathway Level 2 shall comply with 23.6.3.3 through 23.6.3.5 and 7.6.7 .

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 14:29:21 EDT 2023

Committee Statement

Committee Statement: Pathways that are shared pathways are subject to the requirements of Chapter 23. There is a danger that in the context of cybersecurity, this relationship between shared pathway requirements and cybersecurity requirements may not be apparent. The proposed requirements for documentation are more appropriately located in Chapter 7.

Response Message: SR-5082-NFPA 72-2023

Public Comment No. 111-NFPA 72-2023 [New Section after 11.4]



Second Revision No. 5154-NFPA 72-2023 [Section No. 11.5]

11.6 Unused Physical Data Ports.

All unused physical data ports shall be protected by in at least one of the following ways :

- (1) Physically protected from unauthorized access
- (2) Administratively disabled
- (3) Configured to require a token-based authentication, certificate-based authentication, password, or other method that is consistent with the security requirements of the system

A.11.6

~~There might be data that a life safety system(s) maintains that could be considered confidential. It is necessary to protect information that could be used to aid in compromising a system(s) — for example, information such as online documentation that reveals system maintenance status, locations and IP addresses of devices, wiring information, network switch port numbers, riser information, cabling pathways, encryption keys, or user credentials. If compromised, all could be used to attack the life safety system or other connected systems. Different types of cybersecurity attacks attempt to compromise user and system accounts, especially privileged accounts. It is common industry practice to find networkable devices that have limited account management, use common account names and passwords (e.g., *admin* ; *password*), and are configured with built-in accounts that have no individual users (requiring multiple users to share passwords), no levels of access (effectively making any access privileged access), no ability to apply permissions based on the user's job functions, no ability to disable specific accounts (necessary when users change jobs), and no centralized management of these accounts (accounts might be isolated to specific devices and must be managed one device at a time). These devices rely upon specific actions to change these parameters that could occur without being known to the system owners. This should be considered when selecting security levels for various elements of the system.~~

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Aug 01 15:28:31 EDT 2023

Committee Statement

Committee Statement: Section 11.5 addresses unused physical data ports, which is a completely different concern than the protection of data generally and the account management issues that are addressed in this annex material. While this material is relevant to cybersecurity in general, it is not directly relevant to unused physical data ports. These concepts should be represented in reference to a section that is charged with account management.

Response Message: SR-5154-NFPA 72-2023

[Public Comment No. 121-NFPA 72-2023 \[Section No. A.11.5\]](#)



Second Revision No. 5086-NFPA 72-2023 [Section No. 11.7.6]

11.8.6

~~Cybersecurity-related only~~ Cybersecurity software updates applied to ~~barrier~~ gateways or firewalls that do not affect the system site-specific or system executive software shall not be required to comply with 14.4.2.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 15:32:03 EDT 2023

Committee Statement

Committee Statement: The term “barrier gateway” as used previously in NFPA 72, includes the notion of one-way communication to protect life safety equipment from interference by other connected equipment. The following, enhanced content from NFPA 72, 2022, illustrates the point:

“On the fire alarm side of the gateway, the information passed is one way; this information is supplemental annunciation only. It does not permit control of the fire alarm system with regard to the acknowledging of alarm signals, silencing of notification appliances, or, for example, the resetting of the control unit from a building automation workstation — nor does it permit programming changes from that same workstation.”

This is not consistent with 23.8.2.11 Remote Access, which permits many of these activities under certain circumstances, but isn’t consistent with the one-way nature of a barrier gateway.

From the perspective of networking, a gateway is a two-way communication device that uses other methods to protect devices behind the gateway from interference. This change seeks to generalize the use of the term in the context of cybersecurity and be consistent with the 11.6 use of the term “gateway”. This revision also aligns with the action taken to delete the definition 3.3.291.4 Cybersecurity Related Only Software.

Response Message: SR-5086-NFPA 72-2023

[Public Comment No. 113-NFPA 72-2023 \[Section No. 11.7.6\]](#)



Second Revision No. 5087-NFPA 72-2023 [Section No. 11.7.7]

11.8.7

~~Cybersecurity-related only~~ Cybersecurity software changes to systems or system components shall be permitted to be made by remote access in accordance with ~~Chapter 23~~ 23.8.2.11.3.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 15:34:15 EDT 2023

Committee Statement

Committee Statement: Chapter 23 has different requirements for different type of remote access. Providing a specific reference provides clarity to the reader. This revision also aligns with the action taken to delete the definition 3.3.291.4 Cybersecurity Related Only Software.

Response Message: SR-5087-NFPA 72-2023

[Public Comment No. 114-NFPA 72-2023 \[Section No. 11.7.7\]](#)



Second Revision No. 5096-NFPA 72-2023 [Section No. 11.8]

11.9 Notification of Termination of Cybersecurity Update Support.

The manufacturer shall notify the system owner or their representative of the termination of ~~software cybersecurity-related cybersecurity~~ software update support required by Section 11.8 for any element of the system.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Jul 25 10:07:25 EDT 2023

Committee Statement

Committee Statement: This revision is to align with the action taken to delete the definition 3.3.291.4 Cybersecurity Related Only Software.

Response Message: SR-5096-NFPA 72-2023



Second Revision No. 5089-NFPA 72-2023 [New Section after 11.10.2]

11.11.3

The validity of the equipment manufacturer's contact information for the system owner shall be verified annually by the person testing the system.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Mon Jul 24 15:53:49 EDT 2023

Committee Statement

Committee Statement: In the First Draft Report of Chapter 11, manufacturers are required to reach out to system owners to notify of security updates. That contact information is required to be established by the installer, at the time of acceptance testing, but there is no mechanism to ensure that the contact information remains up-to-date. This requirement corrects that, annually, at the same time as the validity of cybersecurity certification is checked. SIG-FUN asks the Correlating Committee to review 11.10 for the purposes of proper placement in the document. This requirement may be more appropriately located in Chapter 14.

Response Message: SR-5089-NFPA 72-2023

Public Comment No. 115-NFPA 72-2023 [New Section after 11.11]



Second Revision No. 5091-NFPA 72-2023 [Section No. A.10.5.3.4(2)]

A.10.5.3.4(2)

Nationally recognized fire alarm certification programs might include those programs formerly offered by the International Municipal Signal Association (IMSA) and those currently offered by the International Public Safety Institute (IPSI), the National Institute for Certification in Engineering Technologies (NICET), and the Electronic Security Association (ESA).

