



Second Revision No. 13-NFPA 715-2021 [Global Comment]

Change from the use of the word "propane" to the use of the words "liquefied petroleum gas (LP-Gas)" wherever propane is used in generic form not as a list of all known LP-Gas chemicals used as fuel gases.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Fri Oct 01 17:15:25 EDT 2021

Committee Statement

Committee Statement: This is consistent with terminology from other standards and with industry terminology for fuel gases and their detection.

Response Message: SR-13-NFPA 715-2021



Second Revision No. 70-NFPA 715-2021 [Global Comment]

Change the 10% LEL alarm detection threshold to 25% LEL throughout the body of the standard, and not in any annex.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Wed Oct 20 11:45:58 EDT 2021

Committee Statement

Committee Statement: The Technical Committee agrees that the 10% threshold be changed to 25% throughout the document because UL 1484 needs to change prior to changing the requirements in NFPA 715. The technical committee is of the opinion based on the scientific studies that a 10 percent LEL sensitivity level provides a significantly higher level of safety for occupants and is desirable to be a requirement in NFPA 715 once it is required in UL 1484. While there is currently 10 percent LEL equipment available for natural gas, there is not consistent availability of equipment for all fuel gases that will alarm at 10 percent LEL. The technical committee intends to change the 25 percent LEL to 10 percent LEL in the next edition of the standard, as it is the technical committee's understanding that the UL STP will have completed its consideration of the proposal to change to 10 percent LEL by that time. The technical committee anticipates a TIA directly following any change to UL 1484 requirements.

Response SR-70-NFPA 715-2021

Message:

[Public Comment No. 25-NFPA 715-2021 \[Global Input\]](#)

[Public Comment No. 14-NFPA 715-2021 \[Section No. 9.6.1.2\]](#)

[Public Comment No. 18-NFPA 715-2021 \[Section No. 9.6.1.2\]](#)

[Public Comment No. 34-NFPA 715-2021 \[Section No. 9.6.1.2\]](#)

[Public Comment No. 56-NFPA 715-2021 \[Section No. 9.6.1.2\]](#)



Second Revision No. 17-NFPA 715-2021 [Chapter 2]

Chapter 2 Referenced Publications

2.1 General.

The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications.

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

NFPA 70[®], National Electrical Code[®], 2020 2023 edition.

NFPA 72[®], National Fire Alarm and Signaling Code[®], 2019 2022 edition.

NFPA 101[®], Life Safety Code[®], 2021 edition.

NFPA 110, Standard for Emergency and Standby Power Systems, 2019 2022 edition.

NFPA 111, Standard on Stored Electrical Energy Emergency and Standby Power Systems, 2019 2022 edition.

NFPA 170, Standard for Fire Safety and Emergency Symbols, 2018 2021 edition.

NFPA 4224 1225, Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems Emergency Services Communications, 2019 2022 edition.

NFPA 5000[®], Building Construction and Safety Code[®], 2021 edition.

2.3 Other Publications.

2.3.1 ANSI Publications.

American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036.

ANSI S1.4A, Electroacoustics — Sound Level Meters, 2014.

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

2.3.2 ASCE Publications.

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

ASCE/SEI 7, Minimum Design Loads and Associated Criteria for Buildings and Other Structures, 2016.

2.3.3 IEEE Publications.

IEEE, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 450, Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications, 2010 2020 .

IEEE 1106, Recommended Practice for Installation, Maintenance, Testing, and Replacement of Vented Nickel-Cadmium Batteries for Stationary Applications, 2005 2015 .

2.3.4 TIA Publications.

Telecommunications Industry Association, 1320 North Courthouse Road, Suite 200, Arlington, VA 22201.

ANSI/TIA 568-C.3, Optical Fiber Cabling Components Standard, 2015.

2.3.5 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.

2.3.6 UL Publications.

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

UL 1484, *Residential Gas Detectors*, 2016.

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

UL 1971, *Signaling Devices for the Hearing Impaired*, 2002, revised ~~2013~~ 2018 .

UL 2075, *Gas and Vapor Detectors and Sensors*, ~~2013~~ 2017 .

2.3.7 Other Publications.

Merriam-Webster's Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 72[®], *National Fire Alarm and Signaling Code*[®], ~~2019~~ 2022 edition.

NFPA 211, *Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances*, 2019 edition.

NFPA ~~1224~~ 1225, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* Emergency Services Communications, ~~2019~~ 2022 edition.

NFPA 5000[®], *Building Construction and Safety Code*[®], ~~2018~~ 2021 edition.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
715-proposed_Chapter_2.doc.docx	For staff use only	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Oct 04 13:55:42 EDT 2021

Committee Statement

Committee Statement: Reference updates.

Response Message: SR-17-NFPA 715-2021

Public Comment No. 63-NFPA 715-2021 [Section No. 2.3.6]



Second Revision No. 47-NFPA 715-2021 [Section No. 3.3.4]

3.3.4* Communications Center.

A building or portion of a building that is specifically configured for the primary purpose of providing emergency communications services or public safety answering point (PSAP) services to one or more public safety agencies under the authority or authorities having jurisdiction. [~~1221~~ 1225, ~~2019~~ 2022]

A.3.3.4 Communications Center.

Examples of functions of a communications center are as follows:

- (1) Communications between the public and the communications center
- (2) Communications between the communications centers, the emergency response agency (ERA), and emergency response facilities (ERFs)
- (3) Communications within the ERA and between different ERAs

[~~1221~~: A.3.3.25] 1221, 2022]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:07:42 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with NFPA 1225. NFPA 1221 has been consolidated into NFPA 1225.

Response Message: SR-47-NFPA 715-2021



Second Revision No. 48-NFPA 715-2021 [Section No. 3.3.7]

3.3.7* Emergency Response Agency (ERA).

Organizations providing law enforcement, emergency medical, fire, rescue, communications, and related support services. [~~1221~~ 1225, ~~2019~~ 2022]

A.3.3.7 Emergency Response Agency (ERA).

An ERA includes any public, governmental, private, industrial, or military organization that engages in the operations specified in the definition. [~~1221~~ 1225 : , ~~A.3.3.52~~ 2022]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:09:46 EDT 2021

Committee Statement

Committee Statement: Revised extract reference sections to align with the new edition of NFPA 1225. NFPA 1221 has been incorporated into NFPA 1225.

Response Message: SR-48-NFPA 715-2021

**Second Revision No. 14-NFPA 715-2021 [Section No. 3.3.12]****3.3.12* Fuel Gas.**

Any number of gasses that, when combined with an oxidizer (typically air or oxygen), ~~that~~ could be burned to produce thermal energy, ~~including, but not limited to, natural gas, methane, propane, butane, or hydrogen.~~

A.3.3.12 Fuel Gas.

Examples of fuel gases include, but are not limited to, natural gas, methane, or liquefied petroleum gases (LP-Gas) such as propane and butane.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Fri Oct 01 17:22:40 EDT 2021

Committee Statement

Committee Statement: Removed the list of examples of fuel gases to the annex. Reordered the list and added LP-Gas to be consistent with the rest of the standard.

Response Message: SR-14-NFPA 715-2021



Second Revision No. 50-NFPA 715-2021 [Section No. 3.3.28]

3.3.28* ~~Separate~~ Sleeping Area.

The area of a dwelling unit where the bedrooms or sleeping rooms are located.
[72,2019 2022]

A.3.3.28 ~~Separate~~ Sleeping Area.

Bedrooms (or sleeping rooms) separated by other use areas, such as kitchens or living rooms (but not bathrooms), are considered separate sleeping areas. [72, ~~3.3.258~~ 2022]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:12:46 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-50-NFPA 715-2021



Second Revision No. 5-NFPA 715-2021 [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. in accordance with the following:~~ ~~[72: 40.3.1]~~

- (1) Residential fuel gas detectors and alarms shall be listed in accordance with UL 1484, *Residential Gas Detectors*.
- (2) Fuel gas detectors shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors*.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 12:23:55 EDT 2021

Committee Statement

Committee Statement: The Technical Committee revises Section 4.3.1 in accordance with PC 53 as it clarifies references and applicability of UL 1484 and UL 2075 for purposes of listing consistent with other sections of this standard. Referencing listings to these two standards here makes it unnecessary to correct outdated references to humidity conditions included in 4.11.1, since that performance is covered by these listings.

Response Message: SR-5-NFPA 715-2021

Message:

Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]



Second Revision No. 26-NFPA 715-2021 [Section No. 4.3.2.1]

4.3.2.1

System components shall be installed, tested, inspected, and maintained in accordance with the listing, the manufacturer's published instructions and this standard. ~~[72:10.3.2]~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 11:14:47 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to match with the new edition of NFPA 72.

Response Message: SR-26-NFPA 715-2021



Second Revision No. 10-NFPA 715-2021 [Section No. 4.3.2.2]

4.3.2.2

~~In cases where the manufacturer's published instructions conflict with this standard, the requirements of this standard shall prevail.~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 17:04:48 EDT 2021

Committee Statement

Committee Statement: There is no reason for this section to specifically address how to handle potential deviations between the manufacturer's instructions and the requirements of this standard. This is not typically addressed in other NFPA standards.

Response Message: SR-10-NFPA 715-2021

Message:

[Public Comment No. 35-NFPA 715-2021 \[Section No. 4.3.2.2\]](#)



Second Revision No. 27-NFPA 715-2021 [Section No. 4.3.3]

4.3.3*

All devices and appliances that receive their power from ~~the an~~ initiating device circuit (IDC) or signaling line circuit (SLC) of a control unit shall be listed for use with the control unit.
[72:10.3.3]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 11:16:23 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-27-NFPA 715-2021



Second Revision No. 12-NFPA 715-2021 [Section No. 4.4.2.2]

4.4.2.2

Fuel gas alarms that receive their primary power from a battery or plug into an AC receptacle shall be permitted to be installed by the occupant of the dwelling unit in accordance with the ~~requirements of the AHJ~~ manufacturer's published instructions .

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Fri Oct 01 08:35:24 EDT 2021

Committee Statement

Committee Statement: Homeowners buying methane detectors at a consumer retail outlet should not be expected to check in with their local inspection agency for instructions. However, the detector must be installed in accordance with the manufacturer's instructions. This requirement is not enforceable under any circumstances.

