Second Revision No. 11-NFPA 715-2024 [Global Comment]

[See attached word document 715_A2025_NFPA_72_Extracts_Global_SR-11 for NFPA 72 extract updates]

Supplemental Information

File Name	Description	Approved
715_A2025_NFPA_72_Extracts_Global_SR-11.docx	715_A2025_NFPA_72_Extracts_Global_SR-11	
715_Global_SR-11_legislative_changes.docx	for prod use	
715_Global_SR-11_FINAL.pdf	for balloting	

Submitter Information Verification

Committee: FWE-AAA
Submittal Date: Thu Sep 12 17:40:29 EDT 2024

Committee Statement

Committee Statement: This revisions updates the extracted text from NFPA 72 in accordance with the Extract Policy.
Response Message: SR-11-NFPA 715-2024

[SR-11]

4.4.2.1

Installation personnel shall be ~~qualified or supervised by persons who are qualified in the installation, inspection, and testing of fuel gas detection systems.~~ at least one of the following:

(1) ~~qualified~~ Qualified in the installation, inspection, and testing of the fuel gas detection systems
(2) Supervised by persons who are qualified in the installation, inspection, and testing of fuel gas detection systems.
[**72:**10.5.2.1]

4.4.3.2* Testing Personnel.

~~Testing personnel shall have knowledge and experience of the testing requirements contained in this standard, of the equipment being tested, and of the test methods. That knowledge and experience shall be acceptable to the AHJ or meet the requirement of 4.4.3.4. [**72:**10.5.3.2]~~

4.4.3.2.1

Testing personnel shall ~~have~~be knowledgeable of and experienced in the following:

(1) Testing requirements contained in this standard

(2) Equipment being tested

(3) Test methods to be used

[**72:**10.5.3.2.1]

4.4.3.2.2

Knowledge and experience shall be acceptable to the AHJ or meet the requirement of 4.4.3.4.
[**72:**10.5.3.2.2]

4.4.3.3 Service Personnel.

~~Service personnel shall have knowledge and experience of the maintenance and servicing requirements contained in this standard, of the equipment being serviced or maintained, and of the servicing or maintenance methods. That knowledge and experience shall be acceptable to the AHJ or meet the requirement of 4.4.3.4. [**72:**10.5.3.3]~~

4.4.3.3.1

Service personnel shall ~~have~~be knowledgeable and experienced in ~~of~~ the following:

(1) Maintenance and servicing requirements contained in this standard

(2) Equipment being serviced or maintained

Commented [JV1]: Note: Text is moving to list item below.

Commented [JV2]: Note: Text is moving to new subs below.

Commented [JV3]: Note: Text is moving to new subs below.

(3) Servicing or maintenance methods to be used

[**72:**10.5.3.3.1]

4.4.3.3.2

Knowledge and experience shall be acceptable to the AHJ or meet the requirement of 4.4.3.4. [**72:**10.5.3.3.2]

A.4.4.3.4(3)

Licenses and certifications offered at a state or local level are intended to recognize those individuals who have demonstrated a minimum level of technical competency in the area of fuel gas alarm servicing. [**72:**A.10.5.3.4(3)]

4.5.3.1

Power shall be supplied in compliance with either 4.5.3.2, ~~or~~ 4.5.4, or 5.12.2. [**72:**10.6.3.1]

4.5.3.2

Unless configured in compliance with 4.5.4 or 5.12.2, at least two independent and reliable power supplies shall be provided, one primary and one secondary. [**72:**10.6.3.2]

4.5.4.3

Failure of an SEPSS shall result in the initiation of a trouble signal in accordance with Section 4.9. [**72:**10.6.4.5~~4~~]

4.5.5.1 Branch Circuit.

The branch circuit supplying the fuel gas detection system equipment(s) shall be supplied by one of the following:

(1) ~~Commercial light and power~~Electric utility

(2) An engine-driven generator or equivalent in accordance with 4.5.10.2, where a person ~~specifically~~ trained in its operation is on duty at all times

(3) An engine-driven generator or equivalent arranged for cogeneration with ~~commercial light and power~~electric utility in accordance with 4.5.10.2, where a person ~~specifically~~ trained in its operation is on duty at all times

[**72:**10.6.5.1.1]

4.5.6.1.1

The secondary power supply shall consist of one of the following:

(1) A storage battery dedicated to the fuel gas detection system arranged in accordance with 4.13.16

(2) An automatic-starting, engine-driven generator serving the branch circuit specified in 4.5.5.1 and arranged in accordance with 4.5.10.3, and storage batteries dedicated to the fuel gas detection system with 4 hours of capacity arranged in accordance with 4.5.9

[**72:**10.6.7.3]

A.4.5.6.2.3.1

Correction factors are intended to address normal aging and temperature effects on battery capacity. As a lead-acid battery ages, rated capacity will decrease to 80 percent, which is considered the end of service life. As a minimum, a correction factor of 1.25 should be applied for aging to ensure the battery can meet its current demand at the end of service life. At initial installation, lead-acid battery capacity can be as low as 90 percent and should gradually increase when it is subjected to several deep discharge/charging cycles or when it remains on float-charge for several weeks. [**72:**A.10.6.7.2.14]

Battery calculations should include correction factors established for the battery technology to ensure that the required calculated amp-hour capacity remains available during the service life of the batteries and to compensate for changes in capacity where the batteries will be operated outside their nominal temperature range. [**72:**A.10.6.7.2.14]

Temperature also affects lead-acid batteries. For additional information on lead-acid battery sizing considerations refer to IEEE 485, *Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications.* [**72:**A.10.6.7.2.14]

Different battery technologies will require different correction factors. [**72:**A.10.6.7.2.14]

4.5.6.2.3.2

~~The secondary power supply for in-building fuel gas detection system emergency voice/alarm communications service shall comply with both of the following:~~

~~(1) Be capable of operating the system under quiescent load for a minimum of 24 hours~~

~~(2) At the end of the 24-hour period, be capable of operating the system during a fire or other emergency condition for a period of 15 minutes at maximum connected load~~

Commented [JV4]: Note: Text is moving to new subs below.

4.5.6.2.3.2.1

The secondary power supply for in-building fuel gas detection system emergency voice/alarm communications service shall ~~comply with both of the following: Be~~ be capable of operating the system under quiescent load for a minimum of 24 hours. [**72:**10.6.7.2.3]

4.5.6.2.3.2.2

At the end of the ~~24-hour~~ period in 4.5.6.2.3.2.1, the secondary power supply shall be capable of operating the system during a fire or other emergency condition for a period of 15 minutes at maximum connected load. [**72:**10.6.7.2.4]

A.4.5.7

Where a computer system of any kind is used to receive and process alarm or supervisory signals, an ESS/SEPSS, or a UPS listed to the requirements of an applicable standard such as UL 864, *Control Units and Accessories for Fire Alarm Systems*, with sufficient capacity to operate the system until the secondary supply is capable of operating the fuel gas detection system might be required ~~in order~~ to prevent signal loss or a greater than 10-second signal delay. [**72:**A.10.6.6]

ESS/SEPSS equipment often contains an internal bypass arrangement to supply the load directly from the line. These internal bypass arrangements are a potential source of failure. ESS/SPESS equipment also requires periodic maintenance. It is, therefore, necessary to provide a means of promptly and safely bypassing and isolating the ESS/SEPSS equipment from all power sources while maintaining continuity of power supply to the equipment normally supplied by the ESS/SEPSS. [**72:**A.10.6.6]

4.5.7.3.1

Storage batteries dedicated to the fuel gas detection system or an ESS arranged in accordance with the provisions of NFPA 111 shall be permitted to supplement the secondary power supply to ensure required operation during the transfer period. [**72:**10.6.6.3.1]

4.5.9.2.2

Storage batteries shall be located so that the fuel gas detection equipment, including overcurrent devices, is not adversely affected by battery gases. [**72:**10.6.10.2.2]

4.5.9.2.3

Batteries shall be insulated against ground- faults. [**72:**10.6.10.2.3]

4.5.9.2.7

If not located in or adjacent to the fuel gas detection control unit, the batteries and their charger location shall be permanently identified at the control unit. [**72:**10.6.10.2.7]

4.5.9.3.1

Battery charging equipment shall be provided to keep the battery fully charged under ~~all conditions of~~ normal ~~operation~~conditions. [**72:**10.6.10.3.1]

A.4.5.9.3.4

The circuitry and methods for charging batteries of various types are to be evaluated by a nationally recognized testing laboratory to ensure they are appropriate for the purpose. During primary power use, batteries are trickle- charged if they are off-line and waiting to be put under load in the event of a loss of power. [**72:**A.10.6.10.3.4]

Float-charged batteries are fully charged and connected across the output of the rectifiers to smooth the output and to serve as a standby source of power in the event of a loss of line power. Other charging methods are used to restore capacity to a battery after it has been utilized during a loss of primary power. [**72:**A.10.6.10.3.4]

4.5.10.3.1

Engine-driven generators used to provide secondary power for a protected premises fuel gas detection system shall comply with the requirements for a Type 10, Class 24, Level 1 System in Chapter 4 of NFPA 110. [**72:**10.6.11.3.1.1]

4.5.10.3.2

Installation of engine-driven generators used to provide secondary power for a fuel gas detection system shall be in accordance with Article 700 of *NFPA 70*. [**72:**10.6.11.3.1.2]

4.5.10.7.1

A separate storage battery and separate automatic charger shall be provided for starting the engine-driven generator ~~and shall not be used for any other purpose~~. [**72:**10.6.11.7.1]

4.5.10.7.2

The separate storage battery automatic charger shall not be used for any other purpose. [**72:**10.6.11.7.2]

4.5.10.7.~~3~~2

The battery shall be sized in accordance with 5.6.4 of NFPA 110. [**72:**10.6.11.7.~~3~~2]

4.6.3*

~~An audible notification appliance on a control unit, on multiple control units that are interconnected to form a system, or at a remote location, shall be permitted to have the same audible characteristics for all alerting functions including, but not limited to, alarm, trouble, and supervisory, provided that the distinction between signals shall be by other means. [**72:**10.10.4]~~

Commented [JV5]: Note: Text is moving to new subs below.

4.6.3.1

An audible notification appliance on a control unit, on multiple control units that are interconnected to form a system, or at a remote location, shall be permitted to have the same audible characteristics for all alerting functions. [**72:**10.10.4.1]

4.6.3.2

The audible notification appliance described in 4.6.3.1 is not limited to alarm, trouble, and supervisory alerting, provided that the distinction between signals shall be by other means. [**72:**10.10.4.2]

4.6.4*

~~Supervisory signals shall be distinctive in sound from other signals, and their sound shall not be used for any other purpose except as permitted in 4.6.3. [**72:**10.10.5]~~

Commented [JV6]: Note: Text is moving to new subs below.

4.6.4.1

Supervisory signals shall be distinctive in sound from other signals. [**72:**10.10.5.1]

4.6.4.2

The distinctive supervisory signal ~~and their sound~~ shall not be used for any other purpose except as permitted in 4.6.3. [**72:**10.10.5]

4.6.5

~~Trouble signals required to indicate at the protected premises shall be indicated by distinctive audible signals, which shall be distinctive from alarm signals except as permitted in 4.6.3. [**72:**10.10.6]~~

Commented [JV7]: Note: Text is moving to new subs below.

4.6.5.1

Trouble signals required to indicate at the protected premises shall be indicated by distinctive audible signals. [**72:**10.10.6.1]

4.6.5.2

Trouble signals described in 4.6.5.1 shall be distinctive from alarm signals except as permitted in 4.6.3. [**72:**10.10.6.2]

4.6.5.3

The audible trouble signals described in 4.6.5.1 shall be permitted to be used for other purposes as permitted by 4.6.3. [**72:**10.10.6.3]

4.7.3.2

The fuel gas alarm notification deactivation means shall be key-operated or located within a locked cabinet, or arranged to provide equivalent protection against unauthorized use. [**72:**10.12.3]

4.7.3.5

A fuel gas alarm notification deactivation means that remains in deactivation position when there is no alarm condition shall operate an audible trouble notification appliance until the means is restored to normal. [**72:**10.12.6]

4.8.4 Supervisory Notification Appliance Location.

The audible supervisory notification appliances shall be located in an area where they are ~~likely~~ to be heard. [**72:**10.14.5]

4.9.9.7*

Unless otherwise permitted by the AHJ, trouble notification appliances at the protected premises of a supervising station alarm system arranged in accordance with Chapter 7, that have been silenced at the protected premises shall automatically reactivate every 24 hours or less until the fault conditions are restored to normal. [**72:**10.15.10.7]

A.4.9.9.7

In large, campus-style arrangements with proprietary supervising stations monitoring protected premises systems, and in other situations where off-premises monitoring achieves the desired result, the authority having jurisdiction is permitted to allow the reactivation to occur only at the supervising station. Approval by the authority having jurisdiction is required so it can consider all fuel gas safety issues and make a determination that there are procedures in place to ensure that the intent is met; in other words, someone is available to take action to correct the problem. [**72:**A.10.15.10.7]

4.13.4

Monitoring for integrity shall not be required for connections to and between supplementary system components, provided that single open, ground-fault, or short-circuit conditions of the supplementary

equipment or interconnecting means, or both, do not affect the required operation of the fuel gas detection system. [**72:**12.6.4]

~~**4.13.5**~~

~~Monitoring for integrity shall not be required for the circuit of an alarm notification appliance installed in the same room with the central control equipment, provided that the notification appliance circuit conductors are installed in conduit or are equivalently protected against mechanical injury. [**72:**12.6.6]~~

4.13.6 ~~5~~

Monitoring for integrity shall not be required for a trouble notification appliance circuit. [**72:**12.6.5~~7~~]

4.13.~~7~~6*

Monitoring for integrity shall not be required for the interconnection between listed equipment within a common enclosure. [**72:**12.6.6~~8~~]

A.4.13.~~7~~ 6

This standard does not have jurisdiction over the monitoring integrity of conductors within equipment, devices, or appliances. [**72:**A.12.6.6~~8~~]

4.13.~~8~~ 7

Monitoring for integrity shall not be required for the interconnection between enclosures containing control equipment located within 20 ft (6 m) of each other where the conductors are installed in ~~conduit or equivalently protected against mechanical injury~~metal raceway or metal armored cable. [**72:**12.6.7~~9~~]

4.13.~~9~~ 8

Monitoring for integrity shall not be required for the conductors for ground-fault detection where a single ground-fault does not prevent the required normal operation of the system. [**72:**12.6.8~~10~~]

4.13.~~10~~ 9

Monitoring for integrity shall not be required for the interconnecting wiring or cabling of a stationary computer and the computer's keyboard, video monitor, mouse-type device, or touch screen, ~~as long as~~if the interconnecting wiring ~~does not exceed 8 ft (2.4 m) in length; is a listed computer/data processing cable as permitted by *NFPA 70*; and failure of cable does not cause the failure of the required system functions not initiated from the keyboard, mouse, or touch screen. [**72:**12.6.12]~~ or cabling meets all of the following conditions:

(1) The interconnecting wiring or cabling does not exceed 8 ft (2.4 m) in length.
(2) The interconnecting wiring or cabling is a listed computer/data processing cable as permitted by *NFPA 70*.

(3) Failure of the interconnecting wiring or cabling~~cable~~ does not cause ~~the~~ failure of the required system functions not initiated from the keyboard, mouse, or touch screen.

Commented [JV8]: Note: Text is moving to list items below.

[**72:**12.6.9~~12~~]

4.13.~~11~~ 10

Interconnection means shall be arranged so that a single ~~break~~ open or single ground–fault does not cause an alarm signal. [**72:**12.6.11~~14~~]

4.13.~~12~~ 11

A wire-to-wire short-circuit fault on any alarm notification appliance circuit shall result in a trouble signal in accordance with Section 4.9, except as permitted by 4.13.4 ~~or 4.13.5~~. [**72:**12.6.12~~15~~]

4.13.~~13~~ 12

Where two or more systems are interconnected, the systems shall be connected using Class A, B, N, or X circuits as described in 5.4.3. [**72:**12.6.13~~16~~]

4.13.~~15~~ 14

An open, ground-fault, or short-circuit fault on the installation conductors of one alarm notification appliance circuit shall not affect the operation of any other alarm notification appliance circuit for more than 200 seconds regardless of whether the short-circuit fault is present during normal or activated circuit state. [**72:**10.17.1]

4.13.~~16~~15.1.5

Monitoring shall not be required for the main power supply in a supervising station~~, provided the fault condition~~ if its failure is otherwise indicated ~~so as to be~~and obvious to the operator on duty. [**72:**10.6.9.1.5]

4.14.1.5*

~~The record of completion documentation shall be completed by the installing contractor and submitted to the AHJ and the owner at the conclusion of the job. The record of completion documentation shall be permitted to be part of the written statement required in 4.14.1.3 and part of the documents that support the requirements of 4.14.1.3. When more than one contractor has been responsible for the installation, each contractor shall complete the portions of the documentation for which that contractor has responsibility. [**72:**7.5.6.2]~~

Commented [JV9]: Note: Text is moving to new subs below.

4.14.1.5.1

The record of completion documentation shall be completed by the installing contractor and submitted to the AHJ and the owner at the conclusion of the job. [**72:**7.5.6.2.1]

4.14.1.5.2

The record of completion documentation shall be permitted to be part of the written statement required in 4.14.1.3 and part of the documents that support the requirements of 4.14.1.3. [**72:**7.5.6.2.2]

4.14.1.5.3

When more than one contractor has been responsible for the installation, each contractor shall complete the portions of the documentation for which that contractor has responsibility. [**72:**7.5.6.2.3]

4.14.2.5.1

Floor plan drawings shall ~~be drawn to an indicated scale.~~ comply with both of the following:

Commented [JV10]: Prod: Text is moving to list item below.

(1) Be drawn to an indicated scale.