NOTE: These organizations and the products or services offered by them have not been independently verified by ~~the~~ NFPA; nor have the products or services been endorsed or certified by ~~the~~ NFPA or any of its technical committees.

Submitter Information Verification

Committee: SIG-FUN

Submittal Date: Tue Jul 25 09:13:29 EDT 2023

Committee Statement

Committee Statement: IMSA no longer offers fire alarm training programs; however, there are a significant number of IMSA Certified professionals. These programs are still developed through the IMSA Educational Foundation (IMSAEF) but are now offered through the International Public Safety Institute (IPSI).

Response Message: SR-5091-NFPA 72-2023

[Public Comment No. 19-NFPA 72-2023 \[Section No. A.10.5.3.4\(2\)\]](#)

[Public Comment No. 162-NFPA 72-2023 \[Section No. A.10.5.3.4\(2\)\]](#)



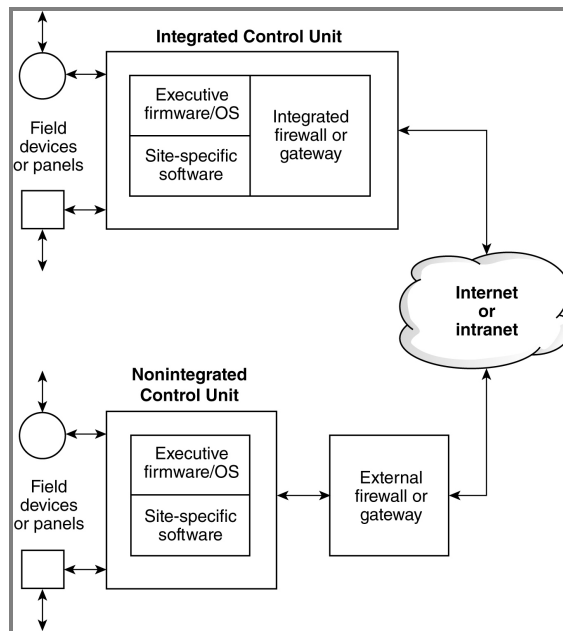
Second Revision No. 5093-NFPA 72-2023 [Section No. A.11.6]

A.11.7

Figure A.11.7 depicts ~~typical~~ system ~~typical~~ firewall/gateway operation. Such functionality, when deployed, could take the form of physical hardware, firmware, or both. The firewall/gateway might be physically integrated into the control unit, as shown in the integrated control unit graphic, or a separate device/service that interacts with the control unit, as shown in the nonintegrated control unit.

Many networks have additional protections, such as multiple firewalls.

Figure A.11.7 System Typical Firewall/Gateway Operation.



Submitter Information Verification

Committee: SIG-FUN
Submittal Date: Tue Jul 25 09:32:11 EDT 2023

Committee Statement

Committee Statement: This section covers firewalls and gateways. The text that was not accepted provided unnecessary detail.
Response Message: SR-5093-NFPA 72-2023

[Public Comment No. 122-NFPA 72-2023 \[Section No. A.11.6\]](#)



Second Revision No. 5097-NFPA 72-2023 [Chapter J]

Annex J Informational References

J.1 Referenced Publications.

The documents or portions thereof listed in this annex are referenced within the informational sections of this Code and are not part of the requirements of this document unless also listed in Chapter 2 for other reasons.

J.1.1 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 3, *Standard for Commissioning of Fire Protection and Life Safety Systems*, 2024 edition.

NFPA 4, *Standard for Integrated Fire Protection and Life Safety System Testing*, 2024 edition.

NFPA 10, *Standard for Portable Fire Extinguishers*, 2022 edition.

NFPA 13, *Standard for the Installation of Sprinkler Systems*, 2025 edition.

NFPA 70[®], *National Electrical Code*[®], 2023 edition.

NFPA 72E, *Standard for Automatic Fire Detectors*, ~~1984~~ 1990 edition.

NFPA 80, *Standard for Fire Doors and Other Opening Protectives*, 2025 edition.

NFPA 90A, *Standard for the Installation of Air-Conditioning and Ventilating Systems*, 2024 edition.

NFPA 90B, *Standard for the Installation of Warm Air Heating and Air-Conditioning Systems*, 2024 edition.

NFPA 92, *Standard for Smoke Control Systems*, 2024 edition.

NFPA 101[®], *Life Safety Code*[®], 2024 edition.

NFPA 105, *Standard for Smoke Door Assemblies and Other Opening Protectives*, 2025 edition.

NFPA 111, *Standard on Stored Electrical Energy Emergency and Standby Power Systems*, 2025 edition.

NFPA 170, *Standard for Fire Safety and Emergency Symbols*, 2024 edition.

NFPA 551, *Guide for the Evaluation of Fire Risk Assessments*, 2022 edition.

NFPA 730, *Guide for Premises Security*, 2023 edition.

NFPA 855, *Standard for the Installation of Stationary Energy Storage Systems*, 2023 edition.

NFPA 909, *Code for the Protection of Cultural Resource Properties — Museums, Libraries, and Places of Worship*, 2021 edition.

NFPA 914, *Code for Fire the Protection of Historic Structures*, 2023 edition.

NFPA 1225, *Standard for Emergency Services Communications*, 2022 edition.

NFPA 1600[®], *Standard on Continuity, Emergency, and Crisis Management*, 2019 edition.

NFPA 5000[®], *Building Construction and Safety Code*[®], 2024 edition.

Datta, M., *Smoke Detector Spacing for High Ceiling Spaces — Phase II*, report prepared for Fire Protection Research Foundation, July 2023.

~~Fire Protection Research Foundation, *Elevator Messaging Strategies*, Fire Protection Research Foundation, 2011.~~

~~Fire Protection Research Foundation, *Optimizing Fire Alarm Notification for High Risk Groups*, Fire Protection Research Foundation, 2007.~~

~~Fire Protection Research Foundation, *Review of Alarm Technologies for Deaf and Hard of Hearing Populations*, Fire Protection Research Foundation, August 2021.~~

~~Fire Protection Research Foundation (FPRF) Report Beyler, C., and D. Gottuk, *Development of a Technical Basis for Carbon Monoxide Detector Siting*, report prepared by C. Beyler and D. Gottuk for Fire Protection Research Foundation, 2007.~~

J.1.2 Other Publications.

J.1.2.1 ASA Publications.

Acoustical Society of America, 1305 Walt Whitman Road, Suite 110, Melville, NY 11747-4300.