Response Message: SR-12-NFPA 715-2021

Public Comment No. 33-NFPA 715-2021 [Section No. 4.4.2.2]



Second Revision No. 6-NFPA 715-2021 [New Section after 4.5.3.4]

4.5.3.5

The power supply voltage and ampacity shall be in accordance with the equipment manufacturer's installation instructions where the input voltage is no less than 85 percent or more than 110 percent of the equipment's nameplate rating.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 12:27:27 EDT 2021

Committee Statement

Committee Statement: The Technical Committee revises section 4.5.3.5 in accordance with recommendations in PC 58. It is appropriate to include this information in the Power Supply Sources section rather than in the section on Performance and Limitations, 4.11.1. The values are consistent with both UL 1484 and UL 2075 test criteria.

Response Message: SR-6-NFPA 715-2021

Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]



Second Revision No. 71-NFPA 715-2021 [Section No. 4.5.4]

4.5.4 Stored Energy Storage Emergency Power Supply Systems (ESS SEPSS).

4.5.4.1

~~The ESS device shall be configured in compliance with NFPA 111 for a Type O, Class 24, Level 1 system. [72: 10.6.4.1]~~ An SEPSS that is not arranged in accordance with 10.6.4.2 of NFPA 72 shall comply with all of the following:

- (1) An SEPSS shall be configured in compliance with NFPA 111 for a Type O or U Level 1 system.
- (2) The SEPSS shall be capable of powering the maximum required system load.
- (3) The SEPSS shall have capacity in accordance with 4.5.6.2 .

[~~72: 10.6.4.1~~]

4.5.4.2

~~The ESS device~~ An SEPSS shall comply with the requirements of 4.5.5. [~~72:10.6.4.3~~]

4.5.4.3

~~Failure of the ESS an~~ SEPSS shall result in the initiation of a trouble signal in accordance with Section 4.9. [~~72:10.6.4.4~~]

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
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Submitter Information Verification

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Submittal Date: Wed Oct 20 12:00:01 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-71-NFPA 715-2021



Second Revision No. 67-NFPA 715-2021 [Section No. 4.5.6.2.3.1]

4.5.6.2.3.1*

Battery ~~As a minimum, battery~~ calculations shall ~~include a minimum 20 percent safety margin above the calculated amp-hour capacity required~~ apply a correction factor of 1.25 for aging to ensure the battery can meet its current demand at the end of service life . [72:10.6.7.2.4-4 14]

A.4.5.6.2.3.1

~~The 20-percent safety margin is~~ Correction factors are intended to address normal aging 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 ~~20-percent~~ 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. ~~For additional information on battery sizing considerations refer to IEEE 485, Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications.~~ [72:A.10.6.7.2.1-4 ;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.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Oct 11 10:52:15 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-67-NFPA 715-2021



Second Revision No. 29-NFPA 715-2021 [Section No. 4.5.6.2.3.3]

4.5.6.2.3.3

The secondary power supply capacity for supervising station facilities and equipment shall be capable of supporting operations for a minimum of 24 hours. [~~72:10.6.7.2.4-3~~ 5]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 11:44:09 EDT 2021

Committee Statement

Committee Statement: Revised extract reference section to align with new edition of NFPA 72.

Response Message: SR-29-NFPA 715-2021



Second Revision No. 30-NFPA 715-2021 [Section No. 4.5.8]

4.5.8 Power Supply for Remotely Located Control Equipment.

4.5.8.1*

Additional power supplies shall be comprised of a primary and secondary power supply that meet the same requirements as those required for system operation with 4.5.1 through 4.5.7 and 4.13.16.

4.5.8.2

The location of ~~any~~ remotely located power ~~supply~~ supplies shall be identified at the master control unit. [72:10.6.8.2]

4.5.8.3

The master control unit display shall be permitted to satisfy the requirement of 4.5.8.2. [72:10.6.8.3]

4.5.8.4

The location of ~~any~~ remotely located power ~~supply~~ supplies shall be identified on the record drawings. [72:10.6.8.4]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 11:46:42 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-30-NFPA 715-2021



Second Revision No. 31-NFPA 715-2021 [Section No. 4.6.3]

4.6.3*

An audible notification appliance on a control unit, ~~or~~ 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]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:11:40 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with new edition of NFPA 72.

Response Message: SR-31-NFPA 715-2021



Second Revision No. 32-NFPA 715-2021 [Section No. 4.9.8.3]

4.9.8.3

The audible and visible trouble signal associated with signaling the depletion or failure of the primary battery of a wireless system as required by 5.12.2.1(3) and (4) ~~and~~ shall automatically resound every 4 hours or less until the depletion signal is restored to normal. [72:10.15.9.2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:12:39 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-32-NFPA 715-2021



Second Revision No. 33-NFPA 715-2021 [Section No. 4.9.9.2]

4.9.9.2

The means shall be key-operated or located ~~with~~ within a ~~lock~~ locked cabinet, or arranged to provide equivalent protection against unauthorized use. [72:10.15.10.2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:13:22 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-33-NFPA 715-2021



Second Revision No. 4-NFPA 715-2021 [Section No. 4.11.1]

4.11.1 Voltage, Temperature, and Humidity Variation Operating Temperatures .

Equipment shall be designed so that it is capable of performing its intended functions under the following conditions:

- * At 85 percent and 110 percent of the nameplate primary (main) and secondary (standby) input voltages

A.4.11.1(1) –

The requirement of 4.11.1(1) does not preclude transfer to secondary supply at less than 85 percent of nominal primary voltage, provided the requirements of 4.5.6 are met. [72: A.10.3.5(1)]

At ambient temperatures of 32°F (0°C) and 120°F (49°C)

At a relative humidity of 85 percent and an ambient temperature of 86°F (30°C)

4.11.1.1* Indoor Conditioned Spaces.

Equipment intended for use in indoor conditioned spaces shall be tested and listed at ambient temperatures of 32°F (0°C) and 120°F (49°C).

A.4.11.1.1

An indoor conditioned space is one that includes heating or air conditioning equipment that will prevent temperature extremes from being present in the space. All fuel-gas detectors and alarms listed in accordance with UL 1484, *Residential Gas Detectors* , and UL 2075, *Gas and Vapor Detectors and Sensors* , have been tested at ambient temperatures of 32°F (0°C) and 120°F (49°C).

4.11.1.2* Outdoors and Indoor Unconditioned Spaces.

Equipment intended for use outdoors and in indoor unconditioned spaces shall be tested and listed for the temperature range determined by the AHJ to be appropriate for the exposure temperatures anticipated at the location.

A.4.11.1.2

Unconditioned indoor spaces include areas that are not served by heating or air conditioning equipment, such as those typically found in attached and detached garages, sheds, attics, and some basements. For low-temperature extremes, the AHJ should consider ambient temperatures likely to occur during a typical cold season. For high-temperature extremes, the AHJ should consider ambient temperatures likely to occur during a typical hot season. In addition, some locations such as unconditioned attic spaces might exceed outdoor ambient temperatures, and consideration should be given to adding a safety factor to the anticipated high ambient temperature.

The equipment manufacturer can choose the temperature extremes used to test and list their equipment. Some equipment has been tested and listed for temperatures as low as – 40°F (–40°C) and as high as 150°F (66°C).

Battery performance can be affected at temperature extremes, and only the batteries recommended in the manufacturer's instruction should be used since they have been tested for use at the rated operating temperatures.

4.11.1.2.1

The manufacturer's published instructions shall identify if the product has been tested and listed for use at the minimum unconditioned space temperature extremes.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 11:38:57 EDT 2021

Committee Statement

Committee Statement: The Technical Committee revises Section 4.11.1 and creates associated Annex material as recommended. The recommendation provides additional clarification regarding placement of devices in unconditioned spaces such as garages. The recommendation also references manufacturers instructions to ensure the device is tested and listed for use considering ambient conditions extremes in both conditioned and unconditioned spaces. Minor revisions to format for clarity and to align with NFPA manual of style.

Response Message: SR-4-NFPA 715-2021

Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]



Second Revision No. 34-NFPA 715-2021 [Section No. 4.12]

4.12 Annunciation and Annunciation Zoning.

4.12.1 Alarm Annunciation.

4.12.1.1

The location of an actuated initiating device shall be annunciated by visible means.

4.12.1.2

Visible annunciation of the location of an operated initiating device shall be by an indicator lamp, alphanumeric display, printout, or other approved means. [72:10.18.1.1-4]

4.12.1.3

The visible annunciation of the location of operated initiating devices shall not be canceled by the means used to deactivate alarm notification appliances. [72:10.18.1.4-2]

4.12.2 Supervisory and Trouble Annunciation.

4.12.2.1

Supervisory or trouble annunciation shall be annunciated by visible means.

4.12.2.2

Visible annunciation shall be accomplished by an indicator lamp, an alphanumeric display, a printout, or other approved means.

4.12.2.3

The visible annunciation of supervisory ~~and~~ or trouble conditions shall not be canceled by the means used to deactivate supervisory or trouble notification appliances. [72:10.18.2.4-2]

4.12.3* Annunciator Access and Location.

4.12.3.1

All required annunciation means shall be readily accessible to responding personnel. [72:10.18.3.1]

4.12.3.2

All required annunciation means shall be located as required by the AHJ to facilitate an efficient response to the situation. [72:10.18.3.2]

4.12.4 Alarm Annunciation Display.

Visible annunciators shall be capable of displaying all zones in alarm. [72:10.18.4]

4.12.4.1

If all zones in alarm are not displayed simultaneously, the zone of origin shall be displayed. [72:10.18.4.1]

4.12.4.2

If all zones in alarm are not displayed simultaneously, there shall be an indication that other zones are in alarm. [72:10.18.4.2]

4.12.5 Annunciation Zoning.

4.12.5.1

For the purpose of alarm annunciation, each floor of the building shall be considered as a separate zone. [72:10.18.5.1]

4.12.5.2

Where the system serves more than one building, each building shall be annunciated separately. [72:10.18.5.3]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:16:02 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-34-NFPA 715-2021

**Second Revision No. 35-NFPA 715-2021 [Section No. 4.13.9]****4.13.9**

Monitoring for integrity shall not be required for the conductors for ~~ground-fault~~ ground-fault detection where a single ~~ground~~ ground-fault does not prevent the required normal operation of the system. [72:12.6.10]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:17:35 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-35-NFPA 715-2021



Second Revision No. 36-NFPA 715-2021 [Section No. 4.13.15.2]

4.13.15.2

~~Control circuits used for the purpose of controlling NAC extender panels~~ Supervised notification appliance control circuits shall comply with all of the following:

- (1) ~~The NAC extender panel(s) connected to the~~ A supervised notification appliance control circuit shall not serve more than one notification zone.
- (2) The supervised notification appliance control circuit shall be monitored for integrity in accordance with Section 4.13.
- (3) A fault in the supervised notification appliance control circuit installation conductors shall result in a trouble signal in accordance with Section 4.9.