(2) ~~Floor plan drawings shall include~~ Include the following information, where applicable for the particular system:

(~~1~~a) Floor or level identification
(~~2~~b) Point of compass (indication of North)
(~~3~~c) Graphic scale
(~~4~~d) All walls and doors
(~~5~~e) All partitions extending to within 15 percent of the ceiling height (where applicable and when known)
(~~6~~f) Room and area descriptions
(~~7~~g) System devices/component locations
(~~8~~h) Locations of fuel gas alarm primary power disconnecting means
(~~9~~i) Locations of monitor/control interfaces to other systems
(~~10~~j) System riser locations
(~~11~~k) Type and number of system components/devices on each circuit, on each floor or level
(~~12~~l) Type and quantity of conductors and conduit (if used) for each circuit
(~~13~~m) Identification of any ceiling over 10 ft (3 m) in height where automatic fuel gas detection is being proposed
(~~14~~n) Details of ceiling geometries, including beams and solid joists, where automatic fuel gas detection is being proposed
(~~15~~o) Where known, acoustic properties of spaces
(p) Pathway class designations in accordance with 5.4.3, including the location of any end-of-line supervisory or power devices that are required by the pathway class
(q) Pathway survivability level designations in accordance with Section 12.4 of *NFPA 72* [**72:**7.4.5]

~~**4.14.2.5.2**~~

~~Floor plan drawings shall include the following information, where applicable for the particular system:~~

~~(1) Floor or level identification~~

~~(2) Point of compass (indication of North)~~

~~(3) Graphic scale~~

~~(4) All walls and doors~~

~~(5) All partitions extending to within 15 percent of the ceiling height (where applicable and when known)~~

~~(6) Room and area descriptions~~

~~(7) System devices/component locations~~

~~(8) Locations of fuel gas alarm primary power disconnecting means~~

~~(9) Locations of monitor/control interfaces to other systems~~

~~(10) System riser locations~~

~~(11) Type and number of system components/devices on each circuit, on each floor or level~~

~~(12) Type and quantity of conductors and conduit (if used) for each circuit~~

~~(13) Identification of any ceiling over 10 ft (3 m) in height where automatic fuel gas detection is being proposed~~

~~(14) Details of ceiling geometries, including beams and solid joists, where automatic fuel gas detection is being proposed~~

~~(15) Where known, acoustic properties of spaces~~

Commented [JV11]: Note: Text is moving to section above as list item (2).

4.14.2.7

~~Control unit diagrams shall be provided for all control equipment (i.e., equipment listed as either a control unit or control unit accessory), power supplies, battery chargers, and annunciators and shall include the following information:~~

~~(1) Identification of the control equipment depicted~~

~~(2) Location(s) of control equipment~~

~~(3) All field wiring terminals and terminal identifications~~

~~(4) All circuits connected to field wiring terminals and circuit identifications~~

~~(5) All indicators and manual controls~~

~~(6) Field connections to supervising station signaling equipment, releasing equipment, or emergency safety control interfaces, where provided~~

~~[**72:**7.4.7]~~

Commented [JV12]: Note: Text is moving to new subs below.

4.14.2.7.1

Control unit diagrams shall be provided for all control equipment (i.e., equipment listed as either a control unit or control unit accessory), power supplies, battery chargers, and annunciators. [**72:**7.4.7.1]

4.14.2.7.2

Control unit diagrams ~~and~~ shall include the following information:

(1) Identification of the control equipment depicted

(2) Location(s) of control equipment

(3) All field wiring terminals and terminal identifications

(4) All circuits connected to field wiring terminals and circuit identifications

(5) All indicators and manual controls

(6) Field connections to supervising station signaling equipment, releasing equipment, or emergency safety control interfaces, where provided

[**72:**7.4.7.2]

A.4.14.3.1.1

The requirements of Chapter 8 should be used to perform the installation wiring and operational acceptance tests required when completing the record of completion. [**72:**A.7.5.6.3]

The record of completion form is permitted to be used to record decisions reached prior to installation regarding intended system type(s), circuit designations, device types, notification appliance type, power sources, and the means of transmission to the supervising station. [**72:**A.7.5.6.3]

4.14.4.2

The revised record of completion shall include a revision date. [**72:**7.5.6.6.3~~2~~]

A.5.2.2.2

A commonly used method of protecting against unauthorized changes can be described as follows (in ascending levels of access):

(1) *Access Level 1*. Access by persons who have a general responsibility for safety supervision, and who might be expected to investigate and initially respond to a fuel gas alarm or trouble signal

(2) *Access Level 2*. Access by persons who have a specific responsibility for safety, and who are trained to operate the control unit

(3) *Access Level 3*. Access by persons who are trained and authorized to do the following:

(a) Reconfigure the site-specific data held within the control unit, or controlled by it

(b) Maintain the control unit in accordance with the manufacturer's published instructions and data

(4) *Access Level 4*. Access by persons who are trained and authorized either to repair the control unit or to alter its site-specific data or operating system program, thereby changing its basic mode of operation

[**72:**A.23.2.2.2]

5.3 System Features.

~~The features required for a protected premises fuel gas detection system shall be both of the following:~~

~~(1) Documented as a part of the system design~~

~~(2) Determined in accordance with 5.3.1 through 5.3.3~~

Commented [JV13]: Note: Text is moving to new subs below.

5.3.1

The features required for a protected premises fuel gas detection system shall be ~~both of the following: Documented~~ documented as a part of the system design. [**72:**23.3.1]

5.3.2

The features shall be ~~Determined~~ determined in accordance with 5.3.~~3~~1 through 5.3.~~5~~3. [**72:**23.3.2]

5.3.~~3~~1 Required Systems.

Features for required systems shall be based on the requirements of other applicable codes or statutes that have been adopted by the enforcing jurisdiction. [**72:**23.3.~~3~~1]

5.3.~~4~~2* Nonrequired (Voluntary) Systems and Components.

The features for a nonrequired system shall be established by the system designer on the basis of the goals and objectives intended by the system owner. [**72:**23.3.~~4~~2]

A.5.3.~~4~~2

Nonrequired fuel gas detection features are defined in 3.3.21. These are fuel gas detection systems or components that are not required by the building codes and are installed voluntarily by a building owner to meet site-specific fuel gas detection safety objectives. There is a need to properly document the nonrequired system and components. Nonrequired components must be operationally compatible in harmony with other required components and must not be detrimental to the overall system

performance. It is for this reason that 5.3.2.1 mandates that nonrequired (voluntary) systems and components meet the applicable installation, testing, and maintenance requirements of this standard. It is not the intent of the standard to have the installation of nonrequired (voluntary) systems or components trigger a requirement for the installation of additional fuel gas detection components or features in the building. For example, if a building owner voluntarily installs a fuel gas detection control unit, that does not trigger a requirement to install other fuel gas detection system components or features. See also A.5.8.5.5 and A.6.1.5. [**72:**A.23.3.4]

5.3.~~4~~2.1

Nonrequired systems and components shall meet the requirements of this standard. [**72:**23.3.4.1]

5.3.~~4~~2.2

Nonrequired systems and components shall be identified on the record drawings required in 8.6.1.1. [**72:**23.3.~~4~~2.2]

5.4.2.1

Performance and survivability ~~characteristics~~ of signaling pathways ~~(interconnections)~~ shall comply with the defined designations of 5.4.2 and 5.4.3. [**72:**12.2.1]

5.4.2.2

A pathway ~~(interconnection)~~ class designation shall be dependent on the pathway ~~(interconnection) capability to continue to operate~~ during abnormal conditions. [**72:**12.2.2]

5.4.2.3.1

Optical fiber cables installed as part of the fuel gas detection system shall meet the requirements of Article 770 of *NFPA 70* and be protected against physical damage in accordance with Article 760 of *NFPA 70*. [**72:**12.2.3.1]

5.4.2.3.3.3

On conductive pathways, operational ~~capability~~ performance shall be maintained during the application of a signal ground connection. [**72:**12.2.4.3]

5.4.3.3* Class C.

A pathway shall be designated as Class C when it performs as follows:

(1) It includes one or more pathways where operational capability is verified via end-to-end communication, but the integrity of individual paths is not monitored.

(2) A loss of end-to-end communication is annunciated as a trouble signal.

[**72:**12.3.3]

A.5.4.3.4

Class D is intended to describe pathways that are not supervised but have a fail-safe operation that performs the intended function when the connection is lost. Examples of such pathways include the following:

(1) Power to door holders where interruption of the power results in the door closing

(2) Power to locking hardware that release upon an open circuit or fuel gas detection operation

[**72:**A.12.3.4]

5.4.3.6* **Class N.**

A pathway shall be designated as Class N when it performs as follows:

(1) When two or more endpoint devices depend on a pathway, it includes a redundant path to those devices.

(2) When only one endpoint device is connected, a single path is permitted.

~~(1)~~*(3) ~~It includes two or more pathways where operational~~ Operational capability of the ~~primary~~ pathway(s) ~~and a redundant pathway~~ to each device ~~shall be~~is verified through end-to-end communication.

~~*Exception: When only one device is served, only one pathway shall be required.*~~

(~~4~~2) A loss of ~~intended~~ communications between endpoints ~~shall be~~ results in the ~~annunciated~~annunciation ~~as~~of a trouble signal.

(~~5~~3) A single open, ground, short, or combination of these faults on one pathway ~~shall~~does not affect any other pathway.

(~~6~~4) *Conditions that affect the operation of the primary pathway(s) and redundant pathway(s) ~~shall be annunciated~~result in the annunciation of ~~as~~ a trouble signal when the system's minimal operational requirements cannot be met.

(~~7~~5) *Primary and redundant path~~s~~ways ~~shall not be permitted~~ do not ~~to~~ share traffic over the same physical segment.

[**72:**12.3.6]

A.5.4.3.6~~(1)~~ [Reassociate annex to A.5.4.3.6]

The Class N pathway designation is added to specifically address the use of modern network infrastructure when used in ~~fire alarm or~~ fuel gas detection and ~~emergency communication~~signaling systems. [**72:**A.12.3.6]

Class N networks can be specified for ancillary functions but are not required for supplemental reporting described in 5.10.4. ~~*[(See Figure A.5.10.4.)]*~~ [**72:**A.12.3.6~~(1)~~]

Ethernet network devices are addressable but with an important distinction from device addresses on a traditional SLC multi-drop loop. A device with an Ethernet address is, in most cases, a physical endpoint connected to a dedicated cable. Traditional SLC devices are all wired on the same communication line (in parallel), similar to an old party-line telephone system. By comparison, Ethernet's network switches direct each data packet to its intended recipient device like our modern phone systems. [**72:**A.12.3.6~~(1)~~]

Class N uses redundant paths as a means to compensate for Ethernet wiring that does not report a single connection to ground, a basic requirement of Class B. Thus, the physical separation of Class A and Class X, and equipment redundancy described in 5.4.3.7, is not inherently required of Class N. In other words, failure of a single switch is permitted take down a class N segment and is only required to report the loss of communication. Where redundant path segments are intended to have survivability similar to Class A or Class X, the physical separation requirements and overall equipment redundancy must be specified in addition to the Class N designation. [**72:**A.12.3.6~~(1)~~]

As a visual model, Class N could be likened to a redundant pathway backbone, allowed to have Class C branch paths to single endpoint devices. Therefore, every effort is made in this section to clearly distinguish the single endpoint device from the transport equipment required to have redundant paths. [**72:**A.12.3.6~~(1)~~]

Class N requires redundant, monitored pathway segments to and from control unit(s) ~~equipment (fire or fuel gas alarm control units, ACUs, or ECCUs)~~ where any interruption in communications could potentially affect multiple endpoint devices. Typically, interconnected communications equipment such as Ethernet switches, wireless repeaters, or media converters are used in combination to create pathways. Chapter 5 describes the required behavior of Class N pathways. All equipment must meet the requirements of other chapters in ~~NFPA 715~~this standard (such as, but not limited to, requirements pertaining to secondary power supplies, equipment listings, and environment conditions). [**72:**A.12.3.6]

Redundant pathways, isolated from ground, are actually common practice in robust Ethernet designs. Managed network switches commonly have specific uplink ports that are intended for load sharing and allow two parallel connections. For compliance with Class N, a trouble must be reported if either of these connections fails. *[See Figure A.5.4.3.6~~(1)~~(a) and Figure A.5.4.3.6~~(1)~~(b).]* [**72:**A.12.3.6~~(1)~~]

Class N pathways can use metallic conductor communications cable, such as a 100 ohm balanced twisted pair (e.g., Category 5E), including single-pair or multi-pair cable, or other communications media, such as optical fiber cable or wireless transmission, or a combination of two or more such transport mediums. [**72:**A.12.3.6~~(1)~~]

Where a conductor-based media is used for Class N, the intention is not to monitor faults on individual conductors but rather to monitor the operational capability and performance of the pathway as a whole. Similar to Class C, end-to-end verification is used in Class N. [**72:**A.12.3.6~~(1)~~]

Primary and required redundant pathways are independently and continuously verified for their ability to support end-to-end communications to and from each endpoint device and its associated control equipment. Pathway segments that service more than one device must have at least one verified redundant pathway segment. Should any primary pathway segment fail, communication is supported by the redundant pathway segment(s.) Failure of either a primary or redundant pathway will indicate a trouble. [**72:**A.12.3.6~~(1)~~]

Redundant pathway segments are generally independent and do not normally share media with the primary pathways. However, there are exceptions, such as different frequencies for wireless components, or ring topologies. *[See Figure A.5.4.3.6(~~7~~5).]* [**72:**A.12.3.6~~(1)~~]

A Class N network can be made more reliable with physically distinct pathway segments (i.e., an alternate conduit, or cable tray route, or wireless transmission frequency range, or a combination of distinct media). In addition to the required primary segments and redundant segments, a Class N pathway is permitted to have nonrequired segments. *[See Figure A.5.4.3.6~~(1)~~(c)]* Additional nonrequired pathway segments are allowed to be connected and not independently monitored for integrity as long as two paths are monitored to meet the redundancy requirement of Class N. [**72:**A.12.3.6~~(1)~~]

Figure A.5.4.3.6~~(1)~~(a) Class N Pathway Block Diagram – Example 1. [**72:**Figure A.12.3.6~~(1)~~(a)]

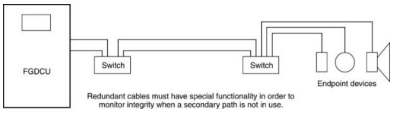
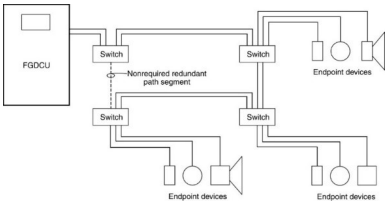


Figure A.5.4.3.6~~(1)~~(b) Class N Pathway Block Diagram – Example 2. [**72:**Figure A.12.3.6~~(1)~~(b)]



Traditionally, NFPA has used the word *device* for input components and the term *appliance* for components used in notification. With respect to Class N, the term *device* includes appliances and other intelligent, addressable components that perform a programmable input or output function. Examples of Class N devices include the following:

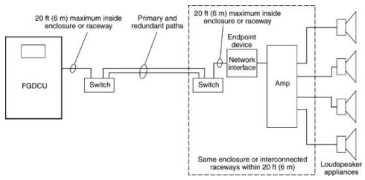
(1) Input components such as alarm initiating modules switches and sensors
(2) Output components such as output modules, Ethernet loudspeakers (i.e., IEEE 8802.3af PoE loudspeakers), intelligent visual notification appliances (strobes), textual signage, and intelligent audio amplifiers

[**72:**A.12.3.6~~(1)~~]

Transmission equipment components (e.g., media converters, Ethernet switches, patch panels, cross-connects) are connected to the Class N pathway merely to transport instructions between other equipment. As such, they are not considered devices with respect to Class N pathways. [**72:**A.12.3.6~~(1)~~]

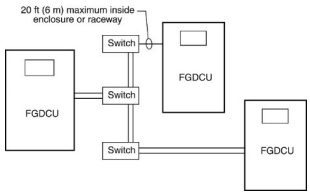
The audio amplifier listed above is an example of an addressable device that can receive a digital audio input from the Class N pathway and then provide a notification appliance circuit (NAC) output with Class A, B, or X pathways. Other endpoint devices can similarly provide alternate class pathways for visual notification appliances (strobes) (NACs) or initiating devices (IDCs). From the perspective of the Class N pathway, communications terminate at this endpoint device. However, since these types of endpoints can support multiple notification appliance devices or initiating devices, path segments are subject to the redundant pathway requirement unless protected in an enclosure or raceway less than 20 ft (6 m) in length. *~~([~~See 4.13.8.~~) [See~~ and *Figure A.5.4.3.6~~(1)~~(c).]* [**72:**A.12.3.6~~(1)~~]

Figure A.5.4.3.6~~(1)~~(c) Class N Pathway to Endpoint with Multiple Devices. [**72**:Figure A.12.3.6~~(1)~~(c)]



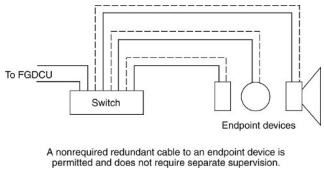
Class N connections between control equipment are required to have redundant monitored pathway segments if a failure of a primary pathway segment in between control equipment could impair the operation of the control equipment. *[See Figure A.5.4.3.6~~(1)~~(d).]* [**72:**A.12.3.6~~(1)~~]

Figure A.5.4.3.6~~(1)~~(d) Class N Pathway Block Diagram with Multiple Control Units. [**72:**Figure A.12.3.6~~(1)~~(d)]



Class N is also permitted to include dual port devices that provide both transmission and input/output functions. Endpoint devices can have multiple connection ports and support dual pathway segment connections; thus the term *endpoint device* is not intended to prohibit more than one connection to a device. Even with dual connections, where other devices depend on the path, primary and redundant paths are required. But, where an endpoint device has two connection ports, and when a secondary nonrequired connection is added, there is no requirement to separately supervise the nonrequired redundant pathway segment. *[See Figure A.5.4.3.6~~(1)~~(e).]* [**72:**A.12.3.6~~(1)~~]

Figure A.5.4.3.6~~(1)~~(e) Class N Pathway Block Diagram with Device with Dual Pathway Connection. [72:Figure A.12.3.6~~(1)~~(e)]



A.5.4.3.6(64)

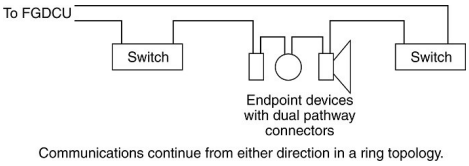
Operational conditions of the pathway include factors such as latency, throughput, response time, arrival rate, utilization, bandwidth, and loss. Life and property safety equipment connected to a Class N network actively monitors some or all of the pathway's operational conditions so that an improperly installed or configured pathway or a subsequently degraded pathway or segment is detected by the life and property safety equipment and reported as a trouble signal. The trouble condition is reported when operational conditions of the pathway(s) have deteriorated to the point where the equipment is no longer capable of meeting its minimum performance requirements, even if some level of communication to devices is still maintained. Performance requirements include the activation of an alarm within 10 seconds, the reporting of a trouble signal within 200 seconds, and delivery of audio messages with required intelligibility. End-to-end communications might be operational under system idle conditions, but in the event of an alarm, the increased load on a degraded pathway could cause a partial or complete failure to deliver required life safety signals. Such predictable failure must be actively detected and reported. [**72:**A.12.3.6(6)]

A.5.4.3.6(75)

Devices with dual path connections are permitted to be connected in a daisy-chain of devices on a ring. Again, where Class N pathway segments support multiple devices, verified redundant pathway segment(s) are required. This can be accomplished with a ring topology, as long as each segment of the ring is verified as functional, and the failure of any one segment does not result in the loss of functionality of more than one device. In this arrangement, primary and redundant pathway segments share the same media~~,~~ and provide two possible directions of communications in a ring topology *[see*

Figure A.5.4.3.6(75)]. This daisy-chain configuration is also permitted between multiple control units that require verified primary and redundant pathway segments. [**72:**A.12.3.6(75)]

Figure A.5.4.3.6(75) Class N Pathway Block Diagram with Daisy-Chained Devices with Dual Pathway Connection. [72:Figure A.12.3.6(75)]



A.5.6.1

The intent of 5.6.1 applies to both short-circuit faults and open-circuit faults. [**72:**A.23.6.1]

Fuel gas detection technologies have evolved to the point that SLCs are now the prevalent means of monitoring initiation devices, controlling output devices, and communicating between panels, annunciators, and controllers. [**72:**A.23.6.1]

The extent of coverage of traditional IDCs is inherently limited based on the quantity of powered initiation devices or code limitations. Similarly, the extent and coverage of NACs also are limited by the power required to operate the devices. SLCs, unlike IDCs and NACs, have few limitations, and it is now common that a single SLC can monitor and control more than 250 devices. In addition, a single SLC can be the only pathway by which alarms are initiated, emergency control functions are controlled, and audible and visual notification appliances are actuated. [**72:**A.23.6.1]

A total catastrophic failure of a fuel gas detection system due to a single open or short on an SLC can negate most, if not all, of this standard's requirements for specifying an acceptable minimum level of performance and reliability for the protection of life and property from fuel gas leak.