ANSI/ASA S3.2, *Method for Measuring the Intelligibility of Speech Over Communication Systems*, 2020.

ANSI/ASA S3.41, *Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI)*, 2015.

J.1.2.2 ASME Publications.

American Society of Mechanical Engineers, Two Park Avenue, New York, NY 10016-5990.

ASME A17.1/CSA B44, *Safety Code for Elevators and Escalators*, 2019.

ASME A.17.2, *Guide for Inspection of Elevators, Escalators, and Moving Walks*, 2020.

J.1.2.3 CENELEC Publications.

European Committee for Electrotechnical Standardization, CEN-CENELEC Management Centre, Rue de la Science 23, B-1040 Brussels, Belgium.

EN 50724, Fixed Ultrasonic Gas Leak Detectors (UGLD) — General requirements and test methods, 2022.

J.1.2.4 FEMA Publications.

Federal Emergency Management Agency, U.S. Department of Homeland Security, 500 C Street, SW, Washington, DC 20024.

FEMA Technical Bulletin, *Outdoor Warning Systems*, Version 2.0, January 2006.

J.1.2.5 FM Approvals LLC Publications .

FM Approvals LLC, 1151 Boston-Providence Turnpike, P.O. Box 9102, Norwood, MA 02062.

FM Approval Standard 3210, *Heat Detectors for Automatic Fire Alarm Signaling*, 2021.

FM Approval Standard 3260, *Radiant Energy-Sensing Fire Detectors for Automatic Fire Alarm Signaling*, 2021.

J.1.2.6 IEC Publications.

International Electrotechnical Commission, 3 rue de Varembe, P.O. Box 131, CH-1211 Geneva 20, Switzerland. IEC documents are available through ANSI.

IEC 60268-16, *Sound system equipment — Part 16: Objective rating of speech intelligibility by speech transmission index*, 2020.

J.1.2.7 IEEE Publications.

IEEE Operations Center, 445 Hoes Lane, Piscataway, NJ 08854-4141.

IEEE 485, *Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*, 2020.

IEEE 1188, *Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*, 2005 (reaffirmed R 2010).

~~IEEE 802.3 8802.3~~, *Standard for Information Technology — Telecommunications and Information Exchange Between Information Technology Systems — Requirements for Local and Metropolitan Area Networks — Specific Requirements — Part 3, Standard for Ethernet*, 2018: 2021.

IEEE 802.3bt™, *IEEE Standard for Ethernet, Amendment 2: Physical Layer and Management Parameters for Power over Ethernet over 4 pairs*, 2018.

J.1.2.8 IES Publications.

Illuminating Engineering Society of North America, 120 Wall Street, 17th floor, New York, NY 10005-4001.

Lighting Handbook: Reference and Application, 2011.

J.1.2.9 ISA Publications.

International Society of Automation, 3252 S. Miami Boulevard, #102, Durham, NC 27703.

ANSI/ISA 62443, *Security for Industrial Automation and Control Systems Series*, 2020.

J.1.2.10 ISO Publications.

International Organization for Standardization, ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier, Geneva, Switzerland.

ISO 7240-19, *Fire detection and alarm systems — Part 19: Design, installation, commissioning, and service of sound systems for emergency purposes*, 2007 (~~R~~, reconfirmed, 2018).

ISO 8201, *Alarm systems — Audible emergency evacuation signal — Requirements*, 2017.

ISO/IEC 14763-3, ~~Informational~~ *Information technology — Implementation and operation of customer premises cabling — Part 3: Testing of optical fibre cabling*, 2014.

J.1.2.11 NEMA Publications.

National Electrical Manufacturers Association, 1300 North 17th Street, Suite 900, Arlington, VA 22209.

NEMA ~~SB-7~~ BS-30003, *Applications Guide for Carbon Monoxide Alarms and Detectors*, ~~2018~~ 2022.

ANSI/NEMA SB-40, *Communications Systems for Life Safety in Schools*, 2015.

NEMA SB-50, *Emergency Communications Audio Intelligibility Applications Guide*, 2021.

J.1.2.12 NIST Publications.

National Institute of Standards and Technology, 100 Bureau Drive, ~~Stop 1070~~, Gaithersburg, MD 20899-1070.

~~Kuligowski, Erica D.~~, NIST Technical Note 1779, *General Guidance on Emergency Communications Strategies for Buildings*, February 2013.

~~NIST~~ “Framework for Improving Critical Infrastructure Cybersecurity,” Version 1.1, 2018.

NIST Technical Note 1455-1, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings*, February 2008.

J.1.2.13 OASIS Publications.

Organization for the Advancement of Structured Information Standards (OASIS), 400 ~~Trade Center~~ Tradecenter Drive, Suite 5900, Woburn, MA 01801.

OASIS Standard CAP-V1.2, *OASIS Common Alerting Protocol*, Version 1.2, 2010.

J.1.2.14 SFPE Publications.

Society of Fire Protection Engineers, 9711 Washingtonian Boulevard, Suite 380, Gaithersburg, MD 20878.

~~SFPE~~ *Engineering Guide: Evaluation of the Computer Fire Model DETACT QS*, 2002.

~~SFPE Engineering Guide to Fire Risk Assessment~~, ~~2006~~ 2nd edition, 2022.

~~SFPE Engineering Guide to Human Behavior in Fire~~, ~~2019~~ 2018.

SFPE Engineering Guide to Performance-Based Fire Protection, 2nd edition, 2007.

SFPE Handbook of Fire Protection Engineering, 5th edition, 2016.

“Projected Beam Smoke Detectors — More Than Just a Substitute for Spot Detectors,” *Fire Protection Engineering*, ~~Issue~~ No. 23, Summer 2004, ~~SFPE~~.

J.1.2.15 TIA Publications.

Telecommunications Industry Association, 1310 North Courthouse Road, Suite 890, Arlington, VA 22201.

TIA 526, *Standard Test Procedures for Fiber Optic Systems*, September 1992.

J.1.2.16 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 38, *Manual Signaling Boxes for Fire Alarm Systems*, 2008, revised 2018.

UL 217, *Smoke Alarms*, 2020, revised 2022.

UL 268, *Smoke Detectors for Fire Alarm Systems*, 2020, revised 2024 2023 .

UL 268A, *Smoke Detectors for Duct Application*, 2008, revised 2020.

UL 521, *Heat Detectors for Fire Protective Signaling Systems*, 1999, revised 2023.