[72:10.17.3.2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:18:10 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-36-NFPA 715-2021



Second Revision No. 37-NFPA 715-2021 [Section No. 4.14.2.6]

4.14.2.6

System riser diagrams shall ~~be coordinated with the floor plans and shall include~~ comply with both of the following information :

- (1) Be coordinated with the floor plans
- (2) Include the following information, where applicable for the particular system:
 - (a) General arrangement of the system in building cross section
 - (b) Number of risers
 - (c) Type and number of circuits in each riser
 - (d) Type and number of system components/devices on each circuit, on each floor or level
 - (e) Number of conductors for each circuit
 - (f) Pathway class designation 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
 - (g) Pathway survivability level designation in accordance with Section 12.4 of NFPA 72

[72:7.4.6]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:20:16 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with new edition of NFPA 72.

Response Message: SR-37-NFPA 715-2021



Second Revision No. 38-NFPA 715-2021 [Section No. 5.8.3]

5.8.3 Protected Premises Fuel Gas Detection Systems Interconnected with Household Fuel Gas Detection System.

5.8.3.1

A protected premises fuel gas detection system shall be permitted to be interconnected to a household fuel gas detection system(s) for the purpose of activating the notification appliances connected to the household fuel gas detection system(s).

5.8.3.2

The status of dwelling unit fuel gas detectors shall be permitted to be displayed at the protected premises fuel gas detection system control unit and annunciators.

5.8.3.3

If interconnected, an alarm condition at the protected premises system shall cause the ~~alarm notification appliance(s) within the family living unit of the dwelling unit~~ intended notification alarm signal of the household's warning equipment to become ~~energized~~ activated and remain ~~energized~~ activated until the protected premises system is silenced or reset. [72:23.8.3.3]

5.8.3.4

The interconnection circuit or path from the protected premises system to the ~~dwelling unit~~ household warning equipment shall be monitored for integrity by the protected premises system in accordance with Section 4.13. [72:23.8.3.4]

5.8.3.5

An alarm condition occurring at the ~~dwelling unit~~ household fire warning equipment or the operation of any test switches provided as part of the ~~dwelling unit~~ household warning equipment shall not cause an alarm condition at the protected premises system. [72:23.8.3.5]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:30:33 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with new edition of NFPA 72.

Response Message: SR-38-NFPA 715-2021



Second Revision No. 66-NFPA 715-2021 [Section No. 5.8.5.3.1]

[Global SR-13](#)

5.8.5.3.1

Fuel gas detectors shall be installed as specified in the manufacturer's published instructions in accordance with 5.8.5.3.1(1) or 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):

- (1)* 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.
- (2)* For ~~propane~~ 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.
- (3)* 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.
- (4) Detectors shall not be installed in locations directly in the airstream of supply and return registers or directly above doorway openings.
- (5)* Detectors shall be installed in basements or other subgrade rooms with foundation penetrations that might convey migrating fuel gas leaks from outside the occupancy.
- (6) 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 ~~detector being sampled~~.
- (7) Detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Oct 11 08:27:38 EDT 2021

Committee Statement

Committee Statement: The charging paragraph already requires installation per the manufacturer's published instructions. The location of combination fuel gas/carbon monoxide should comply with the requirements for fuel gas detectors in this standard because carbon monoxide has a density close to that of air and will disperse more uniformly throughout the space compared to fuel gases.

Response Message: SR-66-NFPA 715-2021

[Public Comment No. 59-NFPA 715-2021 \[Section No. 5.8.5.3.1\]](#)



Second Revision No. 68-NFPA 715-2021 [Section No. 5.8.5.3.6]

5.8.5.3.6

~~Unless specifically designed and listed for the expected conditions, fuel gas detectors shall not be installed if any of the following ambient conditions exist:~~

~~Temperature below 32°F (0°C)~~

~~Temperature above 120°F (49°C)~~

~~Relative humidity of 85 percent and ambient temperature of 86°F (30°C)~~

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

A.5.8.5.3.6

~~Product-listing standards include tests for temporary excursions beyond normal limits. In addition to temperature, humidity, and velocity variations, fuel gas detectors should operate reliably under such common environmental conditions as mechanical vibration, electrical interference, and other environmental influences. Tests for these conditions are also conducted by the testing laboratories in their listing program.~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Mon Oct 11 11:04:41 EDT 2021

Committee Statement

Committee Statement: The technical committee edits the text of 5.8.5.3.6 to ensure consistency with section 4.11.1. The technical committee is removing the annex note because it is not needed if the base requirement references section 4.11.1.

Response Message: SR-68-NFPA 715-2021

[Public Comment No. 60-NFPA 715-2021 \[Section No. 5.8.5.3.6\]](#)

[Public Comment No. 61-NFPA 715-2021 \[Section No. A.5.8.5.3.6\]](#)



Second Revision No. 39-NFPA 715-2021 [Section No. 5.8.5.3.9.2]

5.8.5.3.9.2

Where detection is not required during construction, detectors shall not be installed until after all other construction trades have completed cleanup. [72:17.7.4 2 .42 .3]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:34:10 EDT 2021

Committee Statement

Committee Statement: Revised extract reference section to align with new edition of NFPA 72.

Response Message: SR-39-NFPA 715-2021



Second Revision No. 65-NFPA 715-2021 [Section No. 5.8.5.5.2]

5.8.5.5.2

Where nonrequired detectors are installed for achieving specific fire safety objectives, additional detectors not necessary to achieve the objectives shall not be required.
[72:17.5.3.3. 2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:46:02 EDT 2021

Committee Statement

Committee Statement: Revised extract reference section to align with the new edition of NFPA 72.

Response Message: SR-65-NFPA 715-2021



Second Revision No. 40-NFPA 715-2021 [Section No. 6.1.7]

6.1.7

The requirements of Chapters 4, 5, and 8 shall apply to the interconnection of notification appliances, the cybersecurity of control and communication configurations, the power supplies, and the use of the information provided by notification appliances. [72:18.1.7]

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-40-NFPA 715-2021



Second Revision No. 60-NFPA 715-2021 [Section No. 6.4.1.5.2]

6.4.1.5.2

Unless otherwise required by other sections of this standard, the coverage area for audible occupant notification shall be as required by other governing laws, codes, or standards. [72:18.4.1.5.2]

A.6.4.1.5.2

~~See 3.3.23 for the definition of occupiable. [72: A.18.4.1.5.2]~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:26:10 EDT 2021

Committee Statement

Committee Statement: Revised to remove the annex material as that extract reference has been deleted in the new edition of NFPA 72.

Response Message: SR-60-NFPA 715-2021



Second Revision No. 41-NFPA 715-2021 [Section No. 6.4.5.2]

6.4.5.2* Calculation Method.

The effective masked threshold shall be calculated in accordance with ISO 7731, *Ergonomics — Danger signals for public and work ~~areas~~ places* — Auditory danger signals. [72:18.4.7.2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:36:40 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with new edition of NFPA 72.

Response Message: SR-41-NFPA 715-2021



Second Revision No. 42-NFPA 715-2021 [Section No. 6.5.4]

6.5.4 Appliance Photometrics.

The light output shall comply with the polar dispersion requirements for public mode signaling as described in ~~UL 1971, Signaling Devices for the Hearing Impaired~~ ; UL 1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*, or equivalent. [72:18.5.4]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:37:25 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-42-NFPA 715-2021



Second Revision No. 43-NFPA 715-2021 [Section No. 6.5.5]

6.5.5 Appliance Location.

6.5.5.1

Wall-mounted appliances shall be mounted such that the entire lens is not less than 80 in. (2.03 m) and not greater than 96 in. (2.44 m) above the finished floor or at the mounting height specified using the performance-based alternative of 6.5.5.7. [72:18.5.5.1]

6.5.5.2

Where low ceiling heights do not permit wall mounting at a minimum of 80 in. (2.03 m), wall mounted visual notification appliances shall be mounted within 6 in. (150 mm) of the ceiling. [72:18.5.5.2]

6.5.5.3

Where low ceiling heights do not permit wall mounting at a minimum of 80 in. (2.03 m), the room size covered by a visual notification appliance of a given value shall be reduced by twice the difference between the minimum mounting height of 80 in. (2.03 m) and the actual lower mounting height. [72:18.5.5.3]

6.5.5.4*

Visual notification appliances listed for mounting parallel to the floor shall be permitted to be located on the ceiling or suspended below the ceiling. [72:18.5.5.4]

6.5.5.5* Spacing in Rooms.

A.6.5.5.5

The visual notification appliance intensities listed in Table 6.5.5.5.1(a) or Table 6.5.5.5.1(b), 6.5.5.6, or determined in accordance with the performance requirements of 6.5.5.7 are the minimum required intensities. It is acceptable to use a higher intensity visual notification appliance in lieu of the minimum required intensity.

Areas large enough to exceed the rectangular dimensions given in Figure A.6.5.5.5(a) through Figure A.6.5.5.5(c) require additional appliances. Often, proper placement of appliances can be facilitated by breaking down the area into multiple squares and dimensions that fit most appropriately [see Figure A.6.5.5.5(a) through Figure A.6.5.5.5(d)]. An area that is 40 ft (12.2 m) wide and 80 ft (24.4 m) long can be covered with two 60 cd appliances. Irregular areas and areas with dividers or partitions need more careful planning to make certain that at least one 15 cd appliance is installed for each 20 ft × 20 ft (6.1 m × 6.1 m) area and that light from the appliance is not blocked. [72:A.18.5.5.5 7]

Figure A.6.5.5.5(a) Irregular Area Spacing.