Designers should carefully consider the potential that a single SLC short or open caused by a fire or inadvertent damage to the SLC could disable an entire SLC prior to the activation of an alarm condition along with the subsequent alarm signaling and emergency control functions. [**72:**A.23.6.1]

With traditional IDCs and NACs, a single open, ground, or short fault on one circuit could not affect the performance of other IDCs, NACs, and emergency control circuits. As such, the occurrence of a single short or open could limit the extent of the failure to a particular zone or area. [**72:**A.23.6.1]

One method for providing an acceptable level of performance and reliability of SLCs is to limit the potential catastrophic failure to one zone, in a way similar to how traditional IDCs and NACs have been and are now required to do. [**72:**A.23.6.1]

A single zone could be designated in the following ways:

(1) By floor where an SLC would not span multiple floors

(2) By floor area, where a large floor would be split into multiple zones based on a maximum floor area size (e.g., 22,500 ft^2)

(3) By fire barrier or smoke barrier compartment boundaries, which an SLC would not cross

(4) By maximum length or circuit, where an SLC would not be longer than a predetermined length (e.g., 300 ft)

[**72:**A.23.6.1]

See the definition of zone (3.3.32) and Figure A.5.6.1(a) through Figure A.5.6.1(d) for additional clarification. [**72:**A.23.6.1]

Figure A.5.6.1(a) depicts a Class B SLC with four zones. Wiring of more zones would require one isolator for each additional zone. The isolator can be integrated into the device or a separate component. If a single short or open occurs beyond the isolators, only one zone will be affected. [**72:**A.23.6.1]

Figure A.5.6.1(b) depicts a Class A SLC with four zones. Wiring of more zones would require one isolator for each additional zone. The isolator can be integrated into the device or a separate component. If a single short or open occurs, only one zone will be affected. If a single open occurs, no devices will be affected. [**72:**A.23.6.1]

Figure A.5.6.1(c) depicts a hybrid Class A SLC loop with Class B SLC branches serving four zones that is designated as a Class B SLC. Wiring of more zones would require one isolator for each additional zone. The isolator can be integrated into the device or a separate component. If a single short occurs, only one zone will be affected. If a single open occurs, it might affect only one zone. [**72:**A.23.6.1]

Figure A.5.6.1(d) depicts an incorrect Class B SLC configuration with four zones. If a single short or open occurs, one or more zones could be affected depending on the location of the single short. [**72:**A.23.6.1]

Figure A.5.6.1(a) Class B Isolation Method. [**72:**Figure A.23.6.1(a)]

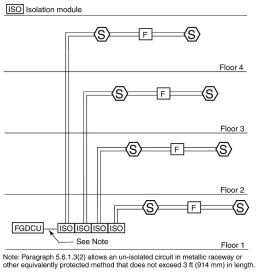


Figure A.5.6.1(b) Class A Isolation Method. [**72:**Figure A.23.6.1(b)]

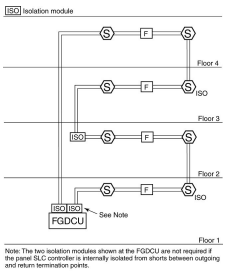


Figure A.5.6.1(c) Hybrid Isolation Method. [**72:**Figure A.23.6.1(c)]

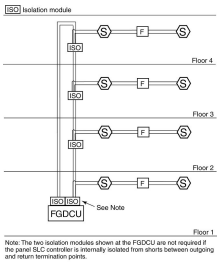
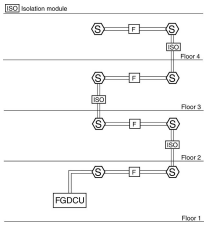


Figure A.5.6.1(d) Incorrect Use of Isolators on an SLC. [**72:**Figure A.23.6.1(d)]



5.6.1.3*

The requirements in 5.6.1 shall not apply to the following:

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

(2) Circuits connecting short-circuit fault isolation modules to enclosures containing transponders and control units where the conductors are installed in metallic raceway or equivalently protected against mechanical injury and where the circuit does not exceed 3 ft (914 mm) in length

(3) *Alterations or modifications made to an existing SLC not required to comply with 5.6.1 when originally installed

[**72:**23.6.1.3]

A.5.6.1.5

Possible scenarios in which a designer might choose to permit loss of more than one zone include a multistory building with a small floor plan footprint where a limited number of addressable devices are located on the floor (e.g., two fuel gas detection devices). In this scenario, the designer might choose to include multiple floors of devices on the same signaling line circuit because the loss of such devices due to a single SLC short or open would disable a limited number of devices. [**72:**A.23.6.1.5]

Another scenario could include buildings with a small vestibule at the top of a stair that exits onto the roof of a building. The vestibule might contain one fuel gas detection device that could be connected to the signaling line circuit on the floor below and considered the same zone. [**72:**A.23.6.1.5]

Designers providing documents for upgrades to an existing building where the control units and all fuel gas detection devices are being replaced but some portion of the existing circuits are being reused might, because of constructability reasons, opt for combining zones and the associated risk of the loss of those devices due to a single SLC short or open. [**72:**A.23.6.1.5]

The intent of 5.6.1.5 is not to impose an unnecessary burden on building owners with existing systems undergoing renovations, upgrades, or replacements. In these scenarios as well as others, the designer would be required to provide a documented, performance-based design approach to justify why the loss of more than one zone is acceptable. Documentation must be composed in accordance with 5.6.2.4 and be submitted in accordance with 5.6.1.6. [**72:**A.23.6.1.5]

A.5.6.2

Class N systems should mitigate risk that could be present when a zone or area is serviced by a single Class N device. However, 5.6.2 is not intended to automatically require the installation of twice as many (or more) Class N devices as compared to a design based on Class A, B, or X pathways. The risks inherent to Class N are different from the risks inherent to Class A, B, or X. [**72:**A.23.6.2]

Class A and B pathways are permitted to lose devices in a zone (see Section 5.6) upon a multiple ground-fault pathway failure. Class A and B pathways require a single ground to be annunciated as a trouble signal. The requirement is to annunciate the first ground fault and alert the user so that the ground fault

can be addressed before a possible second ground fault occurs. Note that a second ground fault is also annunciated at the systems operator interface because communication is lost. [**72:**A.23.6.2]

Class X pathways are not permitted to lose devices in a zone (see Section 5.6) upon a multiple ground-fault pathway failure that results in a short circuit across the pathway. Class X pathways require a single ground to be annunciated as a trouble signal. The requirement is to annunciate the first ground fault and alert the user so that the ground fault can be addressed before a possible second ground fault occurs. [**72:**A.23.6.2]

By contrast, Class N is not required to report a trouble condition at the occurrence of the first ground fault because it limits the loss to a single device if another ground occurs. A second ground fault in the Class N pathway, like Class A and B pathways, annunciates a trouble condition at the systems operator interface because communication is lost. [**72:**A.23.6.2]

In summary, the potential risk of a loss of fire alarm function in an area must be considered in Class N network design. Multiple ground faults might cause such a loss in an area, especially after no one was alerted of a trouble condition at the first ground fault. [**72:**A.23.6.2]

The term “device” in this context should be understood in conjunction with the definition of Device (Class N) 3.3.5 and the associated annex material A.3.3.5. An area is a separated space within a zone where initiating devices or notification appliances are required. Examples include an office, conference rooms, or temporary partitioned banquet rooms where alarm notification is required. Factors to consider when determining the need for multiple Class N devices within an area or zone include the following: whether the space is acoustically and/or visually isolated; specific audible and visual indication of trouble to the occupants in that area for a related ground fault pathway failure of any device/appliance in that area; the pathways to devices in the area are not susceptible to ground faults such as fiber-optic or wireless pathways. [**72:**A.23.6.2]

Also, multiple devices are not required when devices/appliances are connected by redundant pathways. For example, consider the dual port devices deployed as per A.5.4.3.6(7~~5~~). For example, the failure of a sole Class N initiating device might delay or prevent the timely initiation of an alarm. [**72:**A.23.6.2]

Depending on the facility and the risks for that occupancy, areas serviced by single devices, without redundant pathways, that are susceptible to ground faults should be established by the system designer and approved by the authority having jurisdiction. [**72:**A.23.6.2]

A.5.6.2.3

This requirement is to ensure that devices without redundant pathways are not used to terminate additional equipment such that a loss of the pathway would result in more than one device failure to communicate and operate as intended. This stipulation does not apply to dual port devices as described in A.5.4.3.6(7~~5~~), because these devices support redundant pathways. A dual port device that is used to daisy-chain additional devices without a redundant pathway would be prohibited. [**72:**A.23.6.2.3]

The term “device” in this context should be understood in conjunction with the definition of Device (Class N) 3.3.5 and the associated annex material A.3.3.5. [**72:**A.23.6.2.3]

A network-based audio amplifier is an example of an addressable device that can receive a digital audio input from the Class N pathway and then provide a notification appliance circuit (NAC) output with Class A, B, or X pathways. Other endpoint devices can similarly provide alternate class pathways for visual notification appliances (strobes) (NACs) or initiating devices (IDCs). From the perspective of the Class N pathway, communication terminates at this endpoint device. However, since these types of endpoints can support multiple notification appliance devices or initiating devices, Class N path segments are still subject to the redundant pathway requirement unless protected in an enclosure or raceway less than 20 ft (6 m) in length. [See Figure A.5.4.3.6~~(1)~~(c).] [**72:**A.23.6.2.3]

5.6.3.5 Management Organization.

5.6.3.5.1*~~*~~

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

~~(1) Contain members appropriately certified by each manufacturer of the equipment and devices deployed on shared pathways to maintain such a network~~

~~(2) Service and maintain all shared Class N pathways~~

~~(3) Maintain the deployment and shared pathways plan for the lifetime of the shared pathways~~

~~[**72:**23.6.3.5.1]~~

Commented [JV14]: Note: Text is moving to new subs below.

5.6.3.5.1.1

An organization shall be established and maintained to manage the life safety network. [**72:**23.6.3.5.1]

5.6.3.5.1.2*

The organization described in 5.6.3.5.1.1 ~~and~~ shall ~~perform~~comply with the following:

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

(2) Service and maintain all shared Class N pathways

(3) Maintain the deployment and shared pathways plan for the lifetime of the shared pathways

[**72:**23.6.3.5.2~~1~~]

5.6.3.5.1.3~~2~~* [Move to 5.6.3.5.1.3]

Other service personnel, even when certified to service a specific system (i.e., fire alarm or MNS), shall be authorized and managed by this organization to ensure any outages of any system are planned,

managed, and documented and appropriate steps are taken during outages to provide alternate protection of life and property. [**72:**23.6.3.5.~~3~~2]

A.5.6.3.5.1.2 [Reassociate to A.5.6.3.5.1.2]

Regular inspection, testing, and maintenance are conducted on life safety systems. In traditional systems a single certified entity was typically capable of servicing the fire alarm control unit, transport equipment, and/or wiring associated with it. Class N systems will often use modern network infrastructure that might fall outside the expertise of the life safety–certified entity, or other building systems could share the infrastructure used to create the Class N network. The property or building or system owner or the owner's designated representative has responsibility to maintain a list of certified entities that are capable of servicing and maintaining the life safety system and the Class N network. This is what NFPA 72 refers to as a management organization. For example, if the Class N network runs through Ethernet switches and routers, the premises IT infrastructure should be maintained by service personnel as referenced in 4.4.3.3. [**72:**A.23.6.3.5.~~2~~1]

A.5.6.3.5.~~1.3~~2

During inspection, testing, or maintenance it could be necessary to temporarily disable or test part of a life safety system. The management organization is responsible to ensure that other affected entities are notified and action plans put in place to ensure appropriate life safety coverage is maintained and appropriate notification is given to other entities such as the fire or security monitoring services. [**72:**A.23.6.3.5.~~3~~2]

A.5.6.3.6.2

Primary and backup power should meet the requirements of ~~NFPA 715~~this standard. Life safety equipment and their connected equipment (Class N transport devices when not powered by the FGDCU) should utilize dedicated branch circuits for primary power. This is to prevent other loads from tripping a circuit breaker connected to the FGDCU and to prevent inadvertent disconnecting of primary power to the FGDCU. [**72:**A.23.6.3.6.2]

The branch circuit disconnecting means (circuit breakers) should be clearly labeled and made only accessible to authorized personnel. [**72:**A.23.6.3.6.2]

FGDCUs are required to have a secondary power source that must last for 24 hours of standby (nonalarm) power followed by either 5 (non-voice systems) or 15 (voice systems) minutes of alarm power. This is typically accomplished by backup batteries or by an emergency generator. All transport equipment not powered by the FGDCU has the same requirement. The analysis should document the calculation of all power requirements (standby and alarm) of the FGDCU and transport equipment to ensure that the system can meet this requirement. To meet this requirement, non–life safety systems could be disconnected from the secondary power source. [**72:**A.23.6.3.6.2]

A.5.6.3.7.1

Maintenance is a critical aspect of fuel gas detection systems, and a plan needs to be in place to empower continued operation of the fuel gas detection system. Shared Class N pathways present a unique concern in that non–fuel gas detection technicians could perform maintenance or changes to the Class N equipment or pathways. For example, routine updates to software in the routers and switches or upgrades to address new non–fuel gas detection needs. This could result in outages of the portions of the fuel gas detection system or affect the subsequent operation of the fuel gas detection system. It is crucial that the maintenance plan address policy and procedure to monitor, maintain, and test per Chapter 8 and control change of the shared pathways to contribute to continued intended operation of the fuel gas detection system. For example, 8.4.2.5 states that changes to system executive software require a 10 percent functional test of the system, including typical network infrastructure such as routers and switches that now need consideration as part of the life safety network maintenance plan. [**72:**A.23.6.3.7.1]

A.5.6.3.8

Although this section outlines some specific criteria and/or limitations, each application should be based on recognized performance-based design practices and the emergency response plan developed for the specific facility. Here are the general categories of questions that might be presented to the stakeholders responsible for Class N shared network design decisions. The actual questions for each project must be tailored to the area, the building, the campus, and the culture of the user organization and the nature of how the network is being shared. The requirements for the life safety network should be evaluated with respect to the types of emergency events and emergency response plan. The potential impact of these events upon the life safety network also should be evaluated. [**72:**A.23.6.3.8]

(1) What types of emergency events could affect the life safety network (e.g., fire, security, safety, health, environmental, geological, meteorological, utility service disruption~~, or other types of events~~)?

(2) What is the anticipated or expected severity of the emergency events, that is, how will they impact the facility and its functions? Are they expected to be extreme~~,~~ or severe~~, and so forth~~?

(3) What is the certainty of the emergency event, that is, is it happening now, is it very likely to occur, is it likely to occur, is it possible that it will occur in the future, is it unlikely to occur, or is its occurrence unknown?

(4) Natural hazards: What are the network risks to the implementation of the emergency response plan in response to natural hazard events? What are the types of emergency events that could be predicted to result from natural hazard events? For example, if flooding is possible in the surrounding area, how would a flood affect the life safety network while operating in its normal, monitored state? What would happen if a fire alarm occurred during a flood? How likely is it that a flood could damage the life safety network? What related events might impact the life safety network and equipment, such as a power outage?

(5) Human caused: What are the network risks to the implementation of the emergency response plan in response to ~~accidents~~ accidental or intentional human acts? What are the types of emergency events that could be predicted from both within and outside the protected premises? What type of related damage might be expected to impact the life safety network and equipment, such as explosions?

(6) Technological caused: What are the network risks to the implementation of the emergency response plan in response to technologically caused events or failures and the types of emergency events that could be predicted to result from a technologically caused event both within and outside the protected premises?~~.~~ What type of related damage might be expected to impact the life safety network and equipment, such as a network attack?

(7) Network maintenance risks: What are the network risks to the implementation of the emergency response plan in response to a degradation of network software performance (e.g., an unintended degradation of performance due to software updates) or a degradation of physical network performance or implementation (e.g., physical damage, system modifications)? What types of emergency events could be predicted to result from a degradation of the life safety network? What type of related impairments might be expected to impact the components of the life safety network and equipment, such as environmental controls?

[**72:**A.23.6.3.8]

The questions suggested in items (1) through (7) are offered for consideration, and not all of them might be appropriate for every life safety network installation. [**72:**A.23.6.3.8]

5.6.3.8.7

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

(1) Natural hazards—~~geological events~~

~~(2) Natural hazards—meteorological events~~

(a) Geological events

(b) Meteorological events

(~~3~~2) Human caused—~~accidental events~~

~~(4) Human caused—intentional events~~

(a) Accidental events

(b)Intentional events

(~~5~~3) Technological—caused events

Commented [JV15]: Note: Text is moving to lettered list below.