UL 827, *Central-Station Alarm Services*, 2014 2022 , revised 2024 2023 .

UL 864, *Control Units and Accessories for Fire Alarm Systems*, 2014, revised 2020.

UL 1484, *Residential Gas Detectors*, 2016, revised 2022.

UL 1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*, 2016, revised 2017 2023 .

UL 1971, *Signaling Devices for the Hearing Impaired*, 2002, revised 2018.

UL 1989, *Standby Batteries*, 2013, revised 2018.

UL 2034, *Single and Multiple Station Carbon Monoxide Alarms*, 2017, revised 2018 2022 .

UL 2054, *Household and Commercial Batteries*, 2021.

UL 2075, ~~Safety~~ *Gas and Vapor Detectors and Sensors*, 2013, revised 2021.

UL 2572, *Mass Notification Systems*, 2018.

CAN/UL 2900-1, *Software Cybersecurity for Network-Connectable Products, Part 1: General Requirements*, 2020 2023 .

CAN/UL 2900-2-3, *Software Cybersecurity for Network-Connectable Products, Part 2-3: Particular Requirements for Security and Life Safety Signaling Systems*, 2020.

UL 60950-1, *Information Technology Equipment — Safety — Part 1: General Requirements*, 2007, revised 2019.

UL 62368-1, *Audio/Video, Information and Communication Technology Equipment — Part 1: Safety Requirements*, 2019, revised 2021.

J.1.2.17 ~~U.S.~~ US Government Publications.

~~U.S.~~ US Government Publishing Office, 732 North Capitol Street, NW, Washington, DC 20401-0001.

ADA-ABA-AG, *Americans with Disabilities Act and Architectural Barriers Act Accessibility Guidelines*, 2010.

Federal Aviation Administration (FAA) Human Factors Awareness Course,
<http://www.hf.faa.gov/webtraining/Intro/Intro1.htm>.

Title 42 ~~U.S.C.~~, *United States Code, Parts 5401–5426*, “Manufactured Home Construction and Safety Standards.”

~~NIST Technical Note 1455-1, *Performance of Home Smoke Alarms, Analysis of the Response of Several Available Technologies in Residential Fire Settings*, February 2008.~~

Title 29, Code of Federal Regulations, Part 1910.5: “Occupational Safety and Health Standards — Applicability of Standards.”

Title 47, Code of Federal Regulations, Part 15, “Radio Frequency Devices.”

J.1.2.18 References Associated with Annex A.**J.1.2.18.1** Reference to A.17.6.3.5.1.

Schifiliti, R., and W. Pucci, ~~W.~~ “Fire Detection Modelling, State of the Art,” 6 May 1996, sponsored by the Fire Detection Institute, Bloomfield, CT.

J.1.2.18.2 Reference to A.18.4.8.2.

“How We Localize Sound,” *Physics Today*, Volume 52, Issue 11, Page 24 (November 1999).

J.1.2.18.3 Reference to A.18.5.5.7.1.

“Recommended Light Levels,” National Optical Astronomy Observatory, <https://noirlab.edu/>.

J.1.2.18.4 Reference to A.24.3.8.

Bruck, D., ~~I.~~ Thomas, ~~I.~~ and ~~M.~~ Ball-~~M.~~, *Optimizing Fire Alarm Notification for High Risk Groups Research Project — Waking effectiveness of alarms (auditory, visual and tactile) for the alcohol impaired*, Report to the Fire Protection Research Foundation, June 2007.

J.1.2.18.5 References to A.24.3.12.

(1) *CARVER — Target Analysis and Vulnerability Assessment Methodology*, Washington, DC: U.S. Department of Defense (see Field Manual 34-36, Special Operation Forces Intelligence and Electronics Warfare Operation, Sept. 30, 1991), www.defense.gov.

(2) *General Security Risk Assessment Guidelines*, Alexandria, VA: American Society for Industrial Security International, www.asisonline.org.

(3) *NFPA 1600[®], Standard on Continuity, Emergency, and Crisis Management*, National Fire Protection Association, Quincy, MA, 2019 edition.

(4) *NFPA 730, Guide for Premises Security*, National Fire Protection Association, Quincy, MA, 2023 edition.

(5) *Responsible Care Security Code of Management Practices*, Washington, DC: American Chemistry Council, www.americanchemistry.com.

(6) *AWWA J100, Risk and Resilience Management of Water & Wastewater Systems*, American Water Works Association, Denver, CO, 2021, www.awwa.org.

(7) *VAMCAP[®] Vulnerability Assessment Methodology for Critical Asset Protection*, Wilmington, DE: SafePlace Corporation, www.safeplace.com.

(8) *Vulnerability Assessment Methodologies*, Albuquerque, NM: Sandia National Laboratories, www.sandia.gov.

(9) *SFPE Engineering Guide to Fire Risk Assessment*, Society of Fire Protection Engineers, Gaithersburg, MD, 2006, www.sfpe.org.

J.1.2.18.6 Reference to A.24.3.14.13.

International Building Code (IBC), International Code Council, Falls Church, VA, 2018.

J.1.2.18.7 References to A.24.4.8.

(1) Schifiliti, R. P., “To Leave or Not to Leave — That is the Question!”, National Fire Protection Association, World Fire Safety Congress & Exposition, May 16, 2000, Denver, CO.

(2) Ramachandran, G., “Informative Fire Warning Systems,” *Fire Technology*, Volume Vol. 47, Number No. 1, February 1991, National Fire Protection Association, 66–81.

(3) ~~Bryan~~, J. ~~Bryan~~, “Psychological Variables That May Affect Fire Alarm Design,” *Fire Protection Engineering*, Society of Fire Protection Engineers, Issue No. 11, Fall 2001.

(4) Proulx, G., “Cool Under Fire,” *Fire Protection Engineering*, Society of Fire Protection Engineers, Issue No. 16, Fall 2002.

(5) General Services Administration, Proceedings of the Reconvened International Conference on Fire Safety in High Rise Buildings, Washington, ~~D.C.~~ DC, October 1971.

(6) Proulx, G., “Strategies for Ensuring Appropriate Occupant Response to Fire Alarm Signals,” National Research Council of Canada, Ottawa, Ontario, *Construction Technology Update*, No. 43, 1–6, December 2000.

J.1.2.18.8 References to A.24.4.8.3.2.

Kailes, J. I., and ~~A. Enders, A.~~, "Moving Beyond 'Special Needs': A Function Based Framework for Emergency Management and Planning," *Journal of Disability Policy Studies*, SAGE Publications, March 2007.