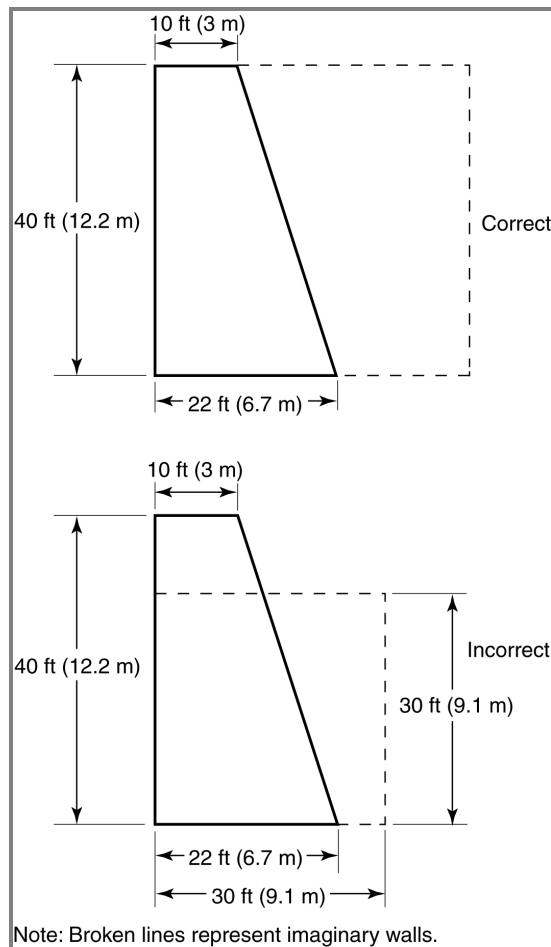


Figure A.6.5.5.5(b) Spacing of Wall-Mounted Visual Notification Appliances in Rooms. [72:Figure A.18.5.5.5 7 (b)]

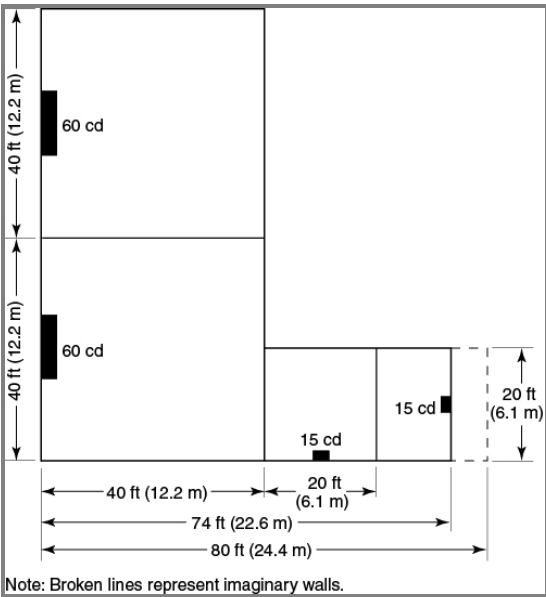


Figure A.6.5.5(c) Room Spacing Allocation — Correct. [72:Figure A.18.5.5.5 7 (c)]

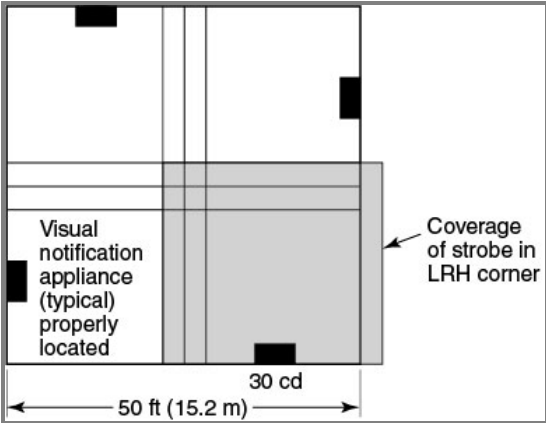
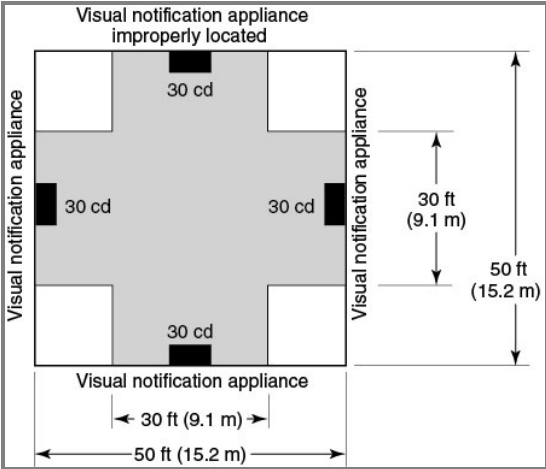


Figure A.6.5.5(d) Room Spacing Allocation — Incorrect. [72:Figure A.18.5.5.5 7 (d)]



6.5.5.5.1

Spacing shall be in accordance with either Table 6.5.5.5.1(a) and Figure 6.5.5.5.1 or Table 6.5.5.5.1(b). [72:48.5.5.5.4 18.5.5.7.1]

Table 6.5.5.5.1(a) Room Spacing for Wall-Mounted Visual Notification Appliances

<u>Maximum Room Size</u>		<u>Minimum Required Light Output</u>	
		<u>[Effective Intensity (cd)]</u>	
		<u>One Visual Notification Appliance per Room</u>	<u>Four Visual Notification Appliances per Room (One per Wall)</u>
<u>ft</u>	<u>m</u>		
20 × 20	6.10 × 6.10	15	NA
28 × 28	8.53 × 8.53	30	NA
30 × 30	9.14 × 9.14	34	NA
40 × 40	12.2 × 12.2	60	15
45 × 45	13.7 × 13.7	75	19
50 × 50	15.2 × 15.2	94	30
54 × 54	16.5 × 16.5	110	30
55 × 55	16.8 × 16.8	115	30
60 × 60	18.3 × 18.3	135	30
63 × 63	19.2 × 19.2	150	37
68 × 68	20.7 × 20.7	177	43
70 × 70	21.3 × 21.3	184	60
80 × 80	24.4 × 24.4	240	60
90 × 90	27.4 × 27.4	304	95
100 × 100	30.5 × 30.5	375	95
110 × 110	33.5 × 33.5	455	135
120 × 120	36.6 × 36.6	540	135
130 × 130	39.6 × 39.6	635	185

NA: Not allowable.

[72:Table 18.5.5.5.1(a)]

Table 6.5.5.5.1(b) Room Spacing for Ceiling-Mounted Visual Notification Appliances

<u>Maximum Room Size</u>		<u>Maximum Lens Height*</u>	<u>Minimum Required Light Output (Effective Intensity); One Visual Notification Appliance (cd)</u>
<u>ft</u>	<u>m</u>	<u>ft</u> <u>m</u>	

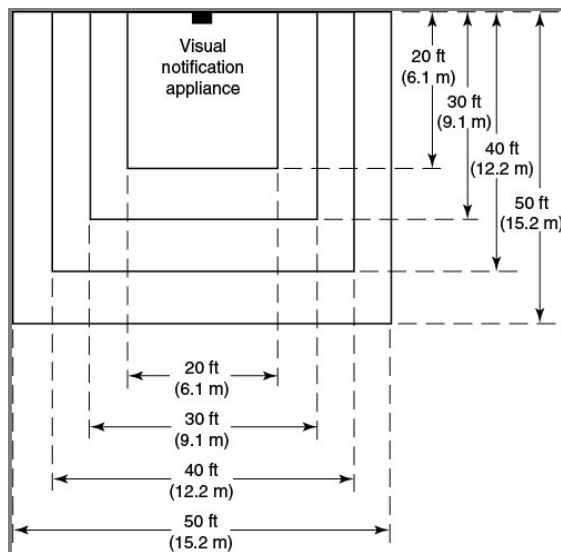
<u>Maximum Room Size</u>		<u>Maximum Lens Height*</u>		<u>Minimum Required Light Output (Effective Intensity); One Visual Notification Appliance (cd)</u>
<u>ft</u>	<u>m</u>	<u>ft</u>	<u>m</u>	
20 × 20	6.1 × 6.1	10	3.0	15
30 × 30	9.1 × 9.1	10	3.0	30
40 × 40	12.2 × 12.2	10	3.0	60
44 × 44	13.4 × 13.4	10	3.0	75
20 × 20	6.1 × 6.1	20	6.1	30
30 × 30	9.1 × 9.1	20	6.1	45
44 × 44	13.4 × 13.4	20	6.1	75
46 × 46	14.0 × 14.0	20	6.1	80
20 × 20	6.1 × 6.1	30	9.1	55
30 × 30	9.1 × 9.1	30	9.1	75
50 × 50	15.2 × 15.2	30	9.1	95
53 × 53	16.2 × 16.2	30	9.1	110
55 × 55	16.8 × 16.8	30	9.1	115
59 × 59	18.0 × 18.0	30	9.1	135
63 × 63	19.2 × 19.2	30	9.1	150
68 × 68	20.7 × 20.7	30	9.1	177
70 × 70	21.3 × 21.3	30	9.1	185

*This does not preclude mounting lens at lower heights.

[72:Table 18.5.5.5 7.1(b)]

Figure 6.5.5.1 Room Spacing for Wall-Mounted Visual Notification Appliances.

[72:Figure 18.5.5.5 7.1]



6.5.5.5.2

Visual notification appliances shall be installed in accordance with Table 6.5.5.5.1(a) or Table 6.5.5.5.1(b) using one of the following:

- (1) A single visual notification appliance.
- (2) Two groups of visual notification appliances, where visual notification appliances of each group are synchronized, in the same room or adjacent space within the field of view. This shall include synchronization of visual appliances operated by separate systems.
- (3) More than two visual notification appliances or groups of synchronized appliances in the same room or adjacent space within the field of view that flash in synchronization.

[72:18.5.5.5.2]

6.5.5.5.3

Room spacing in accordance with Table 6.5.5.5.1(a) and Figure 6.5.5.5.1 for wall-mounted appliances shall be based on locating the visual notification appliance at the halfway distance of the wall. [72:18.5.5.5.3]

6.5.5.5.4

In square rooms with appliances not centered or in nonsquare room 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.

6.5.5.5.5

If a room configuration is not square, the square room size that allows the entire room to be encompassed or allows the room to be subdivided into multiple squares shall be used.

