Public Comment No. 25-NFPA 715-2021 [Global Input]

Consideration should be given to changing the 10% alarm detection threshold to 25% throughout the document.

Statement of Problem and Substantiation for Public Comment

We agree that detection at 10% of LEL will sound an alarm during a gas leak sooner than detection at 25% LEL. However, we are concerned whether sufficient evaluation was completed to make sure the more sensitive alarm threshold will not result in potential nuisance alarms, i.e. those that occurred in the Chicago area in the 1990s with carbon monoxide alarms. Fuel leaks commonly occur from cooktops, where the knob is turned releasing fuel gas prior to the ignitor igniting the gas.
It should be noted that 25% LFL is a common alarm detection threshold in fire codes and other fire safety standards.

Related Item

• First Revision No. 10

Submitter Information Verification

Submitter Full Name: Howard Hopper
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 07 11:25:21 EDT 2021
Committee:

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-70-NFPA 715-2021

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.

Public Comment No. 6-NFPA 715-2021 [Global Input]

Global change: "fuel gas" to "flammable gas and vapor" and "fuel gases" to "flammable gases and vapors"

Statement of Problem and Substantiation for Public Comment

See public comment (PC3)

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 3-NFPA 715-2021 [Section No. 1.1.2]	Scope of standard

Related Item

- Section 1.1.2

Submitter Information Verification

Submitter Full Name:	Glenn McGinley
Organization:	Ohio Bureau of Workers' Compensation, Division of Safety & Hygiene
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Mar 21 11:26:27 EDT 2021
Committee:	

Committee Statement

Committee Action:	Rejected
Resolution:	The Technical Committee does not agree that the wording should be changed to “flammable gas and vapor” or “flammable gases and vapor”. The use of these phrases are too broad. Many other gases like ammonia and hydrogen sulfide are considered flammable gases and are outside the application of this standard. Making this change could create misunderstanding of the scope of the standard. Our remit was to provide a standard for fuel gases specifically and not a specific property. We feel that changing to “flammable gas(es) and vapor(s)” also removes the push for gas detectors to be installed in residences. This is important because it is one of the recommendations by the NTSB after the Silver Spring and Dallas gas explosions.

Public Comment No. 3-NFPA 715-2021 [Section No. 1.1.2]

1.1.2*

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

Statement of Problem and Substantiation for Public Comment

NFPA has long needed a standard for the selection, installation, and placement of gas and vapor detection equipment. Although it isn't clear from the scope or the existing draft, it seems that the intent of this standard is protection for residential occupancies if not then the scope should clearly indicate that it applies to all buildings with a risk of accumulated or accumulating flammable gases and vapors. Limiting the scope of this proposed standard to "fuel" gases or using the term "fuel gases" limits the application of the standard to the multitude of applications for this detection equipment. Several NFPA standards already require the installation of "combustible gas detection" equipment like NFPA 36 and NFPA 820 and others could benefit from a referenced standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 4-NFPA 715-2021 [Section No. 1.1.3]	Scope of standard
Public Comment No. 5-NFPA 715-2021 [Section No. A.1.1.2]	
Public Comment No. 6-NFPA 715-2021 [Global Input]	

Related Item

- 1.1.1

Submitter Information Verification

Submitter Full Name:	Glenn McGinley
Organization:	Ohio Bureau of Workers' Compensation, Division of Safety & Hygiene
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Mar 21 08:25:40 EDT 2021
Committee:	FWE-AAA

Committee Statement

Committee Action:	Rejected
Resolution:	The Technical Committee does not agree that the wording should be changed to “flammable gas and vapor detection”. The use of the phrase “flammable gas” is too broad. Many other gases like ammonia and hydrogen sulfide are considered flammable gases and are outside the application of this standard. Changing from “fuel gas detection” to “flammable gas and vapor detection” could create misunderstanding of the scope of the standard. Our remit was to provide a standard for fuel gases specifically and

not a specific property. We feel that changing to “flammable gas and vapor detection” also removes the push for gas detectors to be installed in residences. This is important because it is one of the recommendations by the NTSB after the Silver Spring and Dallas gas explosions.

Public Comment No. 4-NFPA 715-2021 [Section No. 1.1.3]

1.1.3

This standard shall contain requirements for the selection, installation, operation, and maintenance of equipment that detects concentrations of ~~fuel~~ flammable gases and vapors that could pose a life or property safety risk.