Morrow, B. H., "Identifying and Mapping Community Vulnerability," *Disasters*, 23(1), 1–18, 1999.

Effective Emergency Management: Making Improvements for Communities and People with Disabilities, National Council on Disability, 2009.

Proulx, G., *Occupant Behaviour and Evacuation*, National Research Council of Canada, Ottawa, Ontario, 2001.

Shields, T. J., ~~K. E. Boyce, K.E.~~, and ~~G. W. H. Silcock, G.W.H.~~, *Client Report: Unannounced Evacuation of Marks & Spencer, Sprucefield Store*, Fire Safety Engineering Research and Technology Centre, University of Ulster, Northern Ireland, 1997.

J.1.2.18.9 References to A.29.2.

"A Few Facts at the Household Level," NFPA Fire Analysis Division, *Fire Journal*, July 2009.

Ahrens, M., and ~~R. Maheshwari, Radhika.~~, "Home Structure Fires," NFPA Fire Analysis and Research Division, October 2021.

Haynes, ~~Hilton H.~~ J. G., "Fire Loss in the United States during 2015," NFPA Fire Analysis and Research Division, September 2016.

Injury Facts, National Safety Council, Itasca, IL, 2011.

J.1.2.18.10 References to A.29.5.8.

~~Bruck, D., and I. Thomas, "Smoke alarms for sleeping adults who are hard-of-hearing: comparison of auditory, visual, and tactile signals," *Ear and Hearing*, 30(1), February 2009, pp. 73–80.~~

~~Bruck, D., I. Thomas, and M. Ball, "Optimizing Fire Alarm Notification for High Risk Groups Research Project — Waking effectiveness of alarms (auditory, visual and tactile) for the alcohol impaired," Report to the Fire Protection Research Foundation, June 2007.~~

~~Fire Protection Research Foundation, *Review of Alarm Technologies for Deaf and Hard of Hearing Populations*, Fire Protection Research Foundation, August 2021.~~

~~Roby, R., "Smoke Detector Alert for the Deaf," Phase II SBIR, Final Report, NIH Grant No. 2R44 DC004254-2, May 27, 2005.~~

J.1.2.18.11 References to A.29.5.10.

Ashley, E., ~~and J. DuBois, J.~~, "Waking Effectiveness of Audible, Visual, and Vibratory Emergency Alarms Across All Hearing Levels," Fire Suppression and Detection Research Symposium, Orlando, FL 2005.

~~Bruck, D., and I. Thomas, I., "Smoke alarms for sleeping adults who are hard-of-hearing: comparison of auditory, visual, and tactile signals," *Ear and Hearing*, 30(1), February 2009, pp. 73–80.~~

~~Bruck, D., I. Thomas, I., and M. Ball, M., "Optimizing Fire Alarm Notification for High Risk Groups Research Project — Waking effectiveness of alarms (auditory, visual and tactile) for the alcohol impaired," Report to the Fire Protection Research Foundation, June 2007.~~

~~Roby, R., "Smoke Detector Alert for the Deaf," Phase II SBIR, Final Report, NIH Grant No. 2R44 DC004254-2, May 27, 2005.~~

J.1.2.18.12 References to A.29.8.1.

NBS GCR 75-51, *Detector Sensitivity and Siting Requirements for Dwellings*, 1975.

NBS GCR 77-82, *Detector Sensitivity and Siting Requirements for Dwellings Phase 2*, 1977.

NIST Technical Note 1455-1, *Performance of Home Smoke ~~Detectors~~ Alarms*, *Analysis of the Response of Several Available Technologies in a Residential Settings*, 2007.

J.1.2.18.13 References to A.29.8.2.1.1.

Green, M. A., and C. Andres, G., "2004–2005 National Sample Survey of Unreported Residential Fires," CPSC, 2009.

Ahrens, M., "Factors in Smoke Alarm Performance," National Fire Protection Association, December 2009.

Thomas, I., and D. Bruck, D., "Smoke Alarms in Dwellings: Timely Activation and Effective Notification," Victoria University, June 2010.

J.1.2.18.14 References to A.29.11.3.

Kemano Fire Studies — Part 1: Response of Residential Smoke Alarms, National Research Council Canada, April 2003.

"Spacing Requirements for Complex Beamed and Sloped Ceilings Report," The Fire Protection Research Foundation, NFFPA Quincy, MA, April 2008.

J.1.2.18.15 References to A.29.11.3.4(6).

Dinaburg, J., and D. T. Gottuk, D. T., "Smoke Alarm Nuisance Source Characterization: Experimental Results — Final Report," Fire Protection Research Foundation, ~~Batterymarch Park~~, Quincy, MA, 2015.

J.1.2.18.16 References to A.29.11.3.4(8).

Gottuk, E.D., and D. T. Gottuk, D. T., "The Effect of Ceiling Fans on Smoke Alarm Performance," NFFPA Research Foundation SUPDET Symposium presentation, 2015.

J.1.2.19 Other Publications — Related to Carbon Monoxide Provisions.

Ashley, E., and J. DuBois, "Waking Effectiveness of Audible, Visual, and Vibratory Emergency Alarms Across All Hearing Levels," Fire Suppression and Detection Research Symposium, Orlando, FL 2005.

Coburn, R. F., R. E. Forster, R. E., and P. G. Kane, P. G., "Considerations for the physiological variables that determine the blood carboxyhemoglobin concentration in man," *Journal of Clinical Investigation*, 1965, November; 44(11):1899–1910.

Fire Protection Research Foundation (FPRF) Report, *Development of a Technical Basis for Carbon Monoxide Detector Siting*, prepared by C. Beyler and D. Gottuk, 2007.

UL Subject 1971, "Report of research on emergency signaling devices for use by the hearing impaired (Subject 1974)," Underwriters Laboratories, 1991 (~~Superseded superseded~~; referenced for historical purposes).

Steinberg, S., and G. D. Nielson, G. D., "A proposal for evaluating human exposure to carbon monoxide contamination in military vehicles," AMCMS Code 672716.H700011, March 1977.

Title 47, Code of Federal Regulations, Part 15.

J.1.2.20 References Associated with Annex B.