Commented [JV16]: Note: Text is moving to lettered list below.

Commented [JV17]: Note: Text is moving to lettered list below.

Commented [JV18]: Note: Text is moving to lettered list below.

[**72:**23.6.3.8.7]

5.6.3.9.1 Shared Pathway Level 0.

Level 0 pathways shall not be required to segregate or prioritize life safety data from non–life-safety data. [**72:**12.5.1]

5.6.3.9.2 Shared Pathway Level 1.

~~Level 1 pathways shall not be required to segregate life safety data from non–life safety data, but shall prioritize all life safety data over non–life safety data. [**72:**12.5.2]~~

Commented [JV19]: Note: Text is moving to new subs below.

5.6.3.9.2.1

Level 1 pathways shall not be required to segregate life safety data from non–life-safety data. [**72:**12.5.2.1]

5.6.3.9.2.2

Level 1 pathways shall prioritize all life safety data over non–life-safety data. [**72:**12.5.2.2]

5.6.3.9.3 Shared Pathway Level 2.

Level 2 pathways shall segregate all life safety data from non–life-safety data. [**72:**12.5.3]

5.8.1* Actuation Time.

Actuation of alarm notification appliances or emergency voice communications, fuel gas detection control function interface devices, and annunciation at the protected premises shall occur within 10 seconds after the activation of an initiating device. [**72:**10.11.1]

A.5.8.1

Actuation of an initiating device is usually the instant at which a complete digital signal is achieved at the device, such as a contact closure. Some initiating devices involve signal processing and analysis by the device or by the control unit software. In these cases, actuation means the instant when the signal analysis requirements are completed by the device or control unit software. [**72:**A.10.11.1]

It is not the intent of 5.8.1 to dictate the time frame for the local safety devices to complete their function.

5.8.2.4.2

The method of interconnection of fuel gas detection control units shall be achieved by one or more of the following ~~recognized means~~:

(1) Electrical contacts listed for the connected load

(2) Data communications over signaling line circuit(s) dedicated to the fuel gas detection system or shared with other premises operating systems

(3) Other listed methods

[**72:**23.8.2.5]

5.8.2.5.2

A listed barrier gateway, integral with or attached to each control unit or group of control units, as appropriate, shall be provided to prevent the other systems from interfering with or controlling the fuel gas detection system. [**72:**23.8.2.6.3]

5.8.2.6

Each interconnected fuel gas detection control unit shall be separately monitored for alarm, supervisory, and trouble conditions with supervised pathways that are in accordance with the manufacturers' published instructions. [**72:**23.8.2.7]

5.8.2.7

Interconnected fuel gas detection control unit alarm signals shall be permitted to be monitored by zone or by combined common signals. [**72:**23.8.2.8]

5.8.4.1*

Fuel gas detection systems shall be permitted to share components, equipment, circuitry, and installation wiring with non–fuel gas detection systems. [**72:**23.8.4.1]

5.8.4.3

For non–fuel gas detection system equipment listed to the performance requirements specified in 4.11.1, the requirements of 5.8.4.3.1 through 5.8.4.3.3 shall apply. [**72:**23.8.4.4]

5.8.4.3.2

If the equipment is attached to the fuel gas detection system via separate pathways, then short circuits or open circuits in this equipment, or between this equipment and the fuel gas detection system pathways, shall not impede or impair the monitoring for integrity of the fuel gas detection system or prevent alarm, supervisory, or safety control signal transmissions. [**72:**23.8.4.4.2]

5.8.4.3.3

Grounds in this equipment, or between this equipment and the fuel gas detection system pathways, shall be reported, annunciated, and corrected in the same manner as grounds in the rest of the fuel gas detection system. [**72:**23.8.4.4.3]

5.8.4.4

For non–fuel gas detection system equipment not listed to the performance requirements specified in 4.11.1, the requirements of 5.8.4.4.1 through 5.8.4.4.3 shall apply. [**72:**23.8.4.5]

5.8.4.4.1

Short circuits or open circuits in the equipment, or between the equipment and the fuel gas detection system pathways, shall not impede or impair the monitoring for integrity of the fuel gas detection system or prevent alarm, supervisory, or safety control signal transmissions. [**72:**23.8.4.5.1]

5.8.4.4.2

Grounds in this equipment, or between this equipment and the fuel gas detection system pathways, shall be reported, annunciated, and corrected in the same manner as grounds in the rest of the fuel gas detection system. [**72:**23.8.4.5.2]

5.8.4.4.3

Removal, replacement, failure, maintenance procedures, or ground on this hardware, software, or circuits shall not impair the required operation of the fuel gas detection system. [**72:**23.8.4.5.3]

5.8.5.1.3

Initiating devices shall be supported independently of their attachment to the circuit conductors. [**72:**17.4.4]

5.8.5.1.5*

Duplicate terminals, leads, or connectors that provide for the connection of installation wiring shall be provided on each initiating device for the express purpose of connecting into the fuel gas detection system to monitor the integrity of the signaling and power wiring unless the initiating devices are connected to a system that provides the required monitoring. [**72:**17.4.6]

5.8.5.3.2.1

Performance-based designs submitted to the AHJ for review and approval shall include documentation, in an approved format, of each performance objective and applicable scenario, together with any

calculations, modeling, or other technical substantiation used in establishing the proposed design's life safety and property protection performance. [**72:**17.3.1]

5.8.5.3.9.2

Where detection is not required during new construction, detectors shall not be installed until after all other construction trades have completed cleanup. [**72:**17.7.2.3]

5.8.5.4.2

Interaction with smoke control systems, if such is provided, shall be coordinated. [**72:**17.~~12~~14.9.2]

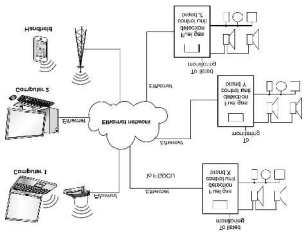
5.10.4*

It shall be permitted to provide supplementary transmission of real-time data from the fuel gas detection system to off-premises equipment. [**72:**23.12.4]

A.5.10.4

Off-~~site~~ premises logging of fuel gas alarm data can be useful to preserve information in the face of fire or building failure to facilitate accurate reconstruction of the event. It can also be beneficial to send data off-premises to incident command personnel to enhance situational awareness and response decisions and to maintain safe and efficient operations. Figure A.5.10.4 shows an example of a network to accomplish these goals. [**72:**A.23.12.4]

Figure A.5.10.4 Supplemental Reporting Network. [**72:**Figure A.23.12.4]



5.10.4.1

Transmission of real-time data off-premises shall not affect the operation or response of the fuel gas detection control unit. [**72:**23.12.4.1]

A.5.12

The term wireless has been replaced with the term low-power radio to eliminate potential confusion with other transmission media such as fiber optics. [**72:**A.23.16]

Low-power radio devices are required to comply with the applicable low-power requirements of ~~Title~~ 47 CFR~~, Code of Federal Regulations, Part~~ 15, "Radio Frequency Devices." [**72:**A.23.16]

5.12.2* Power Supplies.

~~A~~ One or more primary ~~battery(s)~~batteries (dry cell) that meet~~s~~ the requirements of 5.12.2.1 or 5.12.2.2 shall be permitted to be used as the sole power source for devices incorporating a low-power radio transmitter/transceiver. [**72:**23.16.2.1]

5.12.3.1.2

To ensure the receipt of an alarm signal by the fuel gas detection control unit, the low-power radio transmitter/transceiver shall automatically repeat alarm transmissions at intervals not exceeding 60 seconds until the transmitter/transceiver receives a signal confirming receipt of the alarm signal by the fuel gas detection control unit. [**72:**23.16.3.1.2]

5.12.3.2*

An alarm signal from a low-power radio transmitter/transceiver shall ~~both~~ latch at the fuel gas detection control unit until manually reset ~~and identify the particular initiating device in alarm~~. [**72:**23.16.3.1.5]

Commented [JV20]: Note: Text is moving to new section below.

5.12.3.3

An alarm signal from a low-power radio transmitter/transceiver shall identify the particular initiating device in alarm. [**72:**23.16.3.1.6]

5.12.4.1

The low-power radio transmitter/transceiver shall be specifically listed as using a ~~transmission~~ communication method that is highly resistant to misinterpretation of simultaneous transmissions and to interference (e.g., impulse noise and adjacent channel interference). [**72:**23.16.4.1]

5.12.4.2

The occurrence of any single fault that disables communication between any low-power radio transmitter/transceiver and the receiver/transceiver fuel gas detection control unit shall cause a latching trouble signal within 200 seconds at the system control unit that individually identifies the affected device. [**72:**23.16.4.2]

5.12.4.3

A single fault on the signaling channel shall not cause a fuel gas alarm signal. [**72:**23.16.4.3]

5.12.4.6

Reception of any unwanted (interfering) transmission by a retransmission device ~~(repeater)~~ or by the ~~main~~ receiver~~/~~ system control unit, for a continuous period of 20 seconds or more, shall cause an audible and visible trouble indication at the ~~main receiver/~~system control unit ~~to identify the specific trouble condition as an interfering signal~~. [**72:**23.16.4.6]

Commented [JV21]: Note: Text is moving to new section below.

5.12.4.7

The indication required by 5.12.4.6 shall ~~to~~ identify the specific trouble condition as an interfering signal. [**72:**23.16.4.7]

6.3.3.3

~~Multipurpose notification~~ Notification appliances with multiple visible elements used for signaling other than fire shall be permitted to have fire markings only on those visible elements used for fire signaling. [**72:**18.3.3.3]

A.6.3.6

For hardwired appliances, terminals or leads, as described in 6.3.6, are necessary to ensure that the wire run is broken and that the individual connections are made to the leads or other terminals for signaling and power [**72:**A.18.3.6]

A common terminal can be used for connection of incoming and outgoing wires. However, the design and construction of the terminal should not permit an uninsulated section of a single conductor to be looped around the terminal and to serve as two separate connections. For example, a notched clamping plate under a single securing screw is acceptable only if separate conductors of a notification circuit are intended to be inserted in each notch. [See Figure A.5.8.5.1.5(a).] [**72:**A.18.3.6]

Another means to monitor the integrity of a connection is to establish communication between the appliance and the fuel gas detection control unit. The integrity of the connection is verified by the presence of communication. Monitoring integrity in this fashion might not require multiple terminals or leads, as previously described. [**72:**A.18.3.6]

It should be noted that monitoring the integrity of the installation conductors and their connection to an appliance does not guarantee the integrity of the appliance or that it is operational. Appliances can be damaged and become inoperable or a circuit can be overloaded, resulting in failure when the appliances are called upon to work. Presently, only testing can establish the integrity of an appliance. [**72:**A.18.3.6]

6.4.1.3*

Sound from normal or permanent sources, having a duration ~~greater than~~of at least 60 seconds, shall be included when measuring maximum ambient sound level. [**72:**18.4.1.3]

6.4.1.5

Audible alert and evacuation signal tones, including those that precede or follow voice messages, shall meet the requirements of 6.4.2, 6.4.3, 6.4.4, ~~or~~ 6.4.5, or 6.4.6, as applicable. [**72:**18.4.1.5]

6.4.1.5.4

The sound pressure levels that must be produced by the audible appliances in the coverage areas to meet the requirements of this standard shall be documented by the system designer during the planning and design of the notification system. [**72:**18.4.1.5.4]

6.4.1.5.5

The greater of the expected average ambient sound pressure level or expected maximum sound pressure level having a duration of at least 60 seconds shall ~~also~~ be documented for the coverage area by the system designer to ensure compliance with 6.4.2, 6.4.3, 6.4.4, ~~or~~ 6.4.5, or 6.4.6 ~~for the coverage area~~. [**72:**18.4.1.5.5]

6.4.1.6

Voice messages shall not be required to meet the audibility requirements of 6.4.2, 6.4.3, 6.4.4, ~~or~~ 6.4.5, or 6.4.6, but shall meet the intelligibility requirements of 6.4.~~8~~ 9 where voice intelligibility is required. [**72:**18.4.1.6]

6.4.2.5

A fuel gas detection system arranged to stop or reduce ambient noise shall comply with 6.4.2.5.1 through 6.4.2.5.3. [**72:**18.4.4.5]

6.4.2.5.1

A fuel gas detection system arranged to stop or reduce ambient noise shall produce a sound level at least 15 dB above the reduced average ambient sound level or 5 dB above the maximum sound level having a duration of at least 60 seconds after reduction of the ambient noise level, whichever is greater, measured 5 ft (1.5 m) above the floor in the area required to be served by the system using the A-weighted scale (dBA). [**72:**18.4.4.5.1]

A.6.4.4.3

The intent of this section is to require the use of the low frequency signal in areas intended for sleeping and in areas that might reasonably be used for sleeping. For example, this section requires a low frequency audible signal in a bedroom of an apartment and also in the living room area of an apartment as it might have sleeping occupants. However, it would not be required to use the low frequency signal in the hallways, lobby, and other tenantless spaces. In hotels, the guest rooms would require use of the low frequency signals, but other spaces that might require audible signals could use any listed audible appliances regardless of the frequency content of the signal being produced. This chapter of the standard addresses notification appliances connected to and controlled by a system. This chapter does not address dwelling unit protection such as fuel gas alarms and their audible signal characteristics. Requirements for single and multiple-station alarms and household fuel gas alarm systems can be found in Chapter 9. [**72:**A.18.4.6.3]

It is not the intent of this section to preclude devices that have been demonstrated through peer-reviewed research to awaken occupants with hearing loss as effectively as those using the frequency and amplitude specified in this section. [**72:**A.18.4.6.3]

Non-voice (e.g., horns) notification appliances should be listed as a “low frequency alarm” alarm appliance. Voice appliances and systems should be capable of 520 Hz ±10 percent with the appropriate harmonics [**72:**A.18.4.6.3]

For increased protection in the sleeping area, tactile notification in accordance with Section 6.10 might be an effective means of awakening those who have normal hearing, as well as those who are hearing impaired. [**72:**A.18.4.6.3]

6.4.7.1

If ceiling heights allow, and unless otherwise permitted by 6.4.6.2 through 6.4.6.7, wall-mounted appliances shall have their tops above the finished floors at heights of not less than 90 in. (2.29 m) and below the finished ceilings at distances of not less than 6 in. (150 mm). [**72:**18.4.10~~9~~.1]

6.4.7.3

Ceiling-mounted or recessed appliances shall be permitted. [**72:**18.4.10~~9~~.2]

6.4.7.5

If combination audible/visual appliances are installed, the location of the installed appliance shall be determined by the requirements of 6.5.5. [**72:**18.4.10~~9~~.3]

6.4.7.7

Mounting heights other than required by 6.4.6.1 and 6.4.6.3 shall be permitted, provided that the sound pressure level requirements of 6.4.2 for public mode or 6.4.3 for private mode, or 6.4.4 for sleeping areas, based on the application, are met. [**72:**18.4.910.5]

6.4.8 Location of Audible Notification Appliances for Wide–Area Signaling.

Audible notification appliances for wide-area signaling shall be installed in accordance with the requirements of the AHJ, approved design documents, and the manufacturer's installation instruction to achieve the required performance. [**72:**18.4.110]

6.4.9* Voice Intelligibility.

Within the acoustically distinguishable spaces (ADS) where voice intelligibility is required, voice communications systems shall reproduce prerecorded, synthesized, or live (e.g., microphone, telephone handset, and radio) messages with voice intelligibility. [**72:**18.4.121]

A.6.4.9

See Annex D, Speech Intelligibility, of NFPA 72. [**72:**A.18.4.121]

6.4.9.1*

ADSs shall be determined by the system designer during the planning and design of all emergency communications systems. [**72:**18.4.121.1]

A.6.4.9.1

See the definition of acoustically distinguishable space in 3.3.1. [**72:**A.18.4.121.1]

6.4.9.2

Each ADS shall be identified as requiring or not requiring voice intelligibility. [**72:**18.4.121.2]

6.4.9.3*

Unless specifically required by other governing laws, codes or standards, or by other parts of this standard, intelligibility shall not be required in all ADSs. [**72:**18.4.121.3]

A.6.4.9.3

For example, based on the system design the following locations might not require intelligibility.