[72:18.5.5.5.5]

6.5.5.5.6*

If ceiling heights exceed 30 ft (9.14 m), ceiling-mounted visual notification appliances shall be suspended at or below 30 ft (9.14 m) or at the mounting height determined using the performance-based alternative of 6.5.5.7, or wall-mounted visible notification appliances shall be installed in accordance with Table 6.5.5.5.1(a). [72:18.5.5.5.6]

A.6.5.5.5.6

This subsection is also intended to permit ceiling mounted visual notification appliances to be suspended below the ceiling, provided the visual notification appliance height is not below the viewing plane for any ceiling height. [72:18.5.5.5.7 .6]

6.5.5.5.7

Table 6.5.5.5.1(b) shall be used if the ceiling-mounted visual notification appliance is at the center of the room. [72:18.5.5.5.7 18.5.5.7.7]

6.5.5.5.8

If the ceiling-mounted visual notification appliance is not located at the center of the room, the effective intensity (cd) shall be determined by doubling the distance from the appliance to the farthest wall to obtain the maximum room size. [72:18.5.5.5.8 .8]

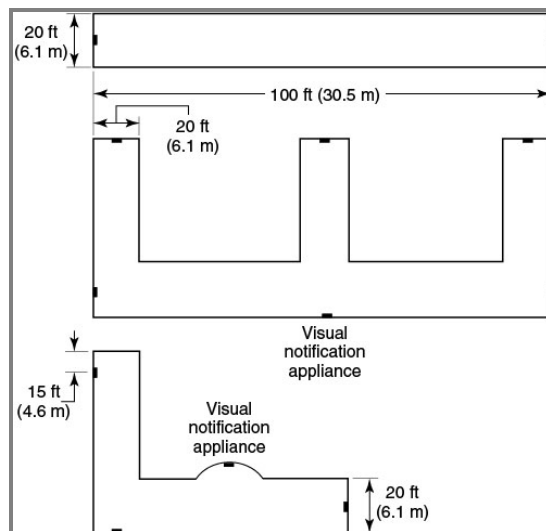
6.5.5.6* Spacing in Corridors.**A.6.5.5.6**

Because the occupants are usually alert and moving, and because their vision is focused by the narrowness of the space, corridor signaling is permitted to be by direct viewing of lower-intensity (15 cd) appliances. That is, the alerting is intended to be done by direct viewing of the visual notification appliance, not necessarily by its reflection off of surfaces (indirect viewing) as required for rooms in 6.5.5.5. [72:A.18.5.5.6 8]

Note that it is acceptable to use 6.5.5.5 (Spacing in Rooms) to determine the number and location of visual notification appliances in corridors. If 6.5.5.5 is used, it is not necessary to have a corridor visual notification appliance within 15 ft (4.6 m) of the end of the corridor. [72:A.18.5.5.6 8]

See Figure A.6.5.5.6 for corridor spacing for visual notification appliances. [72:A.18.5.5.6 8]

Figure A.6.5.5.6 Corridor Spacing for Visual Notification. [72:Figure A.18.5.5.6 8]

**6.5.5.6.1**

The installation of visual notification appliances in corridors 20 ft (6.1 m) or less in width shall be in accordance with the requirements of either 6.5.5.5 or 6.5.5.6. [72:18.5.5.6 1]

6.5.5.6.2

Paragraph 6.5.5.6 shall apply to corridors not exceeding 20 ft (6.1 m) in width. [72:18.5.5.6 2]

6.5.5.6.3

In a corridor application, visual notification appliances shall be rated not less than 15 cd.
[72:18.5.5.6 § .3]

6.5.5.6.4

Corridors greater than 20 ft (6.1 m) wide shall comply with the spacing requirements for rooms in accordance with 6.5.5.5. [72:18.5.5.6 § .4]

6.5.5.6.5*

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.

A.6.5.5.6.5

Visual notification appliances in corridors are permitted to be mounted on walls or on ceilings in accordance with 6.5.5.6. Where there are more than two appliances in a field of view, they need to be synchronized. [72:A.18.5.5.6 § .5]

Note that it is acceptable to use 6.5.5.5 (Spacing in Rooms) to determine the number and location of visual notification appliances in corridors. If 6.5.5.5 is used, it is not necessary to have a corridor visual notification appliance within 15 ft (4.5 m) of the end of the corridor. It is not the intent of this section to require visual notification appliances at or near every exit or exit access from a corridor. [72:A.18.5.5.6 § .5]

6.5.5.6.6

If there is an interruption of the concentrated viewing path, such as a fire door, or an elevation change, ~~or any other obstruction~~, the area shall be treated as a separate corridor.
[72:18.5.5.6 § .6]

6.5.5.6.7

In corridors where more than two visual notification appliances are in any field of view, they shall flash in synchronization. [72:18.5.5.6 § .7]

6.5.5.6.8

~~Wall-mounted visual~~ Visual notification appliances in corridors shall be permitted to be mounted on either the ceiling, end wall, or the side wall of the corridor ~~in accordance with spacing requirements of 6.5.5.6.5~~. [72:18.5.5.6 § .8]

6.5.5.7 Performance-Based Alternative.**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 1971, *Signaling Devices for the Hearing Impaired*; 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. [72:18.5.5.7 § .1]

6.5.5.7.2

Documentation provided to the AHJ shall include ~~the following:~~ inverse square law calculations using each of the vertical and horizontal polar distribution angles in UL1638, *Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories*, or equivalent. [~~72:~~ 18.5.5.9.2.1]

~~Inverse square law calculations using each of the vertical and horizontal polar distribution angles in UL 1971, *Signaling Devices for the Hearing Impaired*, or equivalent.~~

~~The calculations shall account for the effects of polar distribution using one of the following:~~

~~The percentages from the applicable table(s) in UL 1971, *Signaling Devices for the Hearing Impaired*, or equivalent~~

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

[~~72:~~ 18.5.5.7.2]

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 Sleeping Areas.

6.5.5.8.1

Combination fuel gas detectors and visual notification appliances or combination fuel gas alarms and visual notification appliances shall be installed in accordance with the applicable requirements of Chapter 5, Chapter 6, and Chapter 9.

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.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 13:43:26 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-43-NFPA 715-2021



Second Revision No. 44-NFPA 715-2021 [Section No. 6.5.6]

6.5.6 Location of ~~Visible~~ Visual Notification Appliances for Wide Area Signaling.

Visual notification appliances for wide-area signaling shall be installed in accordance with the requirements of the AHJ, approved design documents, and the manufacturer's published instructions to achieve the required performance. [72:18.5.6]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:02:23 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with new edition of NFPA 72.

Response Message: SR-44-NFPA 715-2021



Second Revision No. 45-NFPA 715-2021 [Section No. 6.6]

6.6* ~~Visible~~ Visual Characteristics—Private Mode.

Visual notification appliances used in the private mode shall be of a sufficient quantity and intensity and located so as to meet the intent of the user and the AHJ. [72:18.6]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:03:56 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-45-NFPA 715-2021



Second Revision No. 61-NFPA 715-2021 [Section No. 6.11]

6.11* ~~Standard Emergency Service Interface~~ Emergency Services Interfaces .

Where required by the enforcing authority; governing laws, codes, or standards; or other parts of this standard, annunciators, information display systems, and controls for portions of a system provided for use by emergency service personnel shall be designed, arranged, and located in accordance with the requirements of the organizations intended to use the equipment. [~~72:48.14~~ 10.18.6]

A.6.11

~~Standard Emergency Service~~ Services Interface Interfaces . Annunciators, information display systems, and controls for portions of a system provided for use by emergency service personnel should be designed, arranged, and located in accordance with the needs of the organizations intended to use the equipment. [~~72:A.48.14~~ 10.18.6]

Where annunciators, information display systems, and controls for portions of the system are provided for use by emergency service personnel, these should have a common design and operation to avoid confusion of users. [~~72: A.48.14~~]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:30:04 EDT 2021

Committee Statement

Committee Statement: Revised extract references to align with the new edition of NFPA 72.

Response Message: SR-61-NFPA 715-2021



Second Revision No. 22-NFPA 715-2021 [Section No. 7.4.2]

7.4.2

The operation, staffing, and recordkeeping for a communications center shall be in accordance with NFPA 4221 1225.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Tue Oct 05 14:55:30 EDT 2021

Committee Statement

Committee Statement: NFPA 1221 has been incorporated into NFPA 1225 and the reference has been updated to reflect that change.

Response Message: SR-22-NFPA 715-2021



Second Revision No. 11-NFPA 715-2021 [Section No. 9.1.1.2]

9.1.1.2

~~In cases where the manufacturer's published instructions conflict with this standard, the requirements of this standard shall prevail.~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 17:12:40 EDT 2021

Committee Statement

Committee Statement: There is no reason for this section to specifically address how to handle potential deviations between the manufacturer's instructions and the requirements of this standard. This is not typically addressed in other NFPA standards.

Response Message: SR-11-NFPA 715-2021

Public Comment No. 36-NFPA 715-2021 [Section No. 9.1.1.2]



Second Revision No. 16-NFPA 715-2021 [Section No. 9.4.1.1]

9.4.1.1*

Fuel gas alarms or detectors shall be installed in other than ancillary buildings as follows:

- (1)* 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.
- (2) Alarms or detectors shall be installed in basements or other subgrade rooms ~~that have foundation penetrations that might convey migrating fuel gas leaks from outside the occupancy of buildings served by fuel gas service, where the point of entry is below grade .~~

A.9.4.1.1(2)

~~The purpose of alarms or detectors in basements or other subgrade rooms that have 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.~~

- (3)* Alarms or detectors shall be installed in attached garages where the fuel gas point of delivery or fuel-burning equipment point is installed within a the garage ~~or is adjacent to an exterior garage wall .~~

A.9.4.1.1(3)

~~The purpose of alarms or detectors in garages attached to residences is to detect fuel gases from sources outside the structure migrating to and through the subgrade outer surfaces. Alarm or 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. Consideration should be given to unconditioned spaces to conform to the listing and manufacturer's installation instructions. As explained in NFPA 54 /ANSI Z223.1, the "point of delivery," for other than undiluted liquefied petroleum gas (LP-Gas) systems, is the outlet of the service meter assembly or the outlet of the service regulator or service shutoff valve where no meter is provided. For undiluted LP-Gas systems, the point of delivery is considered to be the outlet of the final pressure regulator, exclusive of line gas regulators where no meter is installed. Where a fuel gas meter is installed, the point of delivery is the outlet of the meter.~~

- (4)* 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.

A.9.4.1.1(4)

The requirements of 9.4.1.1(4) do not pertain to fuel gas detectors.