- (1) Alpert, R., "Ceiling Jets," *Fire Technology*, August 1972.
- (2) "Evaluating Unsprinklered Fire Hazards," *SFPE Technology Report* 83-2.
- (3) Babrauskas, V., ~~Lawson, J. R., Walton, W. D., and Twilley, W. H. et al.~~, "Upholstered Furniture Heat Release Rates Measured with a Furniture Calorimeter," (NBSIR 82-2604) (Dec. 1982). National Institute of Standards and Technology (formerly National Bureau of Standards), Center for Fire Research, Gaithersburg, MD 20889.
- (4) Beyler, C., "A Design Method for Flaming Fire Detection," *Fire Technology*, Vol. 20, No. 4, November 1984.
- (5) ~~Hurley, M. J., ed., Chapter 40, SFPE Handbook of Fire Protection Engineering, by R. Schifiliti, R. Guster, and B. Meacham~~ Society of Fire Protection Engineers, 2016.
- (6) Evans, D. D., and ~~D. W. Stroup, D. W.~~ "Methods to Calculate Response Time of Heat and Smoke Detectors Installed Below Large Unobstructed Ceilings," (NBSIR 85-3167) (Feb. 1985, issued Jul. 1986). National Institute of Standards and Technology (formerly National Bureau of Standards), Center for Fire Research, Gaithersburg, MD 20889.
- (7) Heskestad, G., "Characterization of Smoke Entry and Response for Products-of-Combustion Detectors" Proceedings, 7th International Conference on Problems of Automatic Fire Detection, Rheinisch-Westfalischen Technischen Hochschule Aachen (March 1975).
- (8) Heskestad, G., "Investigation of a New Sprinkler Sensitivity Approval Test: The Plunge Test," FMRC Tech. Report 22485, Factory Mutual Research Corporation, 1151 Providence Turnpike, Norwood, MA 02062.
- (9) Heskestad, G., and ~~M. A. Delichatsios, M. A.~~ "The Initial Convective Flow in Fire: Seventeenth Symposium on Combustion," The Combustion Institute, Pittsburgh, PA (1979).
- (10) Heskestad, G., and ~~M. A. Delichatsios, M. A.~~ "Environments of Fire Detectors — Phase 1: Effect of Fire Size, Ceiling Height and Material," Measurements Vol. I (NBS-GCR-77-86), Analysis Vol. II (NBS-GCR-77-95); National Technical Information Service (NTIS), Springfield, VA 22151.
- (11) Heskestad, G., and ~~M. A. Delichatsios, M. A.~~ "Update: The Initial Convective Flow in Fire," *Fire Safety Journal*, Vol. 15, No. 5, 1989.
- (12) ~~International Organization for Standardization ISO 8201~~, *Alarm systems — Audible Emergency Evacuation Signal emergency evacuation signal — Requirements*, ~~ISO 8201~~ International Organization for Standardization, 2017.
- (13) Klote, J., and ~~J. Milke, J.~~ "Principles of Smoke Management," American Society of Heating, Refrigerating and Air Conditioning Engineers, Atlanta, GA, 2002.
- (14) Lawson, J. R., ~~W. D. Walton, W. D., and W. H. Twilley, W. H.~~ "Fire Performance of Furnishings as Measured in the NBS Furniture Calorimeter, Part 1," (NBSIR 83-2787) (Aug. 1983); National Institute of Standards and Technology (formerly National Bureau of Standards), Center for Fire Research, Gaithersburg, MD 20889.
- (15) Morton, B. R., Taylor, Sir Geoffrey, and Turner, J. S. "Turbulent Gravitational Convection from Maintained and Instantaneous Sources," *Proc. Royal Society A*, 234, 1–23, 1956.
- (16) Schifiliti, R. "Use of Fire Plume Theory in the Design and Analysis of Fire Detector and Sprinkler Response," Master's Thesis, Worcester Polytechnic Institute, Center for Firesafety Studies, Worcester, MA, 1986.
- (17) Title 47, Code of Federal Regulations, Communications Act of 1934 Amended.
- (18) Schifiliti, R., and ~~W. Pucci, W.~~ "Fire Detection Modelling, State of the Art," ~~6 May, May~~ 1996, sponsored by the Fire Detection Institute, Bloomfield, CT.
- (19) Forney, G., ~~R. Bukowski, R., W. Davis, W.~~ "Field Modelling: Effects of Flat Beamed Ceilings on Detector and Sprinkler Response," Technical Report, Year 1; International Fire Detection Research Project, ~~National Fire Protection Research Foundation, Quincy, MA;~~ October, 1993.
- (20) Davis, W., ~~G. Forney, G., and R. Bukowski, R.~~ "Field Modelling: Simulating the Effect of Sloped Beamed Ceilings on Detector and Sprinkler Response," Year 1; International Fire