(1) Private bathrooms, shower rooms, saunas, and similar rooms/areas

(2) Mechanical, electrical, elevator equipment rooms, and similar rooms/areas

(3) Elevator cars

(4) Individual offices

(5) Kitchens

(6) Storage rooms

(7) Closets

(8) Rooms/areas where intelligibility cannot reasonably be predicted

[**72:**A.18.4.12.3]

6.4.9.4*

Where required by the AHJ; governing laws, codes, or standards; or by other parts of this standard, ADS assignments shall be submitted for review and approval. [**72:**18.4.121.4]

A.6.4.9.4

ADS assignments should be a part of the original design process. See the discussion in A.3.3.1. The design drawings should be used to plan and show the limits of each ADS where there is more than one. [**72:**A.18.4.121.4]

All areas that are intended to have audible occupant notification, whether by tone only or by voice should be designated as one or more ADSs. Drawings or a table listing all ADSs should be used to indicate which ADSs will require intelligible voice communications and those that will not. The same drawings or table could be used to list audibility requirements where tones are used and to list any forms of visual or other notification or communications methods being employed in the ADS. [**72:**A.18.4.121.4]

6.4.9.5

Quantitative measurements shall not be required. [**72:**18.4.121.5]

6.4.9.6

Quantitative measurements shall be permitted. [**72:**18.12.6]

A.6.5.1.2

Visual notification appliances for emergency signaling might not be required in all rooms or spaces. For example, a system that is used for general occupant notification should not require visual signaling in closets and other spaces that are not considered as occupiable areas. However, a space of the same size used as a file room could be considered occupiable and should have coverage by notification appliances. Also, signaling intended only for staff or emergency forces might only have to be effective in very specific locations. [**72:**A.18.5.1.2]

6.5.3.6

Visual notification appliances used to signal occupants to seek information or instructions shall be clear, nominal white, or other color as required by the emergency response plan and the AHJ for the area or building. [**72:**18.5.3.6]

6.5.4 Appliance Photometrics.

The light output shall comply with the polar dispersion requirements for public mode signaling ~~as described~~ in UL 1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*~~, or equivalent~~. [**72:**18.5.4]

6.5.5.5.4

In square rooms with appliances not centered or in nonsquare room~~s configurations that are not square rooms~~, the effective intensity (cd) from one visual wall-mounted notification appliance shall be determined by maximum room size dimensions obtained either by measuring the distance to the farthest wall or by doubling the distance to the farthest adjacent wall, whichever is greater, as required by Table 6.5.5.5.1(a) and Figure 6.5.5.5.1. [**72:**18.5.5.7.4]

6.5.5.6.5*

Except as permitted by 6.5.5.6.6 or 6.5.5.6.7, ~~Visual~~ visual notification appliances shall be located not more than 15 ft (4.57 m) from the end of the corridor with a separation not greater than 100 ft (30.5 m) between appliances. [**72:**18.5.5.8.5]

6.5.5.7.1

Any design that provides a minimum of 0.0375 lumens/ft2 (0.4036 lumens/m2) of illumination at any point within the covered area at all angles specified by the polar dispersion planes for wall- or ceiling-mounted public mode visual notification appliances in UL 1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*~~, or equivalent~~, as calculated for the maximum distance from the nearest visual notification appliance, shall be permitted in lieu of the requirements of 6.5.5, excluding 6.5.5.8. [**72:**18.5.5.9.1]

6.5.5.7.2

Documentation provided to the AHJ shall include inverse square law calculations using each of the vertical and horizontal polar distribution angles in UL 1638, Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories~~, or equivalent~~. [**72:**18.5.5.9.2.1]

6.5.5.7.2.1

The inverse square law calculations shall account for the effects of polar distribution using one of the following:

(1) The percentages from the applicable table(s) in UL 1638, Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories~~, or equivalent~~

(2) The actual results of laboratory tests of the specific appliance to be used as recorded by the listing organization

[**72:**18.5.5.9.2.2]

6.5.5.8.2

For rooms with a linear dimension greater than 16 ft (4.87 m), the visual notification appliance shall be located within 16 ft (4.87 m) of the pillow. [**72:**18.5.5.10.4]

A.6.9

Textual and graphical visual appliances are selected and installed to provide temporary text, permanent text, or symbols. Textual and graphical visual appliances are most commonly used in the private mode for fuel gas alarm systems. The use of microprocessors with computer monitors and printers has resulted in the ability to provide detailed information in the form of text and graphics to persons charged with directing emergency response and evacuation. Textual and graphical visual appliances are also used in the public mode to communicate emergency response and evacuation information directly to the occupants or inhabitants of the area protected by the system. For both private mode and public mode signaling, text and graphic annunciators can provide information about pre-alarm, alarm, trouble, and supervisory conditions. Because textual and graphical visual appliances do not necessarily have the ability to alert, they should only be used to supplement audible or visual notification appliances. [**72:**A.18.9]

Textual and graphical visual information should be of a size and visual quality that is easily read. Many factors influence the readability of textual visual appliances, including the following:

(1) Size and color of the text or graphic

(2) Distance from the point of observation

(3) Observation time

(4) Contrast

(5) Background luminance

(6) Lighting

(7) Stray lighting (glare)

(8) Shadows

(9) Physiological factors

[**72:**A.18.9]

While many of these factors can be influenced by the equipment manufacturer and by the building designers, there is no readily available method to measure legibility. [**72:**A.18.9]

6.9.1.1

Textual and graphical visual appliances shall be permitted to be used to signal information about fuel gases or other emergency conditions or to direct intended responses to those conditions. [**72:**18.9.1.1]

6.10.2* Performance.

Tactile appliances shall meet the performance requirements of UL 1971, *Signaling Devices for the Hearing Impaired*~~, or equivalent~~. [**72:**18.10.2]

A.6.10.2

Notification appliances ~~are available for the deaf and hard of hearing. These appliances~~ ~~include~~including, but ~~are~~ not limited to, supplemental tactical notification appliances are available for the deaf and hard of hearing. ~~Such~~ ~~tactile~~ Tactile notification appliances can be capable of awakening people. ~~Tactile~~Such appliances can, ~~initiate in response to the activation of an audible fuel gas alarm,~~ through hard wiring into the fuel gas alarm system or by wireless methods, initiate in response to the activation of an audible fuel gas alarm. [**72:**A.18.10.2]

Some tests show that visual notification appliances might not be effective in awakening some sleeping individuals during an emergency. Some tactile ~~devices~~ notification appliances can be more effective in awakening individuals, regardless of hearing levels, from sleep. See the FPRF report, "Review of Alarm Technologies for Dead and Hard of Hearing Population," and A.9.4.2.4 for further details. [**72:**A.18.10.2]

8.2.1.2

Where the property owner is not the occupant, the property owner shall be permitted to delegate the authority and responsibility for inspecting, testing, and maintaining the fuel gas detection systems to the occupant, management firm, or managing individual through specific provisions in the lease, written use agreement, or management contract. [**72:**14.2.3.2]

A.8.2.4

The test plan is intended to clarify exactly what is to be tested and how it is to be tested. Testing of fuel gas alarm and signaling systems is often done in a segmented fashion to accommodate the availability of testing or other personnel or to minimize the interruption of building operations. Where a building owner has contracted the performance of inspection, testing, and maintenance activities to outside entities, the test plan, what will and will not be tested, should be reviewed by those parties. Building

operations can be affected by testing of the fuel gas alarm or signaling system itself and by the operation of emergency control functions actuated by the fuel gas alarm or signaling system. The boundary of the fuel gas alarm or signaling system extends up to and includes the emergency control function interface device. The testing requirements prescribed in ~~NFPA 715~~this standard for fuel gas alarm and signaling systems end at the emergency control function interface device. The purpose of the test plan is to document what devices will and will not actually be tested. [**72:**A.14.2.10]

The testing of emergency control functions, releasing systems, or interfaced equipment is outside the scope of ~~NFPA 715~~this standard. Requirements for testing other systems are found in other governing laws, codes, or standards. Requirements for integrated testing of combined systems also fall under the authority of other governing laws, codes, standards, or authority having jurisdiction. NFPA 3 provides guidance for such testing. NFPA 3 recognizes the importance of the development of an integrated testing plan. [**72:**A.14.2.10]

Further information on testing associated with emergency control functions can be found in Table 8.4.3, Item 18 and its related annex material in A.8.4.3. [**72:**A.14.2.10]

8.3.1*

Unless otherwise permitted by 8.3.2, visual inspections shall be performed in accordance with AHJ or with the schedules provided in Table 8.3.1 ~~or more often if required by the AHJ~~whichever is more frequent. [**72:**14.3.1]

[no changes to table]

A.8.4.2

Reacceptance testing is performed to verify the proper operation of added or replaced devices, appliances, [fuel gas safety] control function devices, control units, and so forth. It is not the intent of the committee to unduly burden the system owner with increased costs for repeated testing of devices not directly affected by the replacement of devices with like devices. [72:A.14.4.2]

For example, if a 2 amp fuse is replaced with another 2 amp fuse in the fuel gas detection control unit, verification of the circuit(s) served by the fused supply is required, but it would not be necessary to test 10 percent of initiating devices not directly affected by replacing the fuse. Likewise, it is not necessary to test all these initiating devices whenever a fuel gas detector is replaced with a like fuel gas detector. [**72:**A.14.4.2]

When wiring changes are made to correct improperly supervised circuits, a test of the affected device or appliance is required, but not a test of 10 percent of initiating devices not directly affected. [**72:**A.14.4.2]

8.4.2.2

When an initiating device, notification appliance, or control relay is deleted, another device, appliance, or control relay on the circuit shall be ~~operated~~functionally tested. [**72:**14.4.2.2]

8.4.2.3

When ~~modifications or repairs to~~ control unit~~equipment~~ hardware is modified or repaired~~are made~~, the control ~~equipment~~ unit shall be tested in accordance with ~~Table 8.4.3,~~ items 2(1) and 2(4) of Table 8.4.3. [**72:**14.4.2.3]

8.4.2.5*

Changes to the system executive software shall require at least a 10 percent functional test of the system, including a test of at least one device on each input and output circuit to verify critical system functions such as notification appliances, control functions, and off-premises reporting. [**72:**14.4.2.5]

A.8.4.3 Table 8.4.3, Item 8(4).

Ohmic testing is a means to determine the state of health of a VRLA battery's cells by measuring some form of a cell's internal resistance. Typically ohmic testing equipment uses one of three techniques—conductance, impedance, or resistance—to make these measurements. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

In simplest technical terms, ohmic technology is based on Ohm's Law, which expresses the relationship between volts, amperes, and ohms in an electrical circuit. Ohmic testing attempts to use voltage and current to determine the resistive characteristic of a battery's cells. As the cells in a battery age and start to lose capacity, the internal components of the battery are undergoing a degradation process. The degradation of these components (plates, grids, internal connection straps) within the battery's cells causes an increased resistance in the conduction paths of the cell, which in turn causes a change in the internal ohmic values. A measured increase in impedance or resistance, or a decrease in conductance, indicates the battery is losing its ability to produce the energy it was designed to deliver when called upon to support the connected loads. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

The key to effective application of ohmic testing is the appropriate trending of test results over time compared to a baseline or reference value. Studies have demonstrated that an individual battery produces a unique ohmic "signature" and the use of ohmic testing equipment to trend changes in this signature from installation through the life of the battery is the most effective use of the technology. A program that involves ohmic testing on a regular interval to note changes in the battery is a good maintenance practice. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

An ohmic baseline reference value is a benchmark value based on data collected from known good batteries. Reference values can be determined from site-specific measurement, or from testing a sample

of new healthy batteries, or by using a generic baseline value to get started. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

(1) The best baseline is one established on the installed battery within three to six months after installation and trend accordingly using good record keeping. Ideally the individual ohmic value should be measured at installation and again after the battery has been on float charge for at least 72 hours in order for it to reach a high state of stabilization. These initial "site-specific" values should be recorded and permanently affixed to the battery as a baseline for subsequent tests over the life of the battery. The ohmic value will typically increase for conductance and decrease for resistance and impedance between the initial installation and after being on float-charge for 90 to 180 days (10 percent to 15 percent depending on battery type and size). Six months after installation measure and compare the ohmic readings to the readings taken at installation. Use whichever value is greater for conductance or lower for resistance and impedance as the baseline for that particular battery at that site going forward. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

(2) A sample of new healthy batteries in a fully charged state can be tested to obtain a baseline value representative of a new battery. A sample size of at least 30 batteries from one manufacturer with the same make, model, amp-hour rating, age (within 6 months), and manufacturing lot is recommended. Record the following information for the batteries:

(a) Battery manufacturer

(b) Model number

(c) Date of manufacture

(d) Manufacturing lot number (if available)

(e) Battery temperature

(f) Whether or not the battery has had a freshening charge

(g) Battery voltage

(h) Ohmic test value

[**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

Calculate the average ohmic value of the batteries. Do not include batteries that deviate more than 30 percent from the average because they could be outside of an acceptable range. Use the average value as a baseline starting point for this model battery. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

(1) A generic baseline value for a specific battery model can often be found by contacting the ohmic test equipment manufacturer or from the battery manufacturer. While it is important to note that the use of generic reference values might not be as accurate, it is still possible to identify grossly failed batteries and significant changes in battery condition by applying this method. Generic baseline values are typical averages to be used as general guidelines and should only be used when no other data is available. When testing older batteries for which no initial site-specific ohmic value is available, reference values can be obtained in the following ways:

(a) Contact the equipment or battery manufacturer for assistance.

(b) Consult your company documentation to see if reference values were created for the battery you are testing.

(c) Using ohmic readings of recently installed batteries of the same manufacturer and model of the battery, manufacturer and model of the alarm panel/system, charging circuit, and temperature at time of measurements, calculate the average ohmic value of the best 8 to 10 batteries and use this value as a baseline reference.

[**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

As a battery ages and loses capacity, the internal ohmic values change. Although the change might not be perfectly consistent over all battery models and sizes, experience and extensive test data shows that a deviation of ohmic values from the established baseline by 30 percent or more for conductance and 40 percent more for resistance or impedance indicates that the actual battery capacity has dropped to 80 percent or lower. (For lead-acid batteries, capacity drops off rapidly once the 80 percent capacity point is reached in the lifetime curve, so this is known as the “knee” of the capacity vs. lifetime curve). This 80 percent capacity is the level at which battery manufacturers recommend battery replacement. Figure A.8.4.3 illustrates an ohmic trend of a 5-year design life battery with an actual expected service life of 3 years. Note that while battery Unit #1 still has good ohmic readings, semiannual measurements show Unit #2 failing prematurely. For this case, it is desirable to replace both units at the same time. If one unit fails at 21⁄2 years, it is likely the second unit will fail in one of the next semiannual tests. Full replacement ensures that all units will “float” together. One exception might be when a unit fails in the first year. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

Ohmic testing can be a safe, simple, accurate, and reliable means of determining the state of health of VRLA batteries. It is important however to understand the following basic guidelines in order to maximize the benefits and avoid possible misleading test results:

(1) Follow safety regulations: wear eye protection and remove metal jewelry, and so forth prior to working with batteries.

(2) Conduct a visual inspection prior to testing. A cracked case, leaking terminal or post, or bulging battery should be replaced, not tested.

(3) Temperature changes affect measured ohmic values and battery capacity. Ohmic measurements should be taken at 77°F (25°C) ±13°F (7°C).

(4) For maximum accuracy and consistency, batteries should be tested when in a fully charged state.

(5) Check the battery charging current prior to test. The charging current should be stable and be within the normal float current recommendations of the battery manufacturer for the battery model. If it is not, it is likely that the batteries have recently been discharged and a test is not appropriate until this float current stabilizes.

(6) Whenever possible, ohmic readings should be taken each time with the same instrument, but as a minimum with the same model. Changing models will skew the data and require re-establishing the baseline.

(7) When test equipment is provided with an alert, set the ohmic baseline and/or thresholds prior to beginning the test to provide an indication of any deviations from baseline.

(8) It is essential to take ohmic measurements at the battery terminal or post. For consistency and accuracy, subsequent tests should always have probes or clamps placed at the same point while avoiding battery hardware such as bolt heads or washers. Connecting on the hardware will influence the readings and could cause replacement of a healthy battery.

(9) Maintain good contact at the test point for the duration of the test. If the probe or clamp slips off during the test, an incorrect reading will result.

(10) For batteries with fully insulated quick disconnect connectors, the battery should be taken offline by removing the quick disconnects from the battery terminals and then measuring and recording the internal ohmic value of the battery.

(11) Do not condemn a battery based upon results of a single test without any trending data or an established baseline for that specific battery.

(12) When one or more units in a battery falls outside the acceptable range from baseline, replace the entire string.

(13) While testing online is the preferred method, it should be noted that the capability of ohmic meters varies. As such, the test equipment manufacturer might provide instructions to disconnect the battery and test offline. A battery tested online can display a different value than when tested offline due to the charger circuit and load being across the battery. Always test the same way, either online or offline, to have consistent and meaningful results. When ohmic testing is performed online, a change in current occurs due to the ohmic test set signal that could impact battery voltage readings. Because battery float voltage is directly tied to float current, the sum of the voltages of each battery cell/unit have to equal the charger float voltage of the battery string. If a load is applied from the ohmic test set that depresses one cell/unit, then the others have to rise somewhat to offset it. As ohmic testing progresses through the battery string, each cell/unit gets pulled down by the ohmic test set somewhat, and the charger must boost the string current to maintain the voltage, raising the voltage of the cells/units that have not yet been tested. For this reason, voltage readings should be taken with a voltmeter prior to performing ohmic testing online.

[**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(4)]

Table 8.4.3.2, Item 8(5).

Battery capacity is determined by the mass of active material contained in the battery and is a measure of the battery's stored energy. The rated capacity of small VRLA batteries used in fire alarm and signaling system applications is typically measured in ampere-hours (Ah) where the ampere-hour rating is based

on the battery's capability to provide a constant current at the nominal battery voltage for 20 hours. The rated capacity might vary from manufacturer to manufacturer. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

The actual battery capacity during service life, often referred to as the state of charge (SOC), can vary significantly from rated capacity due to aging, charge and discharge cycles, temperature, and other factors. The unique failure modes of VRLA batteries due to aging and internal degradation are attributed for a high failure rate where the actual battery capacity has degraded to 80 percent of the manufacturer's rated capacity. As a result, battery manufacturers often recommend replacement much sooner than the rated design life for critical systems. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

A test of battery capacity is designed to determine if the battery is capable of continuing to deliver the voltage level specified by the manufacturer. The results of a capacity test can also be used to estimate where the battery is in its service life. A test of capacity is performed by applying a constant current load to the battery based on the manufacturer's published discharge rates until voltage falls to specified levels. Although discharging the battery for capacity testing concerns some, VRLA batteries are designed to handle numerous discharges within the limits established by the battery manufacturer. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

The discharge rate selected for testing should be representative of the battery duty cycle. At shorter test times, the test duration has a greater effect on the capacity calculation. For example, a 1-minute difference in actual test time for a 5-minute discharge rate compared to a 3-hour discharge rate will result in a greater deviation of the calculated capacity. The battery is also operating less efficiently at shorter discharge rates and the effects of aging and degradation might not be as prevalent during shorter discharges. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

Fuel gas detection and signaling system loading is typically insufficient for the practical application of a battery load test because the system load cannot be varied to maintain a constant current equal to the battery manufacturer's published discharge rates. The fixed load applied by the system will result in final voltage levels that are deceptively high. Battery sizing is also a factor. The calculated system loads for the battery duty cycle (e.g., 24 hours standby followed by 5 minutes in an alarm) will rarely align with published discharge rates necessary for load testing. In many applications where the battery size is large in comparison to the required system current, the system loading could be too small to accurately determine battery capacity. In these cases, a battery near failure could conceivably satisfy the low discharge rate applied by the fire alarm or signaling system. [**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

In order to satisfy the load test requirements of Table 8.4.3, battery capacity testing can be performed in the following manner or in accordance with other methods such as those identified in IEEE 1188, Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications:

(1) Referring to the battery manufacturer's specifications, determine the load current for the 3-hour battery rating to the selected end voltage, typically 1.67 volts per cell (10.2 volts for a 12-volt system or 20.4 volts for a 24-volt system).

(2) Record the battery temperature at the negative terminal.

(3) Disconnect the charger and connect a load bank to the battery terminals.

(4) Apply the constant current specified for the 3-hour rate to the battery. Once the constant current is applied, continue the test until the battery terminal voltage decreases to the specified end voltage.

(5) Stop the test when the selected end voltage is reached.

(6) Record the actual test duration in minutes.

(7) Disconnect the load bank and reconnect the charger.

(8) Calculate percent battery capacity as follows:

% Capacity = [Tactual/(180 × KT)] × 100

where:

Tactual = the test duration in minutes

KT = the temperature correction factor for the actual battery temperature at the start of the test from Table 8.4.3. Additional temperature correction factors can be obtained from IEEE 1188, *Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*.