- (5) Alarms or detectors shall not be installed in locations directly in the airstream of supply and return registers or directly above doorway openings.
- (6) Alarms or detectors shall be installed in other locations where required by applicable laws, codes, or standards

A.9.4.1.1

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.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
715_9.4.1.1_FinalMarkup.docx	For staff use only	

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Fri Oct 01 17:59:18 EDT 2021

Committee Statement

Committee Statement: Item (2) was revised to clarify when detection is required in basements or other subgrade rooms and with the change the related annex note is no longer necessary.

Item (3) was revised to clarify the instances in which gas detection is required in garages.

The item (4) annex note was revised to clarify that this item does not apply to fuel gas detectors.

The charging statement of section 9.4.1.1 was revised to exclude unoccupied ancillary buildings from alarm and detector requirements because they are not intended for continuous occupancy.

See attached word document for clarification.

Response SR-16-NFPA 715-2021

Message:

[Public Comment No. 49-NFPA 715-2021 \[Section No. 9.4.1.1\]](#)

[Public Comment No. 51-NFPA 715-2021 \[Section No. A.9.4.1.1\(1\)\]](#)

[Public Comment No. 22-NFPA 715-2021 \[Section No. 9.4.1.1\]](#)

[Public Comment No. 52-NFPA 715-2021 \[Section No. A.9.4.1.1\(3\)\]](#)

[Public Comment No. 38-NFPA 715-2021 \[Section No. 9.4.1.1\]](#)



Second Revision No. 15-NFPA 715-2021 [Section No. 9.4.1.2]

[Global SR-13](#)

9.4.1.2

Each fuel gas alarm or detector shall be located 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 on the ceiling or on the wall with the top of the alarm or detector within 12 in. (305 mm) of the ceiling.
- (2)* For ~~propane~~ liquefied petroleum gas (LP-Gas), the entire gas alarm or detector shall be installed on the wall within 18 in. (457 mm) of the floor.
- (3) Combination fuel gas/carbon monoxide alarms and detectors that are an integral part of a carbon monoxide detector or carbon monoxide alarm shall be located in accordance with the requirements for the applicable fuel gases ~~alarm or detector's installation instructions being sampled.~~

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Fri Oct 01 17:52:24 EDT 2021

Committee Statement

Committee Statement: The charging paragraph already requires installation per the manufacturer's published instructions. The location of combination fuel gas/carbon monoxide should comply with the requirements for fuel gas detectors in this standard because carbon monoxide has a density close to that of air and will disperse more uniformly throughout the space compared to fuel gases.

Response SR-15-NFPA 715-2021

Message:

[Public Comment No. 62-NFPA 715-2021 \[Section No. 9.4.1.2\]](#)



Second Revision No. 49-NFPA 715-2021 [Section No. A.3.3.5]

A.3.3.5 Device (Class N). [🔗](#)

Class N devices include components connected to a Class N network that monitor the environment (e.g., smoke, heat, contact closure, manual “in case of fire” pull) and/or provide some output(s) (e.g., dry contact, audible/visual alert/notification, addressable loudspeaker) that are required to provide the real-time functionality necessary for the protection of life and property. In this way, a component connected to the network used for noncritical functions (i.e., maintenance) can be differentiated and excluded from the monitoring for integrity requirements of Class N. [72⁺, A.3.3.7⁺ 2022]

Also in this way, transport equipment (e.g., switches, routers, hubs, media converters) and other equipment (e.g., printers, storage devices) can be differentiated from the requirements applied to Class N devices if they do not provide life safety–specific environmental monitoring, inputs, or outputs for the life safety system. This is not to say that this equipment is not important to the overall operation of the system, just that this equipment is not considered a “device” in the context of Class N. Equipment that does not meet the definition of a device cannot be specifically supervised but rather generally supervised as they are part of the supervised pathways that service the Class N devices themselves. [72⁺, A.3.3.7⁺ 2022]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:11:39 EDT 2021

Committee Statement

Committee Statement: Revised extract reference sections to align with the new edition of NFPA 72.

Response Message: SR-49-NFPA 715-2021



Second Revision No. 51-NFPA 715-2021 [Sections A.3.3.29.3, A.3.3.31.2]

A.3.3.29.3 Trouble Signal. [🔗](#)

Examples include off-normal outputs from integrity monitoring circuits, the light and sound from activated trouble notification appliances, trouble data transmission to a supervising station, and so forth. [72: , A.3.3.263.10 2022]

A.3.3.31.2 Combination System. [🔗](#)

Examples of non-fire systems are security, card access control, closed circuit television, sound reinforcement, background music, paging, sound masking, building automation, time, and attendance. [72: , A.3.3.111.1 2022]

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

Committee Statement: Revised extract reference sections to align with the new edition of NFPA 72.

Response Message: SR-51-NFPA 715-2021



Second Revision No. 53-NFPA 715-2021 [Section No. A.4.13.16.2]

A.4.13.16.2 [🔗](#)

Because digital alarm communicator systems establish communications channels between the protected premises and the central station via the public switched telephone network, the requirement to supervise circuits between the protected premises and the central station (see 4.13.1 and 4.13.2) is considered to be met if the communications channel is periodically tested in accordance with 26.6.4.4 2.5 of NFPA 72. [72:A.10.6.9.2]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:17:45 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-53-NFPA 715-2021



Second Revision No. 54-NFPA 715-2021 [Section No. A.5.6.2]

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(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]

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-54-NFPA 715-2021



Second Revision No. 55-NFPA 715-2021 [Section No. A.5.6.3.3.2]

A.5.6.3.3.2

Life safety Class N network cabling, equipment, and infrastructure might include (but is not limited to) Ethernet switches, media converters, uninterruptible power supplies, separate life safety network dedicated branch circuit power, cabling cross connects, and both copper and optical fiber cabling. [72:A.23.6.3.3.2]

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

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Response Message: SR-55-NFPA 715-2021



Second Revision No. 56-NFPA 715-2021 [Section No. A.5.8.5.1.5]

A.5.8.5.1.5

The monitoring of circuit integrity relies on the interruption of the wiring continuity when the connection to the initiating device is lost. Terminals and leads, as illustrated in Figure A.5.8.5.1.5(a) and Figure A.5.8.5.1.5(b), monitor the presence of the device on the initiating device circuit. [72:A.17.4.5 6]

Figure A.5.8.5.1.5(a) Correct (and Incorrect) Wiring Methods. [72:Figure A.17.4.5 6 (a)]

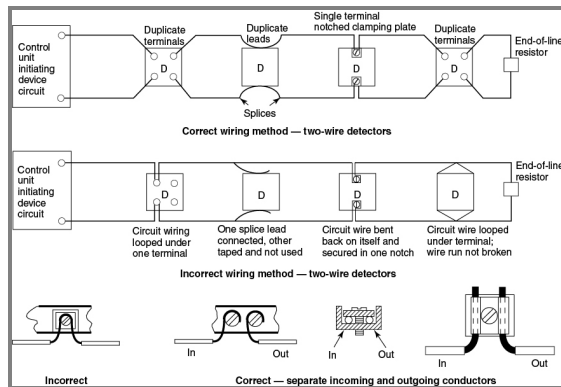
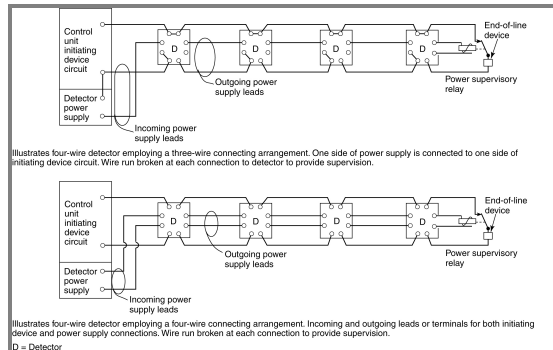


Figure A.5.8.5.1.5(b) Wiring Arrangements for Four-Wire Detectors. [72:Figure A.17.4.5 6 (b)]



Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:21:00 EDT 2021

Committee Statement

Committee Statement: Revised extract reference sections to align with the new edition of NFPA 72.

Response Message: SR-56-NFPA 715-2021



Second Revision No. 21-NFPA 715-2021 [Section No. A.5.8.5.3.3]

A.5.8.5.3.3

The addition of odorants to natural gas as a warning agent in case of leaks capitalizes on the ability of the human nose and olfactory system (i.e., sense of smell) to detect and recognize low parts per billion amounts of mercaptans. Natural gas odorants are usually two or more sulfur-containing compounds that are classified into three groups: mercaptans, cyclic sulfides, and alkyl sulfides. Odorants must not be harmful to people, pipes, or materials in which combustion occurs. Additional factors considered prior to choosing an odorant blend include the following:

- Gas composition and quality
- Presence and interaction of naturally occurring mercaptans and other odorants
- Soil penetration capability
- Odor impact ("gassy odor")
- Odorization injection equipment
- Freeze point
- Water solubility
- Odor stability, fading, absorption, and adsorption

In summary, industry research from the mid-1940s identified tertiary butyl mercaptan (TBM) as one of the most effective odorant blends for pipeline natural gas. While each of the aforementioned factors are described and discussed in the literature, the overall characteristics of TBM are highlighted as follows:

- Most common component in odorant blends today
- Low odor threshold (approximately 0.5 parts per billion)
- Most resistant mercaptan to oxidation
- Superior soil penetrability
- "Gassy odor" most recognized with pipeline natural gas
- Typically blended with lower molecular weight mercaptans due to high freezing point

Current federal code 49 CFR § 192.625, "Odorization of Gas," requires natural gas to either contain a natural odorant or be odorized so that a person with an average sense of smell can readily detect it at a concentration in air of one-fifth of the LEL (i.e., approximately 1 percent gas-in-air, or 20 percent LEL). Since methane is the principal component of natural gas and reaches its one-fifth flammability limit first, it is assumed that the warning level for natural gas is determined by the warning level of its methane content. Therefore, the LEL of natural gas is 5 percent gas-in-air, and the public must be warned at one-fifth of that level (i.e., 1 percent gas-in-air, or 20 percent LEL).

Aligning fuel gas alarm detection thresholds with required pipeline safety odor detection thresholds enables a layers-of-protection approach to further influence human behavior when responding to indications of a potential gas leak. Several states currently require an odor detection threshold of 10 percent LEL with one state having requirements below that threshold. The alarm concentration range of 10 percent LEL meets current federal requirements while simultaneously meeting various state jurisdictional requirements and practical olfactory detection thresholds associated with current industry-acceptable odorization practices. In practice, fuel gas detectors should alarm at a threshold consistent with actual olfactory detection threshold values (or as close as possible) while meeting both federal and state code requirements. The consistency in approach will drive consistent behavior of consumers to an alert condition by odor detection and/or alarm activation.