- Detection Research Project Technical Report, ~~National~~ Fire Protection Research Foundation, Quincy, MA, , October, 1994.
- (21) Brozovski, E., "A Preliminary Approach to Siting Smoke Detectors Based on Design Fire Size and Detector Aerosol Entry Lag Time," Master's Thesis, Worcester Polytechnic, Worcester, MA, 1989.
- (22) Cote, A., *NFPA Fire Protection Handbook*, 20th edition, National Fire Protection Association, Quincy, MA, 2008.
- (23) Tewarson, A., "Generation of Heat and Chemical Compounds in Fires," *SFPE Handbook of Fire Protection Engineering*, ~~Second Edition~~ 2nd edition, NFPA and SFPE, 1995.
- (24) Hollman, J. P., *Heat Transfer*, McGraw-Hill, New York, 1976.
- (25) Custer, R. L. P., and B. Meacham, ~~B.~~ "Introduction to Performance-Based Fire Safety," SFPE, 1997.
- (26) Schifiliti, R. P., B. Meacham ~~B.~~, and R. L. P. Custer, ~~R. L. P.~~ "Design of Detection Systems," *SFPE Handbook of Fire Protection Engineering*.
- (27) Marrion, C., "Correction Factors for the Heat of Combustion in NFPA 72," Appendix B, Fire Protection Engineering, SFPE, 1998.
- (28) Marrion, C., "Designing and Analyzing the Response of Detection Systems: An Update to Previous Correlations," 1988.
- (29) Custer, R., and R. Bright, ~~R.~~ "Fire Detection: The State-of-the-Art," NBS ~~Tech.~~ Technical Note 839, National Bureau of Standards, Washington, 1974.
- (30) Meacham, Brian B. J., "Characterization of Smoke from Burning Materials for the Evaluation of Light Scattering-Type Smoke Detector Response," MS Thesis, WPI Center for Firesafety Studies, Worcester, MA, 1991.
- (31) Delichatsios, M. A., "Categorization of Cable Flammability, Detection of Smoldering, and Flaming Cable Fires," Interim Report, Factory Mutual Research Corporation, Norwood, MA, NP-1630, November 1980.
- (32) Heskestad, G., FMRC Serial Number 21017, Factory Mutual Research Corp., Norwood, MA, 1974.
- (33) Marrion, C. E., "Lag Time Modeling and Effects of Ceiling Jet Velocity on the Placement of Optical Smoke Detectors," MS Thesis, WPI Center for Firesafety Studies, Worcester, MA, 1989.
- (34) Kokkala, M., et al., "Measurements of the Characteristic Lengths of Smoke Detectors," *Fire Technology*, Vol. 28, No. 2, National Fire Protection Association, Quincy, MA, 1992.
- (34a) Yamauchi, Y., et al., "A Calculation Method for Predicting Heat and Smoke Detector's Response," *Fire Science and Technology*, Vol. 24, 2005.
- (34b) Cleary, T. G., et al., "Particulate Entry Lag in Spot Type Smoke Detectors," IAFSS Proceedings, Boston, MA, 2000.
- (34c) Keski-Rahkonen, O., "Revisiting Modeling of Fluid Penetration into Smoke Detectors," AUBE 2001.
- (34d) Bjoerkman, J., et al., "Determination of Dynamic Model Parameters of Smoke Detectors," *Fire Safety Journal*, No. 37, pp. 395–407, 2002.
- (34e) Keski-Rahkonen, O., "A New Model for Time Lag of Smoke Detectors," International Collaborative Project to Evaluate Fire Models for Nuclear Power Plant Application, Gaithersburg, MD, May 2002.
- (35) UL 268, *Standard for Smoke Detectors for Fire Alarm Systems*, 2016, revised 2021, Underwriters Laboratories, Inc., Northbrook, IL, ~~2016, revised 2021~~.
- (36) Deal, ~~Scott S.~~, "Technical Reference Guide for FPEtool Version 3.2," NISTIR 5486-1, National Institute for Standards and Technology, ~~U.S.~~ US Department of Commerce, Gaithersburg, MD, April 1995.
- (37) Mowrer, F. W., "Lag Times Associated with Detection and Suppression," *Fire Technology*, Vol. 26, No. 3, pp. 244–265, 1990.

- (38) Newman, J. S., "Principles for Fire Detection," *Fire Technology*, Vol. 24, No. 2, pp. 116–127, 1988.
- (39) Custer, R., ~~B. Meacham, B., and C. Wood, G.~~ "Performance Based Design Techniques for Detection and Special Suppression Applications," Proceedings of the SFPE Engineering Seminars on Advances in Detection and Suppression Technology, 1994.
- (40) *SFPE Engineering Guide to Performance-Based Fire Protection*, 2nd edition, 2007, SFPE, Gaithersburg, MD.
- (41) *SFPE Handbook of Fire Protection Engineering*, 5th edition, SFPE, Gaithersburg, MD, 2016.
- (42) Drysdale, ~~Dougal D.~~, *An Introduction to Fire Dynamics*, 3rd edition, John Wiley & Sons, New York, NY, 2011, ~~ISBN 0470319038, 3rd edition~~.
- (43) Nam, S., L. P. Donovan, L.P. and S. G. Kim S.G., "Establishing Heat Detectors Thermal Sensitivity Through Bench Scale Tests," *Fire Safety Journal*, Volume Vol. 39, Number No. 3, 191–215, April 2004.
- (44) Nam, S., "Thermal Response Coefficient TRC of Heat Detectors and Its Field Applications," Fire Detection and Research Applications Symposium, NFP Research Foundation, January 2003.
- (45) Nam, S., "Performance-Based Heat Detector Spacing," Interflam 2004, pp. 883–892.
- (46) Geiman, J. A., "Evaluation of Smoke Detector Response Estimation Methods," Master of Science Thesis, University of Maryland, College Park, MD, December 2003.
- (47) [Reference removed.]
- (48) Geiman, J.A., and D. T. Gottuck, D.T., "Alarm Thresholds for Smoke Detector Modeling," *Fire Safety Science — Proceeding of the Seventh International Symposium*, 2003, pp. 197–208.
- (49) *The SFPE Code Official's Guide to Performance-based Design Review and Analysis of Buildings*, Society of Fire Protection Engineers, Bethesda, MD, 2004.
- (50) NFPA 101[®], *Life Safety Code*[®], National Fire Protection Association, Quincy, MA, 2024 edition.
- (51) NFPA 909, *Code for the Protection of Cultural Resource Properties — Museums, Libraries, and Places of Worship*, National Fire Protection Association, Quincy, MA, 2025 2021 edition.
- (52) NFPA 914, *Code for Fire the Protection of Historic Structures*, National Fire Protection Association, Quincy, MA, 2023 edition.
- (53) "Performance-based Based Building Design Concepts," International Code Council, Washington DC, 2004.
- (54) Meacham, B. *Extreme Event Mitigation In Buildings — Analysis and Design*, ~~Meacham~~, National Fire Protection Association, Quincy, MA, 2006.
- (55) Geiman, J. A., D. T. Gottuk, and J. A. Milke, "Evaluation of Smoke Detector Response Estimation Methods: Optical Density, Temperature Rise and Velocity at Alarm," *Journal of Fire Protection Engineering*, 2006.
- (56) ~~Su et al.~~, "Kemano Fire Studies — Part 1: Response of Residential Smoke Alarms," Research Report 108, NRCC National Research Council Canada, April 2003.
- (57) Davis, W., "The Zone Fire Model Jet," "A Model for the Prediction of Detector Activation and Gas Temperature in the Presence of a Smoke Layer," NISTIR 6324, NIST, May 1999.
- (58) *SFPE Engineering Guide to Human Behavior in Fire*, 2019.
- (59) *Guidelines for Peer Review in the Fire Protection Design Process*, Society of Fire Protection Engineers, Gaithersburg, MD, 2009.
- (60) *SFPE Engineering Guide: Guidelines for Substantiating a Fire Model for a Given Application*, Society of Fire Protection Engineers, Gaithersburg, MD, 2011.

J.1.2.21 References Associated with Annex D.