(9) Replace the battery if the battery capacity is less than or equal to 80 percent. Replace the battery at the next scheduled test interval if the battery capacity is less than 85 percent.

[**72:**A.14.4.3.2, Table 14.4.3.2, Item 9(5)]

As a good practice, a new battery should be fully charged and then load tested following the battery manufacturer's recommendations prior to installation. A new fully charged battery should have a capacity of at least 90 percent. [**72:**A.14.4.3.2 Table 14.4.3.2 Item 9(5)]

Table A.8.4.3 Temperature Correction Factors

Temperature		
°F	(°C)	KT
65	18.3	0.92
66	18.9	0.927
67	19.4	0.935
68	20	0.942
69	20.6	0.948

Temperature		
°F	(°C)	KT
70	21.1	0.955
71	21.7	0.96
72	22.2	0.97
73	22.8	0.975
74	23.4	0.98
75	23.9	0.985
76	24.5	0.99
77	25	1
78	25.6	1.002
79	26.1	1.007
80	26.7	1.011
81	27.2	1.017
82	27.8	1.023
83	28.3	1.03
84	28.9	1.035
85	29.4	1.04
86	30	1.045
87	30.6	1.05
88	31.1	1.055
89	31.6	1.06

Temperature		
°F	(°C)	KT
90	32.2	1.065
95	35	1.09
100	37.8	1.112

[**72:**Table A.14.4.3.2]

Figure A.8.4.3 Ohmic Trend Analysis for a 24-Volt Battery Made Up of Two 12-Volt Units. [**72:**Figure A.14.4.3.2]

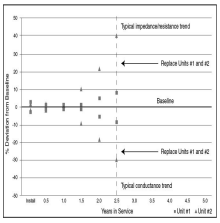


Table 8.4.3, Item 18.

The extent of testing of a fire alarm or signaling system, including devices that were not tested, should be documented in accordance with the test plan in 8.2.4. NFPA 72 does not require testing of an emergency control function, such as elevator recall, but does require testing of the emergency control function interface device, such as the relay powered by the fire alarm or signaling system. Where the emergency control function is not being tested concurrent with the fire alarm or signaling system testing, measurement of the emergency control function interface device output should be verified using the proper test devices. This might require reading or observing the condition of a relay, a voltage measurement, or the use of another type of test instrument. Once testing is complete, verification that any disabled or disconnected interface devices have been restored to normal is essential, and this verification should be documented in the testing results. [**72:**A.14.4.3.2, Table ~~8.4.3~~14.4.3.2, Item 24]

Testing of the emergency control functions themselves is outside of the scope of ~~NFPA 715~~this standard. A complete end-to-end test that demonstrates the performance of emergency control functions actuated by the fire alarm or signaling system might be required by some other governing laws, codes, or standards, or the authority having jurisdiction. In that situation, other applicable installation standards and design documents, not NFPA 715, would address testing and performance of the emergency control functions. [**72:**A.14.4.3.2, Table ~~8.4.3~~14.4.3.2, Item 24]

8.4.4* Testing Frequency.

Unless otherwise permitted by other sections of this standard, testing shall be performed in accordance with the AHJ or with the schedules provided in Table 8.4.3, ~~or more often if required by the AHJ~~whichever is more frequent. [**72:**14.4.4]

8.6.1.2

The system owner shall be responsible for maintaining these records for the life of the system for examination by any AHJ. ~~Paper or electronic media shall be permitted. [**72:**14.6.1.3]~~ [**72:**14.6.1.3]

Commented [JV22]: Note: Text is moving to new section below.

8.6.1.3

Paper or electronic media shall be permitted. [**72:**14.6.1.~~43~~]

8.6.2.1

The system owner shall be responsible for retaining maintenance, inspection, and test ~~Records~~ records ~~shall be retained~~ until the next test and for 1 year thereafter. [**72:**14.6.2.1]

8.6.2.2

A record of all inspections, testing, and maintenance shall be provided in accordance with Figure 8.6.2.2. [**72:**14.6.2.~~54~~]

9.4.2.4.1

Where low frequency sounders, tactile notification appliances, or both are required in rooms by governing laws, codes, or standards, they shall comply with either of the following: ~~Notification appliances provided in sleeping rooms and guest rooms for those with hearing loss shall comply with 9.4.2.4.1.1 and 9.4.2.4.1.2, as applicable.~~

(1) The low frequency sounders shall have a fundamental frequency of 520 Hz +/- 10 percent.
(2) Tactile notification appliances shall meet the requirements of Section 6.10.

[**72:**29.5.10]

~~**9.4.2.4.1.1* Mild to Severe Hearing Loss.**~~

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

~~(1) An audible notification appliance producing a low frequency alarm signal shall be installed in the following situations:~~

~~(a) Where required by governing laws, codes, or standards for people with hearing loss~~

~~(b) Where provided voluntarily for those with hearing loss~~

~~(2) The low frequency alarm signal output shall have a waveform with a fundamental frequency of 520 Hz ±10 percent.~~

~~**9.4.2.4.1.2* Moderately Severe to Profound Hearing Loss.**~~

~~Visual notification appliances in accordance with the requirements of 6.5.5.8 and tactile notification appliances in accordance with the requirements of Section 6.10 shall be required for those with moderately severe to profound hearing loss in the following situations:~~

~~(1) *Where required by governing laws, codes, or standards for people with hearing loss~~

~~(2) Where provided voluntarily for those with hearing loss~~

~~[**72:**29.5.10.2]~~

A.9.4.2.4.~~1.1~~ [Reassociate to A.9.4.2.4 as the 2nd para]

~~As an example, governing~~ Governing laws, codes, or standards might require a certain number of accommodations to be equipped for those with hearing loss or other ~~disability~~disabilities. Based on sleep studies to assess the waking effectiveness of different types of alarm signals, a low-frequency alarm signal with a fundamental frequency of 520 Hz has been shown to provide improved awakening for people with hearing loss when compared to typical alarms from high-frequency piezoelectric sounders used in most smoke alarms (Bruck and Thomas, 2009). Visual alarm signals, such as xenon strobes or LED strobes, have been shown to be ineffective at waking people with mild to severe hearing loss (Thomas and Bruck, 2009; Ashley and Du Bois, 2005). [**72:**A.29.5.10]

As for all alarm signals, effectiveness of the installed notification for the specific occupants should be tested by the occupants, if possible. The low-frequency alarm signal can be provided by the sounder in a smoke alarm or by a separate notification appliance. It is not the intent of this section to preclude devices that have been demonstrated, through peer-reviewed research, to awaken occupants with hearing loss as effectively as those using the frequency and amplitude specified in this section. [**72:**A.29.5.10]

Low-frequency or tactile notification appliances such as bed shakers have been shown to be effective in waking those with normal hearing to profound hearing loss (CSE NIH report, 2005; Bruck and Thomas, 2009; Bruck, Thomas, and Ball, NFPA RF report, 2007; Ashley and Du Bois, 2005; UL 1971, 2024). [**72:**A.29.5.10]

Tactile signaling has been studied and found to be an effective way to alert and notify sleeping persons. However, there are many variables that have not been tested that might affect the reliability of their performance. [**72:**A.29.5.10]

Some of the appliance variables include the mass of the appliance, the frequency of vibration, and the throw or displacement of the vibrating mass. Occupant variables that might affect the reporting of test results and the effectiveness of the appliance include the person's age, how long a person has lived with

their hearing loss, and what sleep stage the person is experiencing when the appliance operates. The type of mattress might also have an effect of the performance of certain tactile appliances. Mattress variables can include mattress thickness, mattress firmness, memory foam mattresses, pillow top mattresses, water beds, air beds, and motion isolation mattresses. Users of tactile appliances are cautioned to test how well they sense the effect of an appliance.

[**72:**A.29.5.10~~.1~~]

~~**A.9.4.2.4.1.1(2)**~~

~~It is not the intent of this section to preclude devices that have been demonstrated through peer reviewed research to awaken occupants with hearing loss as effectively as those using the frequency and amplitude specified in this section. [**72:**A.29.5.10.1(2)]~~

~~**A.9.4.2.4.1.2**~~

~~Tactile notification appliances such as bed shakers have been shown to be effective in waking those with normal hearing to profound hearing loss (Ashley, et al. 2005, UL 1971, 2018). Tactile signaling has been studied and found to be an effective way to alert and notify sleeping persons. However, there are many variables that have not been tested that might affect the reliability of their performance. Some of the appliance variables include the mass of the appliance, frequency of vibration, and the throw or displacement of the vibrating mass. Occupant variables that might affect the reporting of test results and the effectiveness of the appliance include the person's age, how long a person has lived with their hearing loss, and what sleep stage the person is experiencing when the appliance operates. The type of mattress might also have an effect of the performance of certain tactile appliances. Mattress variables can include thickness, firmness, memory foam, pillow tops, water beds, air beds, and motion isolation mattresses. Users of tactile appliances should be cautioned to test how well they might sense the effect of the appliance. [**72:**A.29.5.10.2]~~

~~The standard requires both visual notification appliances and tactile appliances. Visual notification appliances can awaken sleeping persons, provide verification that there is a fuel gas alarm condition, and serve to alert persons when they are not in contact with a tactile appliance.~~

~~**A.9.4.2.4.1.2(1)**~~

~~As an example, governing laws, codes, or standards might require a certain number of accommodations be equipped for those with hearing loss or other disability. [**72:**A.29.5.10.2(1)]~~

9.4.2.4.3

Since hearing ~~deficits~~ disabilities are ~~often~~ not always apparent, the responsibility for advising the appropriate person(s) of the existence of this ~~deficit~~ disability shall be that of the party with hearing ~~loss~~disability. [**72:**29.5.9]

9.6.1.5

Trouble signals shall be distinctive from alarm signals. [**72:**29.10.3.54]

9.6.8.4.2

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

(1) Require ~~a single~~one telephone line
(2) Require a call to ~~a single~~one digital alarm communicator receiver (DACR) number
[**72:**29.10.9.10.1]

Commented [JV23]: Note: Text is moving to numbered list below.

9.6.8.4.6

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

(1) Be provided with a minimum of 24 hours of secondary power capacity
(2) Transmit a specific trouble ~~condition indicating~~signal upon loss of primary power~~.~~
[**72:**29.10.9.10.4]

Commented [JV24]: Note: Text is moving to numbered list below.

9.6.10.3*

Wireless interconnected fuel gas alarms~~—~~ (in receive mode)~~—~~ shall remain in alarm as long as the originating unit (~~i.e.,~~ transmitter) remains in alarm. [**72:**29.10.8.2.4]

9.7.1.2

All fuel gas alarms or detectors shall be located and mounted ~~so~~ that accidental operation ~~will~~is not ~~be~~ caused by jarring or vibration. [**72:**29.11.1.2]

9.7.1.3

All fuel gas alarms or detectors shall be mounted so as to be supported independently of their attachment to wires. [**72:**29.11.1.3]

Second Revision No. 9-NFPA 715-2024 [Section No. 1.1]

1.1 Scope.

1.1.1*

This standard shall be concerned with life safety and protection of property from the unintended release of fuel gases .

A.1.1.1

This document does not attempt to cover all equipment, methods, and requirements that might be necessary or advantageous for the protection of life and property from unintended fuel gas releases, including, but not limited to, purge ventilation systems and process control systems for mitigating flammable gas concentration development, explosion venting structural elements, and fire suppression systems linked to gas detection .

1.1.2*

This standard shall cover the selection, design, application, installation, location, performance, operation, inspection, testing, and maintenance of fuel gas detection and warning equipment in buildings and structures.

A.1.1.2

The requirements in this standard specifically address fuel gas alarm and fuel gas detection systems in residential, commercial, and mixed residential/ commercial ~~mixed~~ occupancies. The requirements also apply to other occupancies ~~(e.g., industrial facilities, power plants)~~ if deemed necessary by applicable laws, codes, and standards for a specific type of occupancy.

~~Additionally, see~~ ~~NFPA 1192~~ ~~for~~ The requirements do not cover equipment for use in recreational vehicles, including, but not limited to, those vehicles covered by NFPA 1192 .

See UL 2075, *Gas and Vapor Detectors and Sensors*, and UL 1484, *Residential Gas Detectors,* for specific certification requirements for gas detection equipment .

UL 2075 addresses toxic and combustible gas and vapor detectors and sensors, that include an assembly of electrical components coupled with a sensing means inside a chamber, or by separate components, to detect toxic or combustible gases or vapors. Detectors in UL 2075 cover a broad spectrum of applications, including residential, industrial, and commercial. Detectors are intended for monitoring environments for open-area protection and for connection to a compatible power supply or control unit for operation as part of gas detection or emergency signaling systems. In addition, UL 2075 addresses detectors solely for control of ventilation or shutoff devices, such as fans or control valves, as provided by the listing. ~~UL 2075 also covers equipment intended for use in hazardous locations.~~

The scope of UL 1484 specifically addresses requirements for electrically operated gas alarms intended for residential and recreational vehicle occupancies to detect fuel gases such as liquefied petroleum gas (LP-Gas) and natural gas. Devices are intended to be factory-built as a complete assembly of components functioning as a self-contained alarm device, including an element to detect gas concentration, an alarm-sounding appliance, and provision for connection to a power supply source. Devices are specifically not intended for use in hazardous locations as defined in *NFPA 70*, for industrial or commercial use, or for use as smoke and fire detectors or alarms.

Although UL 2075 does not cover self-contained and single- and multiple-station residential fuel gas alarms otherwise covered in UL 1484, those sensors, detectors, and alarms that are covered in UL 2075 must operate within the sensitivity parameters defined by the manufacturer and must not exceed alarm limits defined in UL 1484.

1.1.3*

~~This standard shall contain requirements for the selection, installation, operation, and maintenance of equipment that detects concentrations of fuel gases that could pose a life or property safety risk.~~ The scope of this standard shall not apply to fuel gas installations specific to industrial or process-oriented activities that are within the scope of other NFPA standards unless otherwise determined by the authority having jurisdiction (AHJ).

A.1.1.3

The requirements do not cover commercial or industrial process facilities addressed by other NFPA fire safety and gas detection standards, such as NFPA 30A or standards, covering industrial facilities, except where local AHJs adopt specific requirements of this standard.

1.1.4

This standard shall not apply to hazardous (classified) locations as defined in Article 500 and Article 505 of *NFPA 70* .

Supplemental Information

File Name	Description	Approved
715_A2025_Chapter_1_1_1-SR-9.docx	715_A2025_Chapter_1_1_1-SR-9	
715_SR-9_1.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 12 17:12:39 EDT 2024

Committee Statement

Committee Statement: This revision adds “from the unintended release of fuel gases” to the scope to clarify when the standard is applicable, specifically that intentional fuel gas releases (for example, from industrial processes) are not within scope. Annex material is moved from A.1.1 to A.1.1.1 as a more logical location since Section 1.1 does not have any text or requirements. The annex is enhanced with specific applications where the standard is and is not applicable.

The reference to NFPA 1192 in Annex A.1.1.2 was modified since NFPA 715 does not cover recreational vehicles. The reference to UL 2075 covering detectors in hazardous locations was deleted since it was incorrect. Existing clause 1.1.3 was largely redundant to 1.1.2 with the exception of "operation" which was added to 1.1.2.

NFPA 715 is not intended to apply to industrial or process applications. New sections 1.1.3, 1.1.4, and associated annex material is added to address concerns that NFPA 715 might be applied to industrial process applications in certain jurisdictions or by the AHJ. Text is added to clarify that NFPA 715 is not intended to address hazardous classified areas.

Response Message: SR-9-NFPA 715-2024

Public Comment No. 2-NFPA 715-2024 [Sections A.1.1, A.1.1.2]

Public Comment No. 1-NFPA 715-2024 [Section No. 1.1]

Second Revision No. 1-NFPA 715-2024 [Section No. 2.3]

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, *Electroacoustics — Sound Level Meters* — Part 1: Specifications, 2014.

ANSI/ASA S3.41, *Audible Emergency Evacuation (E2) and Evacuation Signals with Relocation Instructions (ESRI)*, 2015, reaffirmed 2020 .

2.3.2 ASCE Publications.

American Society of Civil Engineers, 1801 Alexander Bell Drive, Reston, VA 20191-4400.

ASCE/SEI 7, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, 2022.

2.3.3 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.

2.3.4 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).

2.3.5 TIA Publications.

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

ANSI/TIA 568.3, *Optical Fiber Cabling Components Standard*, 2022.

2.3.6 UL Publications.

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

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

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

UL 1971, *Signaling Devices for the Hearing Impaired*, 2002, revised ~~2018~~ 2024 .

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

2.3.7 Other Publications.

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

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Aug 19 10:45:27 EDT 2024

Committee Statement

Committee Statement: References are updated in accordance with the Reference Policy.
Response Message: SR-1-NFPA 715-2024

Second Revision No. 2-NFPA 715-2024 [Section No. 2.4]

2.4 References for Extracts in Mandatory Sections.

NFPA 72®, National Fire Alarm and Signaling Code®, ~~2022~~ 2025 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel–Burning Appliances,* 2024 edition.

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

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

Submitter Information Verification

Committee: FWE-AAA
Submittal Date: Mon Aug 19 11:38:25 EDT 2024

Committee Statement

Committee Statement: This revision updates extracted text in accordance with the Extract Policy.
Response Message: SR-2-NFPA 715-2024

Second Revision No. 7-NFPA 715-2024 [Section No. 4.3.1]

4.3.1

Equipment constructed and installed in conformity with this standard shall be listed for the purpose for which it is used. [**72:** 10.3.1] ~~in accordance with the following:~~

~~Residential fuel gas detectors and alarms shall be listed in accordance with UL 1484, *Residential Gas Detectors* .~~

~~Fuel gas detectors shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors* .~~

Supplemental Information

File Name	Description	Approved
715_SR-7_4.3.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Wed Sep 11 11:33:35 EDT 2024

Committee Statement

Committee Statement: This revision aligns with previous revisions to Sections 5.8.5.3.3.1 and .2 to eliminate the specific reference to the actual detector sensitivity and eliminates redundant references to UL 2075 and UL 1484. These standards are already referenced in Chapter 5 and Chapter 9. This text is extracted from NFPA 72 and is a fundamental clause that all equipment, not just detectors and alarms, need to be listed for the purpose for which they are used.

Response Message: SR-7-NFPA 715-2024

Public Comment No. 4-NFPA 715-2024 [Section No. 4.3.1]

Second Revision No. 8-NFPA 715-2024 [Section No. 5.8.5.3]

5.8.5.3* Requirements for Fuel Gas Detectors.