In addition, the minimum detection threshold of 10 percent LEL affords first responders the opportunity to respond prior to a building reaching a hazardous gas buildup condition. Fuel gas detectors that alarm at levels correlating with typical industry odorization practices provide a significant opportunity for public safety intervention as supported in the recently completed study from Gexcon US, Inc., sponsored by the NFPA Fire Protection Research Foundation, "Combustible Gas Distribution in Residential Occupancies and Detector Location Analysis." The study concluded that reliable and early detection are the most critical aspects of protection and substantiates that early detection resulting from a lower alarm threshold (i.e., 10

percent LEL) provides a significant opportunity to alert consumers sooner than a higher alarm threshold (i.e., 25 percent LEL) and provides first responders more time to address a fuel gas concentration prior to hazardous gas buildup.

Subparagraph 5.8.5.3.3 requires a maximum fuel gas detection threshold of 25 percent LEL, but also will accept listed detectors with lower detection thresholds, including 10 percent LEL detectors. Using detectors with lower LEL detection thresholds should provide faster detection response. Currently, natural gas detectors are commercially available that are listed with a 10 percent LEL detection threshold. Listed liquefied petroleum gas (LP-Gas) gas detectors with a detectable level at 10 percent LEL are not as readily available to the public market as natural gas detectors.

Due to the current listing standards, there is not uniform adoption of 10 percent LEL detection for all fuel gas detectors. Until manufacturers are required by the test standard to meet this higher level of sensitivity to obtain a listing, up to 25 percent LEL detection is allowed. Based on the scientific studies, it is recommended that a 10 percent LEL detector is used when available.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Tue Oct 05 14:54:02 EDT 2021

Committee Statement

Committee Statement: The Technical Committee agrees to remove the explanation of odorization information from this section and consolidate it into Annex B. Having these technical notes in one section of the standard will remove repetitive information and make later edits easier. The addition of odorization details for propane enhances the information.

The technical committee adds annex language clarifying the recommendation for 10 percent LEL detectors as contrasted with the requirement for up to 25 percent LEL detectors. The technical committee adds annex language explaining the landscape of the listing standard requirements and the availability of equipment.

Response Message: SR-21-NFPA 715-2021

Public Comment No. 29-NFPA 715-2021 [Section No. A.5.8.5.3.3]



Second Revision No. 57-NFPA 715-2021 [Section No. A.5.8.6.5.2]

A.5.8.6.5.2

Coordination or synchronization of the audible signal within a notification zone is needed to preserve the temporal pattern. It is unlikely that the audible signal in one evacuation/notification zone will be heard in another at a level that will destroy the temporal pattern. Thus, it would not normally be necessary to provide coordination or synchronization for an entire system. Caution should be used in spaces such as atriums, where the sounds produced in one notification zone can be sufficient to cause confusion regarding the temporal pattern. [72:A.18.4.2.4 5]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:21:59 EDT 2021

Committee Statement

Committee Statement: Revised extract reference section to align with the new edition of NFPA 72.

Response Message: SR-57-NFPA 715-2021



Second Revision No. 58-NFPA 715-2021 [Section No. A.5.9.2]

A.5.9.2

Embossed plastic tape, pencil, ink, or crayon should not be considered to be a permanently attached placard. [72:A.17.4.6 7.1]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:23:07 EDT 2021

Committee Statement

Committee Statement: Revised extract reference section to align with the new edition of NFPA 72.

Response Message: SR-58-NFPA 715-2021



Second Revision No. 59-NFPA 715-2021 [Section No. A.5.12]

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 ~~optical fiber cables~~ optics . [72:A.23.16]

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

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:23:49 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-59-NFPA 715-2021



Second Revision No. 62-NFPA 715-2021 [Section No. A.8.4.2]

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 equipment 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.

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]

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Oct 07 14:34:13 EDT 2021

Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-62-NFPA 715-2021



Second Revision No. 63-NFPA 715-2021 [Section No. A.8.4.3]

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 2½ 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.

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:

$$\% \text{ Capacity} = [T_{\text{actual}} / (180 \times K_T)] \times 100$$

where:

T_{actual} = the test duration in minutes

K_T = 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.

- (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

<u>Temperature</u>		-
<u>°F</u>	<u>(°C)</u>	<u>K_T</u>
65	18.3	0.92
66	18.9	0.927
67	19.4	0.935
68	20	0.942
69	20.6	0.948
70	21.1	0.955

<u>Temperature</u>		
<u>°F</u>	<u>(°C)</u>	<u>K_T</u>
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
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]

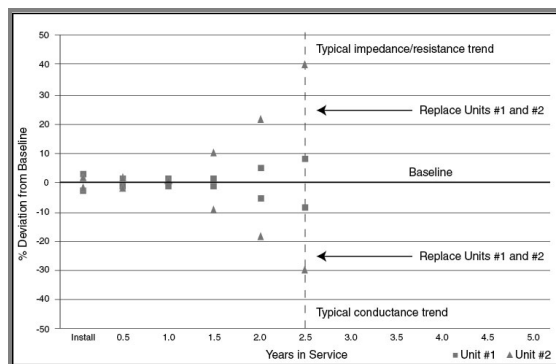


Table 8.4.3, Item 18.

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:Table 8.4.3, Item 24]

Testing of the emergency control functions themselves is outside of the scope of NFPA 715. 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:Table 8.4.3, Item 24]

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

Committee Statement: Revised extract reference to align with the new edition of NFPA 72.

Response Message: SR-63-NFPA 715-2021



Second Revision No. 64-NFPA 715-2021 [Section No. A.9.4.2.4.1.2]

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, ~~4994~~ 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.

Submitter Information Verification

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Second Revision No. 20-NFPA 715-2021 [Section No. A.9.6.1.2]

A.9.6.1.2



The addition of odorants to natural gas as a warning agent in case of leaks capitalizes on the ability of the human nose and olfactory system (i.e., sense of smell) to detect and recognize low parts per billion amounts of mercaptans. Natural gas odorants are usually two or more sulfur-containing compounds that are classified into three groups: mercaptans, cyclic sulfides, and alkyl sulfides. Odorants must not be harmful to people, pipes, or materials in which combustion occurs. Additional factors considered prior to choosing an odorant blend include the following:

- Gas composition and quality
- Presence and interaction of naturally occurring mercaptans and other odorants
- Soil penetration capability
- Odor impact ("gassy odor")
- Odorization injection equipment
- Freeze point
- Water solubility
- Odor stability, fading, absorption, and adsorption

In summary, industry research from the mid-1940s identified tertiary butyl mercaptan (TBM) as one of the most effective odorant blends for pipeline natural gas. While each of the aforementioned factors are described and discussed in the literature, the overall characteristics of TBM are highlighted as follows:

- Most common component in odorant blends today
- Low odor threshold (approximately 0.5 parts per billion)
- Most resistant mercaptan to oxidation
- Superior soil penetrability
- "Gassy odor" most recognized with pipeline natural gas
- Typically blended with lower molecular weight mercaptans due to high freezing point

Current federal code 49 CFR § 192.625, "Odorization of Gas," requires natural gas to either contain a natural odorant or be odorized so that a person with an average sense of smell can readily detect it at a concentration in air of one-fifth of the LEL (i.e., approximately 1 percent gas-in-air or 20 percent LEL). Since methane is the principal component of natural gas and reaches its one-fifth flammability limit first, it is assumed that the warning level for natural gas is determined by the warning level of its methane content. Therefore, the LEL of natural gas is 5 percent gas-in-air and the public must be warned at one-fifth of that level (i.e., 1 percent gas-in-air, or 20 percent LEL).

Aligning fuel gas alarm detection thresholds with required pipeline safety odor detection thresholds enables a layers-of-protection approach to further influence human behavior when responding to indications of a potential gas leak. Several states currently require an odor detection threshold of 10 percent LEL with one state having requirements below the that threshold. The alarm concentration range of 10 percent LEL meets current federal requirements while simultaneously meeting various state jurisdictional requirements and practical olfactory detection thresholds associated with current industry-acceptable odorization practices. In practice, fuel gas detectors should alarm at a threshold consistent with actual olfactory detection threshold values (or as close as possible) while meeting both federal and state code requirements. The consistency in approach will drive consistent behavior of consumers to an alert condition by odor detection and/or alarm activation.

In addition, the minimum detection threshold of 10 percent LEL affords first responders the opportunity to respond prior to a building reaching a hazardous gas buildup condition. Fuel gas detectors that alarm at levels correlating with typical industry odorization practices provide a significant opportunity for public safety intervention as supported in the recently completed study from Gexcon US, Inc., sponsored by the NFPA Fire Protection Research Foundation, "Combustible Gas Distribution in Residential Occupancies and Detector Location Analysis." The study concluded that reliable and early detection are the most critical aspects of protection and substantiates that early detection resulting from a lower alarm

~~threshold (i.e., 10 percent LEL) provides a significant opportunity to alert consumers sooner than a higher alarm threshold (i.e., 25 percent LEL) and provides first responders more time to address a fuel gas concentration prior to hazardous gas buildup.~~

Paragraph 9.6.1.2 requires a maximum fuel gas detection threshold of 25 percent LEL, but also will accept listed detectors and alarms with lower detection thresholds, including 10 percent LEL detectors and alarms. Using detectors and alarms with lower LEL detection thresholds should provide faster detection response. Currently, natural gas detection equipment is commercially available that is listed with a 10 percent LEL detection threshold. Listed liquefied petroleum gas (LP-Gas) detection equipment with a detectable level at 10 percent LEL is not as readily available to the public market as natural gas detection equipment.

Due to the current listing standards, there is not uniform adoption of 10 percent LEL detection for all fuel gas detectors and alarms. Until manufacturers are required by the test standard to meet this higher level of sensitivity to obtain a listing, up to 25 percent LEL detection is allowed. Based on the scientific studies, it is recommended that a 10 percent LEL detector or alarm is used when available.

Submitter Information Verification

Committee: FWE-AAA

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Committee Statement

Committee Statement: The Technical Committee agrees to remove the explanation of odorization information from this section and consolidate it into Annex B. Having these technical notes in one section of the standard will remove repetitive information and make later edits easier. The addition of odorization details for propane enhances the information.