Statement of Problem and Substantiation for Public Comment

See related comment to 1.1.2

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 3-NFPA 715-2021 [Section No. 1.1.2]	

Related Item

- 1.1.2

Submitter Information Verification

Submitter Full Name:	Glenn McGinley
Organization:	Ohio Bureau of Workers' Compensation, Division of Safety & Hygiene
Street Address:	
City:	
State:	
Zip:	
Submittal Date:	Sun Mar 21 08:47:29 EDT 2021
Committee:	FWE-AAA

Committee Statement

Committee Action:	Rejected
Resolution:	The Technical Committee does not agree that the wording should be changed to “flammable gases and vapors”. The use of the phrase “flammable gas” is too broad. Many other gases like ammonia and hydrogen sulfide are considered flammable gases and are outside the application of this standard. Changing from “fuel gases” to “flammable gases and vapors” could create misunderstanding of the scope of the standard. Our remit was to provide a standard for fuel gases specifically and not a specific property. We feel that changing to “flammable gases and vapors” also removes the push for gas detectors to be installed in residences. This is important because it is one of the recommendations by the NTSB after the Silver Spring and Dallas gas explosions.

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

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, revised 2017 .

Statement of Problem and Substantiation for Public Comment

Update revised standards.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 64-NFPA 715-2021 [Section No. D.1.2.7]	

Related Item

- PI 2

Submitter Information Verification

Submitter Full Name: Kelly Nicolello
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 17:53:54 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-17-NFPA 715-2021
Statement: Reference updates.

Public Comment No. 20-NFPA 715-2021 [New Section after 3.3.17]

Advanced Fuel Gas Detector

3.3.17 Fuel Gas Detector.

A device having a sensor that responds to fuel gas that is connected to an alarm control unit.

3.3.17* Gas Detector

3.3.17.1* Fuel Gas Detector

A device having a sensor that responds to fuel gas that is connected to an alarm control unit. A device having a sensor that responds to fuel gas above one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set above the one percent of the Lower Explosion Limit.

3.3.17.2* Advanced Fuel Gas Detector

A device having a sensor that responds to fuel gas at or below one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below one percent of the Lower Explosion Limit.

Statement of Problem and Substantiation for Public Comment

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

Related Item

• FR [3.3.17], [5.8.5.3.1], [9.4.1.1], [9.4.1.2]

Submitter Information Verification

Submitter Full Name: Eric Crosson
Organization: Sparrow Detect, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 07 10:25:51 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: This comment is not being accepted for the following reasons: 1. A second definition of fuel gas detector was added, which is confusing and is not necessary. 2. Requirements for advanced fuel gas detectors were not added to the body of the standard, so a definition is not needed.

Public Comment No. 53-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. [~~**72:** 10.3.1~~] This includes listing to the following standards:

(1) Residential fuel gas detectors and alarms shall be listed in accordance with UL 1484, the *Standard For Residential Gas Detectors*, or

(2) Fuel gas detectors shall be listed in accordance with UL 2075, the *Standard for Gas and Vapor Detectors and Sensors*

Statement of Problem and Substantiation for Public Comment

We understand that the intent of NFPA 715 is to require fuel gas detectors and alarms to be listed to the construction and performance requirements of these referenced UL standards. This proposal differentiates UL 2075 and UL 1484 listed devices from devices listed to other standards for electrical safety only, and not performance. These two UL standards are already included in the Chapter 2 and Annex D referenced standard sections. 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.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
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]	
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
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]	

Related Item

- First Revision No. 37

Submitter Information Verification

Submitter Full Name: Howard Hopper
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 19:59:55 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-5-NFPA 715-2021

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.

Public Comment No. 35-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~~ more restrictive requirements shall prevail.

Statement of Problem and Substantiation for Public Comment

This standard should not place manufacturers at risk because of differences with the standard regarding design, installation or operation. Let the most restrictive practices prevail.

Related Item

• Public input 35

Submitter Information Verification

Submitter Full Name: Robert Torbin
Organization: Omega Flex, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 14:54:48 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-10-NFPA 715-2021

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.

Public Comment No. 33-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 instructions .

Statement of Problem and Substantiation for Public Comment

Home owners buying methane detectors at Home Depot 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.

Related Item

• no public comments are avaialble.

Submitter Information Verification

Submitter Full Name: Robert Torbin
Organization: Omega Flex, Inc.
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 14:24:03 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-12-NFPA 715-2021
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.