A.5.8.5.3

For purposes of this standard, fuel gas detector location refers to specific areas where the detector should be sited while fuel gas detector placement identifies specific installation criteria, such as proximity to fuel-burning appliances and placement distances relative to the floor or ceiling within a covered location.

5.8.5.3.1* Fuel Gas Detector Location and Placement.

Fuel gas detectors shall be installed in other than ancillary buildings as specified in the manufacturer's published instructions and listing, ~~and~~ as well as in accordance with 5.8.5.3.1.1 or in accordance with 5.8.5.3.1.2~~,~~ and with 5.8.5.3.1.3 ~~through 5.8.5.3.1(6) or with 5.8.5.3.1(7)~~ :

* ~~For natural gas, the detector shall be installed on the ceiling or on the wall with the top of the detector within 12 in. (305 mm) of the ceiling in the same room as permanently installed fuel-gas-burning appliances.~~

~~**A.5.8.5.3.1(1)** –~~

~~For natural gas, detectors located on a wall should be located as close as practicable to the ceiling in the same room as permanently installed fuel-gas-burning appliances.~~

* ~~For liquefied petroleum gas (LP-Gas), the entire detector shall be installed on the wall within 18 in. (457 mm) of the floor in the same room as permanently installed fuel-gas-burning appliances.~~

~~**A.5.8.5.3.1(2)** –~~

~~For liquefied petroleum gas (LP-Gas), detectors located on a wall should be located no more than 18 in. (457 mm) from but as close as practicable to the floor in the same room as permanently installed fuel-gas-burning appliances.~~

* ~~Detectors shall be installed more than 3 ft (914 mm) but no further than 10 ft (3 m) in a horizontal flow path from permanently installed fuel-gas-burning appliances.~~

~~**A.5.8.5.3.1(3)** –~~

~~Detectors should be located as close as practicable, but no closer than 3 ft (914 mm), to permanently installed fuel-gas-burning appliances and should not be placed in obstructed pathways, which is consistent with considerations of detector accessibility, sources of detector contamination, and nuisance sources. Siting considerations can include locations where gas pockets or layers of gas are likely to accumulate, where transient back-drafting spillage of flue gases during startup could occur, and near ventilation supply or exhaust vents.~~

~~Detectors shall not be installed in locations directly in the airstream of supply and return registers or directly above doorway openings.~~

* ~~Detectors shall be installed in basements or other subgrade rooms with foundation penetrations that might convey migrating fuel gas leaks from outside the occupancy.~~

~~**A.5.8.5.3.1(5)** –~~

~~The purpose of detectors in basements or other subgrade rooms with foundation penetrations that might convey migrating fuel gas leaks from outside the occupancy is to detect fuel gases from sources outside the structure migrating to and through the subgrade outer surfaces. Detector location and spacing should be based on an engineering evaluation that considers potential sources and migration of fuel gases. Fuel gas lines outside the structure should be considered in the evaluation since damaged pipelines are a potential source of the migrating fuel gas. Other considerations when locating fuel gas detectors are the permeability of the wall, permeability of the floor, manmade penetrations (e.g., pipe passthroughs), and naturally occurring penetrations such as cracks.~~

~~Combination fuel gas/carbon monoxide detectors that are an integral part of a carbon monoxide detector shall be located in accordance with the requirements for the applicable fuel gases being sampled.~~

~~Detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2 .~~

A.5.8.5.3.1

For examples of ancillary buildings, see A.9.4.1.1 .

5.8.5.3.1.1 Installation of Fuel Gas Detectors.

Fuel gas detectors shall be located and placed in accordance with one of the following:

(1) In locations required by applicable laws, codes, and standards.

(2) In locations based on a performance-based design in accordance with 5.8.5.3.2 .

5.8.5.3.1.2 Fuel Gas Detector Locations.

Fuel gas detectors shall be located in accordance with 5.8.5.3.1.2(1) or 5.8.5.3.1.2(2), and 5.8.5.3.1.2(3), as follows:

(1)* Detectors shall be located in accordance with the following:

(a) On the same floor as the permanently installed fuel gas-burning appliances

(b) In a horizontal flow path between 3 ft (914 mm) and 10 ft (3 m) from permanently installed fuel gas cooking appliances

(c) In a horizontal flow path within 10 ft (3 m) from other permanently installed fuel gas-burning appliances or a grouping of permanently installed fuel gas-burning appliances

A.5.8.5.3.1.2(1)

The requirement for installing detectors more than 3 ft (914 mm) from permanently installed fuel-gas burning cooking appliances is intended to prevent false positive alarms resulting from short-term, episodic releases of fuel gas due to pre-ignition phenomena and cooking emissions. Installation within 3 ft (914 mm) of permanently installed fuel gas-burning appliances other than cooking appliances where space is limited is permitted provided the manufacturer's instructions do not prohibit installation within 3 ft (914 mm) and installation is permitted within 3 ft (914 mm) by the AHJ. More than one permanently installed fuel gas appliance is often located in close proximity to other permanently installed fuel gas appliances to facilitate common supply piping or common appliance venting. When a grouping of appliances is present, whether in a mechanical room or an open space, such as a basement, garage, or kitchen, only one detector is required, provided that the grouping of permanently installed appliances meets the spacing requirements of 5.8.5.3.1.2(1).

(2)* One detector shall be located for every 600 ft^2 (56 m^2) of contiguous floor space and located not more than 30 ft (10 m) from any permanently installed fuel gas-burning appliance or grouping of permanently installed fuel gas-burning appliances.

A.5.8.5.3.1.2(2)

Locating detectors in the general proximity of permanently installed fuel gas-burning appliances, where connections to this equipment may be subject to leakage due to general movement of the appliance resulting from maintenance activity or a malfunction of the appliance resulting in a fuel gas release, is supported by the gas dispersion studies in Annex D. However, the gas dispersion modeling studies support that a single alarm or detector centrally located within a defined area not to exceed 600 ft^2 (56 m^2) and not more than 30 ft (10 m) from any permanently installed fuel gas burning appliance will provide an equal level of protection. More specifically, the data supports that the lower explosive limit of the gaseous mixture at the leak source would not exceed the ignition threshold when the lower explosive limit within the area of concern reached 10 percent LEL.

(3)* Detectors shall be located in basements or subgrade rooms where fuel gas piping penetrations of the foundation wall exist below grade.

A.5.8.5.3.1.2(3) _

For purposes of this requirement, the term “basement” is considered a story of a building having one half or more of its height below grade level, unless otherwise defined by the AHJ. The purpose of the requirement for detectors in basements and other subgrade rooms is that belowgrade fuel gas piping foundation wall penetrations associated with the point of entry, if not sufficiently sealed, can provide a pathway for fuel gas migration into the building.

5.8.5.3.1.3 Fuel Gas Detector Placement.

Fuel gas detectors shall be placed and permanently mounted in accordance with the following:

(1)* For natural gas, the detector shall be ~~installed~~ placed on the ceiling or on the wall with the top of the detector within 12 in. (305 mm) of the ceiling ~~in the same room as permanently installed fuel gas burning appliances~~ .

A.5.8.5.3.1.3(1)

Due to natural gas being lighter than air , detectors ~~located~~ placed on a wall should be ~~located~~ mounted as close as practicable to the ceiling ~~in the same room as permanently installed fuel gas burning appliances~~ .

(2)* For liquefied petroleum gas (LP-Gas), the entire detector shall be ~~installed~~ placed on the wall within 18 in. (457 mm) of the floor ~~in the same room as permanently installed fuel gas burning appliances~~ .

A.5.8.5.3.1.3(2)

~~For~~ Due to liquefied petroleum gas (LP-Gas) being heavier than air , detectors ~~located~~ placed on a wall should be ~~located~~ mounted ~~no more than 18 in. (457 mm) from but~~ as close as practicable to the floor ~~in the same room as permanently installed fuel gas burning appliances~~ .

(3)* Detectors shall not be placed directly in the airstream of supply and return registers or in areas with obstructed airflow.

A.5.8.5.3.1.3(3)

Detectors placed in airflow obstructed pathways, with additional considerations of detector accessibility, sources of detector contamination, and contaminants, could result in nuisance alarms. Placement should consider locations where gas pockets or layers of gas are likely to accumulate, where transient back-drafting spillage of flue gases from fuel-burning appliances could occur during startup, and near ventilation supply or exhaust vents. For basement installations, unfinished basement ceilings with exposed floor joists and beams that can inhibit airflow should be considered when placing any detector.

(4)* Natural gas detectors shall not be placed directly above doorway openings or other areas with obstructed airflow.

A.5.8.5.3.1.3(4)

See A.5.8.5.3.1.3(3) .

(5) Combination fuel gas/carbon monoxide detectors that are an integral part of a carbon monoxide detector shall be ~~located~~ placed in accordance with the requirements for the applicable fuel gas~~es~~ being sampled.

5.8.5.3.2 Performance-Based Design.

Global SR-11

5.8.5.3.2.1

Performance-based designs submitted to the AHJ for review and approval shall include documentation, in an approved format, of each performance objective and applicable scenario, together with any calculations, modeling, or other technical substantiation used in establishing the proposed design's life safety and property protection performance. [**72:** 17.3.1]

5.8.5.3.2.2

The AHJ shall determine whether such identified performance objectives are appropriate and have been met. [**72:**17.3.2]

5.8.5.3.2.3

The AHJ shall approve modifications to or variations from the approved design or design basis in advance. [**72:**17.3.3]

5.8.5.3.3 Alarm Threshold.

5.8.5.3.3.1*

Each fuel gas detector shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors.*

5.8.5.3.3.2*

Each fuel gas detector shall meet the sensitivity testing and alarm thresholds of UL 1484, *Residential Gas Detectors.*

5.8.5.3.3.3

Fuel gas detectors shall be marked in accordance with their listing.

5.8.5.3.4

All fuel gas detectors shall be located and mounted so that accidental operation will not be caused by jarring or vibration.

5.8.5.3.5

The selection and placement of fuel gas detectors shall take into account both the performance characteristics of the detector and the areas into which the detectors are to be installed to prevent nuisance and unintentional alarms or improper operation after installation.

5.8.5.3.6

The installation of fuel gas detectors in conditioned and unconditioned indoor spaces and in outdoor locations shall comply with 4.11.1.

5.8.5.3.7*

The location of fuel gas detectors shall be based on an evaluation of potential ambient sources and flows of fuel gas, moisture, temperature, dust, or fumes, and electrical or mechanical influences to minimize nuisance alarms.

5.8.5.3.8

Unless tested and listed for recessed mounting, fuel gas detectors shall not be recessed into the mounting surface.

5.8.5.3.9 Protection During Construction.

5.8.5.3.9.1

Where detectors are installed for signal initiation during construction, they shall be replaced prior to the final commissioning of the system.

Global SR-11

5.8.5.3.9.2

Where detection is not required during new construction, detectors shall not be installed until after all other construction trades have completed cleanup. [**72:** 17.7.2.3]

Supplemental Information

File Name	Description	Approved
715_A2025_Chapter_5_5_8_5_3-SR-8.docx	715_A2025_Chapter_5_5_8_5_3-SR-8	
715_SR-8_5.8.5.3_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 12 15:35:35 EDT 2024

Committee Statement

Committee Statement: The development of new fuel-gas detection technologies warranted a reevaluation of the location and placement requirements. The requirements for fuel-gas detectors is rewritten for clarity and consistency regarding placement and location criteria based on an analysis of the gas dispersion studies in Annex D and coupled with an enhanced understanding of fuel-gas dispersion. An allowance for locating fuel-gas detectors based on an area of coverage and distance from fuel-gas burning appliances is included based on the analysis of the dispersion studies. Requirements for location and placement of fuel-gas detectors were separated for clarification and ease of use. The annex language was revised to include expanded guidance.

Response Message: SR-8-NFPA 715-2024

Public Comment No. 7-NFPA 715-2024 [Section No. 5.8.5.3]

Public Comment No. 9-NFPA 715-2024 [Section No. 5.8.5.3.1]

Public Comment No. 14-NFPA 715-2024 [Section No. A.5.8.5.3.1(2)]

Public Comment No. 11-NFPA 715-2024 [New Section after A.5.8.5.2.3]

Public Comment No. 33-NFPA 715-2024 [Section No. 5.8.5.3.1]

Public Comment No. 10-NFPA 715-2024 [New Section after A.5.8.5.3.1(5)]

Public Comment No. 16-NFPA 715-2024 [New Section after A.5.8.5.3.1(5)]

Public Comment No. 12-NFPA 715-2024 [Section No. A.5.8.5.3.1(5)]

Public Comment No. 13-NFPA 715-2024 [Section No. A.5.8.5.3.1(1)]

Public Comment No. 18-NFPA 715-2024 [Section No. A.5.8.5.3.1(3)]

Second Revision No. 10-NFPA 715-2024 [New Section after 6.4.5]

6.4.6* Restricted Audible Mode Operation (RAMO) Notification.

A.6.4.6

The intent of restricted audible mode operation (RAMO) is to be used for areas where loud sounds might be detrimental to typical occupants of the notification zones, such as early education classrooms or facilities that service people with autism spectrum disorder, other neurodiversities, or other conditions that might include sensitivity to noise, light, or other stimuli. The goal of RAMO is to ensure effectiveness of the system signals for the notification zone without causing undue distress on the occupants. [**72:** A.18.4.8]

6.4.6.1

The requirements of 6.4.6.1.1 through 6.4.6.1.4 shall apply where RAMO is required either by the risk analysis of a notification zone or by the authority having jurisdiction, governing laws, codes, or standards, or other parts of this Code. [**72:** 18.4.8.1]

6.4.6.1.1

RAMO areas shall be indicated on the project drawings. [**72:** 18.4.8.1.1]

6.4.6.1.2

RAMO shall be permitted to be used only where trained, awake, and mobile staff are present in the notification zone. [**72:** 18.4.8.1.2]

6.4.6.1.3*

All audible signals within a RAMO notification zone shall comply with 6.4.4.3 .
[**72:** 18.4.8.1.3]

A.6.4.6.1.3

Lower frequency audible signals are less distressing to people with autism spectrum disorder, other neurodiversities, or sensitivity to higher frequency and louder audible signals. Note that the referenced paragraph addresses sleeping areas; however, RAMO audible appliances should have the capability to produce signals of 520 Hz ± 10 percent. [**72:** A.18.4.8.1.3]

6.4.6.1.4*

The requirements of 6.4.3 shall apply to all RAMO notification zones. [**72:** 18.4.8.1.4]

A.6.4.6.1.4

Although 6.4.3 is for written for private mode, the requirements are also applicable to RAMO notification zones. One of the key elements to note is that the system dB design is lowered from 15 dBA-fast over ambient to 10 dBA-fast and that visual notification appliances are required throughout the RAMO notification zones. [**72:** A.18.4.8.1.4]

6.4.6.2*

All audible notification signals in a RAMO notification zone shall be synchronized in accordance with 5.8.6.5.2 . [**72:** 18.4.8.2]

A.6.4.6.2

Fuel gas alarms, fuel gas detectors with an integral sounder, and fuel gas detectors with an attached sounder base can be used if they comply with the RAMO requirements as outlined in 6.4.6.1 . Because the sound power output of these listed devices is required to produce a minimum of 85 dBA, the sound power output of the listed device might exceed the RAMO specifications. Therefore, the sound power output can be adjusted at the control unit to comply with the RAMO specifications.

6.4.6.3

All visual notification signals in a RAMO notification zone shall be synchronized in accordance with 6.5.5.5.2 . [**72:** 18.4.8.3]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 12 17:36:58 EDT 2024

Committee Statement

Committee Statement: This revision extracts the new restricted audible mode operation (RAMO) from NFPA 72 2025 in accordance with the extract policy. Additional annex information is provided to address the situation where the integral audible notification sound power output from gas a detector or gas alarm exceeds the RAMO specifications.

Response Message: SR-10-NFPA 715-2024

Second Revision No. 12-NFPA 715-2024 [Section No. 9.4.1]

9.4.1* Fuel Gas Alarms and Detectors.

The warning functions intended in this standard shall be performed by single- or multiple-station alarms or by detectors connected to a control unit and associated equipment~~,~~ in accordance with 9.3.3 and installed in accordance with 9.4.1.1 .

A.9.4.1

Hazardous concentrations of fuel gas can accumulate in a residence due to leaking or defective piping systems or connections to end-use devices of malfunctioning equipment such as boilers, water heaters, and cooking appliances.

While fuel gas is typically odorized by use of fuel gas odorants to impart a gassy odor, individuals ~~that~~ who do not have a normal sense of smell might not detect a leak. Fuel gas alarms meeting the requirements of UL 1484, *Residential Gas Detectors,* or fuel gas detection systems meeting UL 2075, *Gas and Vapor Detectors and Sensors*, and installed in accordance with the applicable standard(s) should provide a significant additional level of protection against ~~fuel-gas-related~~ fuel gas-related incidents.

The installation of fuel gas alarms or detection systems could result in a greater degree of protection in addition to gas odorants. Adding alarms to rooms where fuel-burning appliances are located could provide earlier warning of fuel gas hazards caused by those sources. Additional alarms located in rooms normally closed off from the required alarms could increase the escape time, since the fuel gas concentration needed to force the fuel gas out of the closed rooms to the alarms would not be necessary. As a consequence, the installation of additional fuel gas alarms should be considered.

Fuel gas alarms or detectors are not substitutes for properly odorized fuel gases~~,~~ and proper maintenance, inspection, and testing of fuel-burning equipment. Fuel gas piping systems and ~~fuel-gas-burning~~ fuel gas-burning equipment and appliances should be used, maintained, tested, and inspected according to the manufacturers' instructions and all applicable standards.

Fuel gas alarms or detectors are cross-sensitive to hydrogen, a combustible gas that can be given off by recharging lead acid batteries. Where households include recharging stations (e.g., for golf carts), the alarm should be located away from the recharging location.

9.4.1.1* Fuel Gas Alarm and Detectors Location and Placement.

Fuel gas alarms or detectors shall be installed in dwelling units in other than ancillary buildings as ~~follows:~~ specified in the manufacturer's published instructions and listing, in accordance with 9.4.1.2 or 9.4.1.3 , and in accordance with 9.4.1.4 .