The technical committee adds annex language clarifying the recommendation for 10 percent LEL detection equipment as contrasted with the requirement for up to 25 percent LEL detection equipment. The technical committee adds annex language explaining the landscape of the listing standard requirements and the availability of equipment.

Response Message: SR-20-NFPA 715-2021

Public Comment No. 31-NFPA 715-2021 [Section No. A.9.6.1.2]



Second Revision No. 3-NFPA 715-2021 [Chapter B]

Annex B Dangers and Properties of Fuel Gases

This annex is not a part of the requirements of this NFPA document but is included for informational purposes only.

B.1 Fuel Gases.

A fuel gas is any gas intended to be burned to produce thermal energy. If the gas is released and the concentration is allowed to exceed the lower explosive limit (LEL), also called the lower flammable limit (LFL), an explosion risk will exist. If the gas is above the LEL and in the presence of an ignition source and an oxidizer, such as air, a fire or explosion could occur. As a result, it is important to warn occupants of the presence of fuel gas before the concentration reaches the LEL. The LEL of fuel gas mixtures is often estimated to be the LEL of the primary fuel gas constituent; for example, with natural gas, the LEL is based on methane (i.e., 5 percent by volume gas-in-air). However, the actual LEL for natural gas depends on the gas composition and is generally less than 5 percent gas-in-air when considering other mixed gas components such as ethane and other hydrocarbons that might be present. The actual LEL of a combustible gas mixture (LEL_{MIX}) can be calculated using the Le Chatelier's mixing rule and is calculated using the gas composition (in mol percent) from a complete gas analysis of the combustible gas and the LELs of the constituents as follows:

$$LEL_{MIX} = \frac{100}{\left(\sum x_i / LEL_i\right)} \quad [B.1a]$$

where:

x_i = mol percentage hydrocarbon component

i = gas mixture

LEL_i = component i 's LEL

The gas composition is typically determined with gas chromatography, in accordance with analytical methods in ASTM D1945, *Standard Test Method for Analysis of Natural Gas by Gas Chromatography*; GPA 2261, *Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography*; or GPA 2286, *Method for the Extended Analysis of Hydrocarbon Liquid Mixtures Containing Nitrogen and Carbon Dioxide by Temperature Programmed Gas Chromatography*. These methods provide the composition of natural gas in mol percent, which is equivalent to volume percent.

For example, calculate the LEL of a mixture of 90 percent methane (i.e., LEL 5 percent according to Table B.1) and 10 percent ethane (LEL 3 percent according to Table B.1):

$$LEL_{MIX} = \frac{100}{\left(\frac{90}{5} + \frac{10}{3}\right)} = 4.7\% \text{ gas in air} \quad [B.1b]$$

The requirements of this standard will not mitigate the release of gas and keep the concentration below the LEL; they will only serve to warn the occupants of the presence of fuel gas in the building. Gases also have an upper explosive limit (UEL), that, when exceeded, renders the mixture nonflammable. However, it is important to note that although a mixture below the LEL cannot ignite, a mixture above the UEL can be diluted and fall within the flammable range (i.e., between LEL and UEL). Since many gases do not have an odor and thus might not be readily detected by smell, an odorant is often added to aid in detection. Although it is rare 1 in 1000, individuals are insensitive to the odorant added.

Gases will behave differently depending on their specific gravity (SG), which is the ratio of gas density to air.

Table B.1 shows the LEL, UEL, and SG of typical fuel gases.

Table B.1 Properties of Common Fuel Gases

Fuel Gas*	LEL (% vol)	UEL (% vol)	Specific Gravity (@ STP)
Biomethane†	Varies	Varies	Varies
Ethane	3.0	12.4	1.065
Hydrogen	4.0	75.0	0.070
Iso-butane	1.8	8.4	2.006

<u>Fuel Gas</u> [*]	<u>LEL</u> (% vol)	<u>UEL</u> (% vol)	<u>Specific Gravity</u> (@ STP)
Methane	5.0	15.0	0.554
Propane	2.1	9.5	1.522

^{*}This table includes a broad list of gases that might require special consideration beyond detection requirements detailed in this standard.

[†]This is sometimes referred to as renewable natural gas.

B.1.1 Gas Density and Temperature Effects.

Gases that have an SG less than 1 are less dense than air and will naturally rise within a space, thus detector placement must account for the tendency of the gas to rise. Gases that have an SG greater than 1 are denser than air and, absent air movement or thermal convection, will tend to naturally sink within a space, thus detector placement must account for the tendency of the gas to sink and concentrate in low areas.

The temperature of the released gas will also play a part—if a gas temperature is substantially warmer than the ambient air, the released mixture can rise initially, even if the relative density of the mixture at the ambient temperature is higher than that of the air. The converse could also be the case.

B.1.2 Gas Mixing.

When a gas is released it will mix with the other gases in the volume, typically air, and the concentration of the gas will decrease. The mixing process occurs most quickly through natural or mechanical ventilation; however, some mixing will also occur through diffusion. Once the gas is mixed it will remain mixed unless it is removed through a chemical process, however continued dilution is possible and will decrease the concentration.

B.2 Gas Odorants as Fuel Gas Leak Warning Agents.

The addition of odorants (i.e., sulfur containing compounds) to fuel gases as warning agents in case of leaks capitalizes on the ability of the human nose and olfactory system (i.e., sense of smell) to detect and recognize low parts per billion amounts of mercaptans. Fuel gas odorants are usually two or more sulfur-containing compounds that are classified into three groups: mercaptans, cyclic sulfides, and alkyl sulfides. Liquefied petroleum fuel gas, such as liquefied petroleum gas (LP-Gas), is typically odorized with ethyl mercaptan while pipeline natural gas systems use a variety of mercaptan compounds/blends with the most common being a tertiary-butyl-mercaptan (TBM) blend. The AGA Odorization Manual describes the chemical properties of fuel gas odorants and is referenced in Annex D.

Current federal code 49 CFR § 192.625 requires fuel gas to either contain a natural odorant or be odorized such that a person with an average sense of smell can readily detect it at a concentration in air of one-fifth of the lower explosive limit or 20 percent LEL (i.e., for pipeline natural gas approximately 1 percent gas-in-air and for liquefied petroleum gas (LP-Gas) approximately 0.42 percent gas-in-air). Some state jurisdictional requirements are more conservative requiring a 10 percent LEL minimum detectable threshold and lower (for example, in MA, the detection threshold is 0.15 percent gas-in-air).

However, as a practical matter, fuel gases are typically odorized to more conservative, higher levels, to enable detection while accounting for many variables affecting olfactory response. This typically results in olfactory detection thresholds less than 10 percent LEL. For example, the common natural gas odorant tertiary-butyl mercaptan is typically injected at a rate of 0.5 lb/MMSCF ($8\text{g}/10^3 \text{ m}^3$), resulting in an olfactory detection threshold typically less than 10 percent LEL. Similarly, for liquefied petroleum gas (LP-Gas), the amount of odorant injected (e.g., ethyl mercaptan is between 1 and 1.5 lb/10,000 gallons) exceeds the amount of odorant needed to meet the minimum detection threshold of 0.42 percent gas-in-air concentration.

In practice, fuel gas detectors should alarm at or below the practical odorization olfactory detection threshold based on current industry odorant injection practices. The consistency in approach between odor detection (typically less than 10 percent) and alarm activation will drive consistent behavior of consumers to act on an alert condition by odor detection and alarm activation.

Ideally, every person should be able to detect the odorant in fuel gas well before the concentration approaches the lower explosive limit. However, the fact is that there are some people whose olfactory response system is not able to detect the odorant. This could be due to age, a medical condition (e.g., a common cold), or the effects of medication, alcohol, tobacco, or drugs. In households having any of these conditions, the installation of a fuel gas detector can provide an additional measure of security.

Submitter Information Verification

Committee: FWE-AAA

Submittal Date: Thu Sep 30 11:18:04 EDT 2021

Committee Statement

Committee Statement: The Technical Committee edits the text to add the consolidated odorization information to Annex B. Having these technical notes in one section of the standard will remove repetitive information and make later edits easier. The addition of odorization details for propane enhances the information. The TC also made some minor edits to the suggested text for further clarity.

Response Message: SR-3-NFPA 715-2021

Message:

Public Comment No. 32-NFPA 715-2021 [Chapter B]



Second Revision No. 18-NFPA 715-2021 [Chapter D]

Annex D Informational References

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 54, *National Fuel Gas Code*, 2021 edition.

NFPA 70[®], *National Electrical Code*[®], 2020 2023 edition.

NFPA 72[®], *National Fire Alarm and Signaling Code*[®], 2019 2022 edition.

NFPA 731, *Standard for the Installation of Premises Security Systems*, 2020 2023 edition.

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

“Combustible Gas Distribution in Residential Occupancies and Detector Location Analysis,” Fire Protection Research Foundation and Gexcon US, Inc., August 2020.

D.1.2 Other Publications.

D.1.2.1 AGA Publications.

American Gas Association, 350 North Capitol Street, NW, Suite 450, Washington, DC 20001.

AGA XQ1702, *Odorization Manual*, 2017.

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, Oklahoma, 74135, www.gpamidstream.org.

GPA 2261, *Analysis for Natural Gas and Similar Gaseous Mixtures by Gas Chromatography*, 2000.

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, 3 Park Avenue, 17th Floor, New York, NY 10016-5997.

IEEE 485, *Recommended Practice for Sizing Lead-Acid Batteries for Stationary Applications*, 2010.

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.

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.

D.1.2.6 Military Specifications.

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, 1320 North Courthouse Road, Suite 200, 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.

UL 1484, *Residential Gas Detectors*, 2016.

UL 2075, *Gas and Vapor Detectors and Sensors*, ~~2013~~ 2017 .

D.1.2.9 ~~U.S.~~ US Government Publications.

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

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

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

Report of research on emergency signaling devices for use by the hearing impaired (Subject 1971), Underwriters Laboratories, 1991.

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

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

"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.

D.3 References for Extracts in Informational Sections.

NFPA 72[®], *National Fire Alarm and Signaling Code*[®], ~~2019~~ 2022 edition.

NFPA 4224 1225, *Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems* ~~Emergency Services Communications~~, ~~2019~~ 2022 edition.

Supplemental Information

<u>File Name</u>	<u>Description</u>	<u>Approved</u>
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Submitter Information Verification

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Committee Statement

Committee Statement: Reference updates.

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