- (1) Jacob, K. & and T. Tyson, F., “Computer-Based Prediction of Speech Intelligibility for Mass Notification Systems,” SUPDET 2008, Fire Protection Research Foundation, March 2008.
- (2) IEC 60268-16, “*Sound system equipment — Part 16: Objective rating of speech intelligibility by speech transmission index*,” International Electrotechnical Commission, Geneva, Switzerland, 2020.
- (3) ANSI/ASA S3.5, *Methods for Calculation of the Speech Intelligibility Index*, Acoustical Society of America, 35 Pinelawn Road, Suite 114 E, Melville, NY 11747-3177, 1997 (~~R~~, reapproved 2017).
- (4) Barnett, P. W., and A. D. Knight, A.D., “The Common Intelligibility Scale,” Proceedings of the Institute of Acoustics, Vol. 17, Part 7, 1995.
- (5) ISO 7240-16, *Fire detection and alarm systems — Part 16: Sound system control and indicating equipment*, International Organization for Standardization, ~~ISO Central Secretariat, BIBC II, Chemin de Blandonnet 8, CP 401, 1214 Vernier,~~ Geneva, Switzerland, 2007.
- (6) ~~Sander J. van Van~~ Wijngaarden, S. J., and ~~Jan J. A. Verhave, Past.~~ Jan J. A. Verhave, Past., *Present and Future of the Speech Transmission Index*, Chapter 9, Measurement and Prediction of Speech Intelligibility in Traffic Tunnels Using the STI, p. 113, TNO Human Factors, The Netherlands, 2002.
- (7) Mapp, P., “Systematic & Common Errors in Sound System STI and Intelligibility Measurements,” Convention Paper 6271, Audio Engineering Society, 117th Convention, San Fran, CA, 28–31 October 2004.
- (8) ~~Peter~~ Mapp, P., *Past. Present and Future of the Speech Transmission Index*, Chapter 8, Practical Application of STI to Assessing Public Address and Emergency Sound Systems, TNO Human Factors, The Netherlands, 2002.
- (9) UL 1480, *Speakers for Fire Alarm and Signaling Systems, Including Accessories*, 2016, revised 2017.
- (10) Schifiliti, ~~Robert R. P.~~ Robert R. P., “Fire Alarm Testing Strategies Can Improve Occupant Response and Reduce the ‘Cry Wolf’ Syndrome,” NEMA Supplement in *Fire Protection Engineering*, Society of Fire Protection Engineers, Bethesda, MD, 2003.
- (11) Breznitz, S., *Cry Wolf: The Psychology of False Alarms*, Lawrence Erlbaum Associates, Hilldale, NJ, 1984.

J.1.2.22 References Associated with Annex G.

- Kuligowski, E.D., ~~S.M.V. Gwynne, K.M. Butler, B.L. Hoskins, and C.R. Sandler, et al.~~ S.M.V. Gwynne, K.M. Butler, B.L. Hoskins, and C.R. Sandler, et al., *Developing Emergency Communication Strategies for Buildings*, NIST Technical Note 1733, National Institute of Standards and Technology, Gaithersburg, MD, 2012.
- Kuligowski, E.D. and H. Omori, H., *General Guidance on Emergency Communication Strategies for Buildings*, NIST Technical Note 1827, National Institute of Standards and Technology, Gaithersburg, MD, ~~2nd Edition~~ 2nd Edition, 2014.
- START (National Consortium for the Study of Terrorism and Responses to Terrorism), 2013. Task 2.9: Phase II Interim Report on Results from Experiments, Think-out-Louds, and Focus Groups. University of Maryland, College Park: College Park, MD.
- 2010 *ADA Standards for Accessible Design*, U.S. Department of Justice, Washington, DC, September 2010 (http://www.ada.gov/2010ADAstandards_index.htm).

J.1.2.23 References Associated with Annex H.

- ~~U.S.~~ U.S. Consumer Product Safety Commission, *Responding to Residential Carbon Monoxide Incidents: Guidelines for Fire and Other Emergency Response Personnel*, Washington, DC, July 2002, <http://www.cpsc.gov/s3fs-public/coguide.pdf>.

J.2 Informational References.

The following documents or portions thereof are listed here as informational resources only. They are not a part of the requirements of this document.

J.2.1 ASTM Publications.

ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.

ASTM E2292, *Standard Guide for Field Investigation of Carbon Monoxide Poisoning Incidents*, 2021.

J.2.2 EPRI Publications.

Electric Power Research Institute, 3420 Hillview Avenue, Palo Alto, CA 94304.

Technical Report 1002925, *Stationary Battery Monitoring by Internal Ohmic Measurement*, 2002.

Technical Report 1006757, *Stationary Battery Guide; Design, Application, and Maintenance*, 2002.

J.2.3 IMSA Publications.

International Municipal Signal Association, ~~165 East Union Street, Newark, NY 14513-0539~~ 597 Haverly Ct, Rockledge, FL 32955.

IMSA Official Wire and Cable Specifications Manual, 2012.

J.2.4 NFPA Publications.

National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471.

NFPA 1192, *Standard on Recreational Vehicles*, 2021 edition.

J.2.5 UL Publications.

Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096.

UL 1973, *Batteries for Use in Light Electric Rail (LER) Applications and Stationary Applications*, 3rd edition, 2022.

UL 2054, *Household and Commercial Batteries*, 2021.

UL 2075, *Gas and Vapor Detectors and Sensors*, 2013, revised ~~2024~~ 2023.

UL 9540, ~~*Outline of Investigation for Energy Storage Systems and Equipment*~~, ~~4th~~ 3rd edition, ~~2016~~ 2023.

J.2.6 Other Publications.

Keating, John P. and Loftus, Elizabeth F., "People Care in Fire Emergencies — Psychological Aspects, 1975," SFPE, 1975.

Stone, W. Electromagnetic Attenuation in Construction Materials, National Institute of Standards and Technology, NISTIR 6055, 1997.

J.3 References for Extracts in Informational Sections.

NFPA 70[®], *National Electrical Code*[®], 2023 edition.

NFPA 92B, *Smoke Management Systems in Malls, Atria, and Large Spaces*, 1995 edition (withdrawn).

NFPA 101[®], *Life Safety Code*[®], 2024 edition.

NFPA 1225, *Standard for Emergency Services Communications*, 2022 edition.

Submitter Information Verification

Committee: SIG-FUN

Submission Date: Tue Jul 25 10:13:10 EDT 2023

Committee Statement

Committee Statement: Certain references in Annex J are updated and new references are added.

Response Message: SR-5097-NFPA 72-2023

[Public Comment No. 125-NFPA 72-2023 \[Section No. J.1.2.17.8\]](#)