* ~~Alarms or detectors shall be installed more than 3 ft (914 mm) but no further than 10 ft (3 m) in a horizontal flow path from permanently installed fuel-gas-burning appliances.~~

~~A.9.4.1.1(1)~~ –

~~Alarms or detectors should be located as close as practicable, but no closer than 3 ft (914 mm), to permanently installed fuel-gas-burning appliances and should not be placed in obstructed pathways, which is consistent with considerations of alarm or detector accessibility, sources of alarm or detector contamination, and nuisance sources. Siting considerations can include locations where gas pockets or layers of gas are likely to accumulate, where transient back-drafting spillage of flue gases during startup could occur, and near ventilation supply or exhaust vents.~~

~~Alarms or detectors shall be installed in basements or other subgrade rooms of buildings served by fuel gas service, where the point of entry is below grade.~~

~~Alarms or detectors shall be installed in attached garages where the fuel gas point of delivery or fuel-burning equipment is installed within the garage.~~

~~Where interconnection of alarms is required by 9.6.4 , alarms shall be located outside of each separate sleeping area in the immediate vicinity of the bedroom.~~

~~Alarms or detectors shall not be installed in locations directly in the airstream of supply and return registers or directly above doorway openings.~~

~~Alarms or detectors shall be installed in other locations where required by applicable laws, codes, or standards~~

A.9.4.1.1

For purposes of this standard, fuel gas alarm or detector location refers to specific areas the alarm or detector should be sited while fuel gas alarm or detector placement identifies specific installation criteria such as proximity to fuel burning appliances and placement distances relative to the floor or ceiling within a covered location.

Where sleeping areas are separated and the audibility of the alarm or detector to occupants within each sleeping area could be seriously impaired, more than one unit could be needed. [**72:**A.29.7.1.1]

At times, depending on conditions, the audibility of notification appliances could be seriously impaired when occupants are in the bedroom area. For instance, there might be a noisy window air conditioner or room humidifier generating an ambient noise level of 55 dBA or higher. The detection device alarms need to penetrate through the closed doors and be heard over the bedroom's noise levels with sufficient intensity to awaken sleeping occupants. Test data indicate that alarms with ratings of 85 dBA at 10 ft (3 m) that are installed outside the bedrooms can produce about 15 dBA over ambient noise levels of 55 dBA in the bedrooms. This sound pressure is likely to be sufficient to awaken the average sleeping person. [**72:**A.29.7.1.1]

Alarms or detectors located remote from the bedroom area might not be loud enough to awaken the average person. In such cases, it is recommended that units be interconnected in such a way that the operation of the remotely located detector or alarm causes an alarm of sufficient intensity to penetrate the bedrooms. The interconnection can be accomplished by the following:

(1) Installation of a system

(2) Wiring together of multiple-station alarms

(3) Use of line carrier or radio frequency transmitters/receivers

(4) Adding supplemental notification appliances

[**72:**A.29.7.1.1]

Examples of ancillary buildings are maintenance sheds, detached garages, summer kitchens, pool pump rooms, and structures other than important buildings as defined in NFPA 58.

9.4.1.2 Installation of Fuel Gas Alarms and Detectors.

Fuel gas alarms and detectors shall be installed in locations and placed as required by applicable laws, codes, and standards.

9.4.1.3 Fuel Gas Alarm and Detector Locations.

Fuel gas alarms or detectors shall be located in accordance with 9.4.1.3(1) or 9.4.1.3(2) and in accordance with 9.4.1.3(3) through 9.4.1.3(5), as follows:

(1)* Alarms or detectors shall be located in accordance with the following:

(a) On the same floor as the permanently installed fuel gas-burning appliances

(b) In a horizontal flow path between 3 ft (914 mm) and 10 ft (3 m) from permanently installed fuel gas cooking appliances

(c) In a horizontal flow path within 10 ft (3 m) from other permanently installed fuel-gas-burning appliances or a grouping of permanently installed fuel gas-burning appliances.

A.9.4.1.3(1)

The requirement for installing alarms or detectors more than 3 ft (914 mm) from permanently installed fuel gas-burning cooking appliances is generally to prevent false positive alarms resulting from short-term, episodic release of fuel gas due to pre-ignition phenomena and cooking emissions. Installation within 3 ft (914 mm) of permanently installed fuel gas-burning appliances other than cooking appliances where space is limited is permitted provided the manufacturer's instructions do not prohibit installation within 3 ft (914 mm) by the AHJ. More than one permanently installed fuel gas appliance is often located in close proximity to other permanently installed fuel gas appliances to facilitate common supply piping or common appliance venting. When a grouping of appliances is present, whether in a mechanical room or an open space, such as a basement, garage, or kitchen, only one alarm or detector is required provided the grouping of permanently installed appliances meets the spacing requirements of 9.4.1.3(1).

(2)* One alarm or detector shall be located for every 600 ft^2 (56 m^2) of contiguous floor space, and not more than 30 ft (10 m) from any permanently installed fuel gas-burning appliance or grouping of permanently installed fuel gas-burning appliances.

A.9.4.1.3(2)

Locating alarms or detectors in the general proximity of permanently installed fuel-burning appliances, where connections to this equipment may be subject to leakage due to general movement of the appliance resulting from maintenance activity or a malfunction of the appliance resulting in a fuel gas release, is supported by the gas dispersion studies in Annex D. However, the gas dispersion modeling studies support that a single alarm or detector centrally located within a defined area not to exceed 600 ft^2 (56 m^2) and not more than 30 ft (10 m) from any permanently installed fuel gas-burning appliance will provide an equal level of protection. More specifically, the data supports that the lower explosive limit of the gaseous mixture at the leak source would not exceed the ignition threshold when the lower explosive limit within the area of concern reached 10 percent LEL.

(3)* Alarms or detectors shall be located in basements or subgrade rooms where fuel gas piping penetrations of the foundation wall exist below grade.

A.9.4.1.3(3)

For purposes of this requirement, the term “basement” is considered a story of a building having one-half or more of its height below grade level, unless otherwise defined by the AHJ. The purpose of the requirement for alarms or detectors in basements and other subgrade rooms is that belowgrade fuel gas piping foundation wall penetrations associated with the point of entry, if not sufficiently sealed, may provide a pathway for fuel gas migration into the building.

(4)* Alarms or detectors shall be ~~installed~~ located in attached garages where the fuel gas point of delivery or fuel-burning equipment is installed within the garage.

(5)* Where interconnection of alarms is required by 9.6.4, alarms shall be located outside of ~~each separate~~ sleeping area(s) in the immediate vicinity of the bedroom(s) .

A.9.4.1.3(5)

The requirements of 9.4.1.3 ~~1~~ (5 ~~4~~) do not pertain to fuel gas detectors.

9.4.1.4 Fuel Gas Alarm and Detector Placement.

~~Each fuel~~ Fuel gas alarms or detectors shall be ~~located~~ placed and permanently mounted in accordance with the following: ~~on the wall, ceiling, or other location as specified in the manufacturer's published instructions as follows:~~

(1)* For natural gas, the gas alarm or detector shall be ~~installed~~ placed on the ceiling or on the wall with the top of the alarm or detector within 12 in. (305 mm) of the ceiling.

A.9.4.1.4(1)

~~For~~ Due to natural gas being lighter than air , alarms or detectors ~~located~~ placed on a wall should be ~~located~~ mounted as close as practicable to the ceiling ~~in the same room as permanently installed fuel-gas-burning appliances~~ .

(2)* For liquefied petroleum gas (LP-Gas), the entire gas alarm or detector shall be ~~installed~~ placed on the wall within 18 in. (457 mm) of the floor.

A.9.4.1.4(2)

~~For~~ Due to liquefied petroleum gas (LP-Gas) being heavier than air , alarms or detectors ~~located~~ placed on a wall should be mounted ~~no more than 18 in. (457 mm) from but~~ as close as practicable to the floor ~~, in the same room as permanently installed fuel-gas-burning appliances~~ .

(3)* Alarms or detectors shall not be placed directly in the airstream of supply and return registers or in areas with obstructed air flow.

A.9.4.1.4(3)

Alarms or detectors placed in airflow obstructed pathways, with additional considerations of alarm or detector accessibility, sources of alarm or detector contamination, and contaminants, could result in nuisance alarms. Placement should consider locations where gas pockets or layers of gas are likely to accumulate, where transient back-drafting spillage of flue gases from fuel-burning appliances could occur during startup, and near ventilation supply or exhaust vents. For basement installations unfinished basement ceilings with exposed floor joists and beams that can inhibit airflow should be considered when placing any alarm or detector.

(4)* Natural gas alarms or detectors shall not be placed directly above doorway openings or other areas with obstructed airflow.

A.9.4.1.4(4)

See A.9.4.1.4(3) .

(5) Combination fuel gas/carbon monoxide alarms and detectors that are an integral part of a carbon monoxide ~~detector~~ alarm or carbon monoxide ~~alarm~~ detector shall be ~~located~~ placed in accordance with the requirements for the applicable fuel gas~~es~~ being sampled.

Supplemental Information

File Name	Description	Approved
715-2025_Chapter_9_9_4_1-SR-12.docx	715-2025_Chapter_9_9_4_1-SR-12	

715_SR-12_9.4.1_legislative_changes.docx for prod use

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 12 17:55:23 EDT 2024

Committee Statement

Committee Statement: These revisions align with revisions to the location and placement in Chapter 5. The development of new fuel-gas detection technologies warranted a reevaluation of the location and placement requirements. The requirements for fuel-gas alarms and detectors is rewritten for clarity and consistency regarding placement and location criteria based on an analysis of the gas dispersion studies in Annex D and coupled with an enhanced understanding of fuel-gas dispersion. An allowance for locating fuel-gas alarms and detectors based on an area of coverage and distance from fuel-gas burning appliances is included based on the analysis of the dispersion studies. Requirements for location and placement of fuel-gas alarms and detectors were separated for clarification and ease of use. The annex language was revised to include expanded guidance.

Response Message: SR-12-NFPA 715-2024

Public Comment No. 26-NFPA 715-2024 [Section No. A.9.4.1.1(4)]

Public Comment No. 21-NFPA 715-2024 [Sections 9.4.1.1, 9.4.1.2]

Public Comment No. 24-NFPA 715-2024 [Section No. A.9.4.1.1(1)]

Public Comment No. 15-NFPA 715-2024 [Sections 9.4.1.1, 9.4.1.2]

Public Comment No. 25-NFPA 715-2024 [Section No. A.9.4.1.1(3)]

Public Comment No. 28-NFPA 715-2024 [Section No. A.9.4.1.2(2)]

Public Comment No. 27-NFPA 715-2024 [Section No. A.9.4.1.2(1)]

Public Comment No. 22-NFPA 715-2024 [Section No. A.9.4.1.1]

Public Comment No. 17-NFPA 715-2024 [Section No. A.9.4.1.1(1)]

Public Comment No. 32-NFPA 715-2024 [Section No. 9.4.1.1]

Public Comment No. 30-NFPA 715-2024 [New Section after A.9.4.1.2(2)]

Public Comment No. 29-NFPA 715-2024 [New Section after A.9.4.1.2(2)]

Public Comment No. 20-NFPA 715-2024 [Section No. 9.4.1 [Excluding any Sub-Sections]]

Second Revision No. 6-NFPA 715-2024 [Section No. 9.6.7.1]

9.6.7.1

Operation of fuel gas alarms or detectors shall not cause fire alarm or combination system control units to ~~activate~~ actuate either protected premises or supervising station ~~fuel gas~~ fire alarm signals. [**72:** 23.8.4.9.4]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Wed Sep 11 10:51:19 EDT 2024

Committee Statement

Committee Statement: The existing text was unclear and conflicted with NFPA 72. This revision changes 'fuel-gas' to 'fire-alarm'. This revision aligns with the old NFPA 720 (which was incorporated into NFPA 72) language which, in this section, was dictating that when CO detection was connected to a combination or fire alarm system, it was not to activate a fire alarm. In other words, it needed to activate a CO alarm. The language unintentionally changed the word "fire" to "fuel-gas" when it was originally converted from NFPA 720 over to NFPA 715. Fuel gas detectors and alarms should activate protected premises and supervising station fuel gas signals. They should not activate fire alarm signals. This text is extracted from NFPA 72, the extract tag is added, the extracted text is updated.

Response Message: SR-6-NFPA 715-2024

Public Comment No. 6-NFPA 715-2024 [Section No. 9.6.7.1]

Second Revision No. 5-NFPA 715-2024 [Section No. C.1]

C.1 Guidelines for Occupants.

How occupants respond to a fuel gas incident is essential for their safety.

Information on how occupants should respond to a fuel gas incident can be found through fuel gas industry sources. References include, but are not limited to, the following:

~~www.propane.com/newsroom/can-do-journal/what-to-do-if-you-smell-gas-in-the-home~~

~~www.aga.org/natural-gas/safe/smell-gas~~

(1) The Propane Education & Research Council – “What To Do if You Smell Gas”

(2) American Gas Association – “Using Natural Gas Safely”

It is important to note that the primary safety indicator for the presence of fuel gas and the potential of a fuel gas leak is the presence of a “gassy odor.” Odorants are sulfur compounds that impart a gassy odor, typically associated with the smell of a rotten egg, that are added to fuel gases for detection by an average sense of smell because fuel gases in their natural state are usually odorless. Gas odor detection by a person with an average sense of smell could precede fuel gas alarm activation; as a result, either a gas odor or a gas alarm should trigger identical response actions.

Occupants are advised to act immediately if a gas odor is detected and an alarm is not activated. Do not wait for an alarm to activate!

Occupants are advised to act immediately if an alarm is activated and a gassy odor is not present. Do not wait for a gas odor to be present!

Supplemental Information

File Name	Description	Approved
715_SR-5_C.1_legislative_changes.docx	for prod use	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Wed Sep 11 10:36:57 EDT 2024

Committee Statement

Committee Statement: The existing website links were not working properly. This revision is an editorial change to reference the organizations and articles specifically to avoid broken website links. A task group is being established to update this section with guidance for the next revision cycle.

Response Message: SR-5-NFPA 715-2024

Public Comment No. 3-NFPA 715-2024 [Section No. C.1]

Second Revision No. 3-NFPA 715-2024 [Sections D.1, D.2]

D.1 Referenced Publications.

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

D.1.1 NFPA Publications.

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

NFPA 30A , *Code for Motor Fuel Dispensing Facilities and Repair Garages* , 2024 edition.

NFPA 54, *National Fuel Gas Code*, 2024 edition.

NFPA 58, *Liquefied Petroleum Gas Code*, 2024 edition.

NFPA 70®, *National Electrical Code*®, 2026 edition.

NFPA 72®, *National Fire Alarm and Signaling Code*®, 2025 edition.

NFPA 731, *Standard for the Installation of Premises Security Systems*, 2023 edition.

NFPA 1192, *Standard on Recreational Vehicles*, ~~2021~~ 2026 edition.

D.1.2 Other Publications.

D.1.2.1 AGA Publications.

American Gas Association, 400 North Capitol Street, NW, Washington, DC 20001.

AGA XQ1702, *Odorization Manual,* 2017.

"Using Natural Gas Safely," aga.org, accessed August 19, 2024.

D.1.2.2 ASTM Publications.

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

ASTM D1945, *Standard Test Method for Analysis of Natural Gas by Gas Chromatography*, 2014, reapproved 2019.

D.1.2.3 GPA Publications.

GPA Midstream Association, 6060 American Plaza, Suite 700, Tulsa, OK 74135.
~~https://~~ gpamidstream.org

GPA 2261, *Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography*, 2020.

GPA 2286, *Method for the Extended Analysis of Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Temperature Programmed Gas Chromatography*, 2014.

D.1.2.4 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 802.3af, *Standard for Information Technology — Telecommunications and Information Exchange Between Systems — Local and Metropolitan Area Networks — Specific Requirements — Part 3: Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications — Data Terminal Equipment (DTE) Power Via Media Dependent Interface (MDI)*, 2003.

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

D.1.2.5 ISO Publications.

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

ISO/IEC 14763-3, *Information technology — Implementation and operation of customer premises cabling — Part 3: Testing of optical fibre cabling*, ~~2014~~ 2024 .

D.1.2.6 Military Specifications.

US Department of Defense Single Stock Point, Document Automation and Production Service, Building 4/D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

MIL-HDBK 217F, *Military Standardization Handbook,* 1974.

D.1.2.7 TIA Publications.

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

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

D.1.2.8 UL Publications.

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

UL 217, *Smoke Alarms*, 2020, revised ~~2022~~ 2024 .

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

UL 1971, *Signaling Devices for the Deaf and Hard of Hearing ~~Impaired~~* , ~~2018~~ 2002, revised 2024 .

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

D.1.2.9 US Government Publications.

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.

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

Title 49, Code of Federal Regulations, Part 192.625, “Odorization of Gas.”

D.1.2.10 Other Publications.

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.

"What to Do if You Smell Gas," Propane Education and Reserach Council. propane.com, accessed August 19, 2024.

D.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.

An Experimental Study of the Buildup and Dispersal of Natural Gas in a House, Contract Research Report 169, BG Technology for the Health and Safety Executive, Leicestershire, England, 1988.

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.

"NYSEARCH Study for Natural Gas Dispersion and Detection in Residential Environments," Fire & Risk Alliance, LLC, Derwood, MD, March 2020.

"Natural Gas Dispersion Testing Report," Consolidated Edison Company of New York, Fire & Risk Alliance LLC, Derwood, MD, February 2018.

"Odorization Manual," American Gas Association (AGA), Washington, DC, April 2017.

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

Crosson, E. and Fisher, D. "Measuring Trace Amounts of Released Methane in the Home using Advanced Gas Detection Sensors", 2021.

"Sparrow Technologies Methane Sensor Testing", Fire & Risk Alliance, LLC, Derwood, MD, March 2022.

"NYSEARCH Study for Natural Gas Dispersion and Detection in Residential Environments with HVAC," Fire & Risk Alliance, LLC, Derwood, MD, 2021.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Aug 19 14:15:13 EDT 2024

Committee Statement

Committee Statement: References are updated in accordance with the Reference Policy. Three new reports that are included in the Informational References are the basis of the revisions and referenced in the Annex in Chapter 5 and Chapter 9 for location and placement of gas detectors and alarms.

Response Message: SR-3-NFPA 715-2024

Second Revision No. 4-NFPA 715-2024 [Section No. D.3]

D.3 References for Extracts in Informational Sections.

NFPA 72®, *National Fire Alarm and Signaling Code®*, ~~2022~~ 2025 edition.

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

Submitter Information Verification

Committee: FWE-AAA
Submittal Date: Mon Aug 19 14:17:52 EDT 2024

Committee Statement

Committee Statement: This revision updates extracted text in accordance with the Extract Policy
Response Message: SR-4-NFPA 715-2024