Public Comment No. 58-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. In no case shall the input voltage be less than 85% or more than 110% of the equipment's nameplate rating.

Statement of Problem and Substantiation for Public Comment

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.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
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]	
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
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]	

Related Item

- First Revision No. 37

Submitter Information Verification

Submitter Full Name: Howard Hopper
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 14:44:32 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-6-NFPA 715-2021
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.

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

Replace with the following:

4.11.1

~~– Voltage, Temperature, and Humidity Variation.~~

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

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

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

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

Operating Temperatures.

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 and/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 and UL 2075 have been tested at ambient temperatures of 32 °F (0 °C) and 120 °F (49 °C).

4.11.1.2 Outdoors and unconditioned spaces.* Equipment intended for use outdoors and 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. The manufacturer's instructions will identify if the product has been tested and listed for use at the minimum unconditioned space temperature extremes.

A.4.11.1.2 Unconditioned indoor spaces include areas that are not served by heating and/or air conditioning equipment, such as those typically found in attached and detached garages, sheds, attics and in 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 may 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 minus 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.

Statement of Problem and Substantiation for Public Comment

The proposal assumes that the public comment to include UL 1484 and UL 2075 in the body of the code was accepted, and that the 85 % to 110% voltage range was added to the Power Supply Sources section.
The reference to a relative humidity of 85 % and an ambient temperature of 86 F was deleted because these specific values are not included in either UL 1484 or UL 2075, and both standards include performance criteria at both high and low humidity conditions. Accordingly there is no need for a code user to have to consider humidity at the installation location.
New criteria for installations of equipment in both conditioned and unconditioned spaces has been included, along with annex notes, since this should be considered at the installation locations.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
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]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
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]	

Related Item

- First Revision No. 37

Submitter Information Verification

Submitter Full Name: Howard Hopper
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 07 11:35:05 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-4-NFPA 715-2021
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.

Public Comment No. 21-NFPA 715-2021 [New Section after 5.8.5.3]

Advanced Fuel Gas Detector

5.8.5.3.1.2* Advanced Fuel Gas Detector

Advanced Fuel gas detectors shall be installed as specified in the manufacturer's published instructions in accordance with 5.8.5.3.1.2(1) through 5.8.5.3.1.2(5) or with 5.8.5.3.1.2(6):

(1)* Advanced fuel gas detectors need to only be installed in accordance with the manufacturer's published instructions .

(2)* Advanced fuel gas detectors need to only be installed in accordance with the manufacturer's published instructions for horizontal flow path distances from permanently installed fuel-gas-burning appliances.

(3)* Advanced fuel gas detectors need to only be installed in accordance with the manufacturer's published instructions for locations directly in the airstream of supply and return registers or directly above doorway openings.

(4)* Advanced fuel gas detectors shall be installed in basements or other subgrade rooms with foundations penetrations that might convey migrating fuel gas leaks from outside the occupancy.

(5)* Combination advanced 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 fuel gases detector.

(6)* Advanced Fuel Gas detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2 .

Additional Proposed Changes

File Name	Description	Approved
210507_Advanced_Fuel_Gas_Detector_Explanatory_Materials.pdf	Advanced Fuel Gas Detector Explanatory Notes that could be included in Annex A	

Statement of Problem and Substantiation for Public Comment

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

Related Item

• FR [3.3.17], [5.8.5.3.1], [9.4.1.1], [9.4.1.2]

Submitter Information Verification

Submitter Full Name: Eric Crosson
Organization: Sparrow Detect
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 07 10:56:00 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: This comment is not being accepted for the following reasons: 1. No data was provided to show that detection at 1% LEL would not generate nuisance alarms due to low levels of fuel gases near fuel burning appliance that are operating normally, such as in proximity to a gas cooktop with a spark ignitor. 2. The standard currently does not preclude detection below 10 % LEL, despite the lack of nuisance alarm data. However no data was provided to show that the advanced fuel gas detectors can be listed as required by this standard. You may wish to work with the UL STP that develops fuel gas detector standards to see if this technology can be recognized. 3. The proposed wording in 5.8.5.3.1.2 indicates that these detectors “need only be installed” per specific requirements, which does not fit in with how the overall standard is structured. 4. No annex material was provided that corresponded with the (*) notes.

Annex A Explanatory Materials

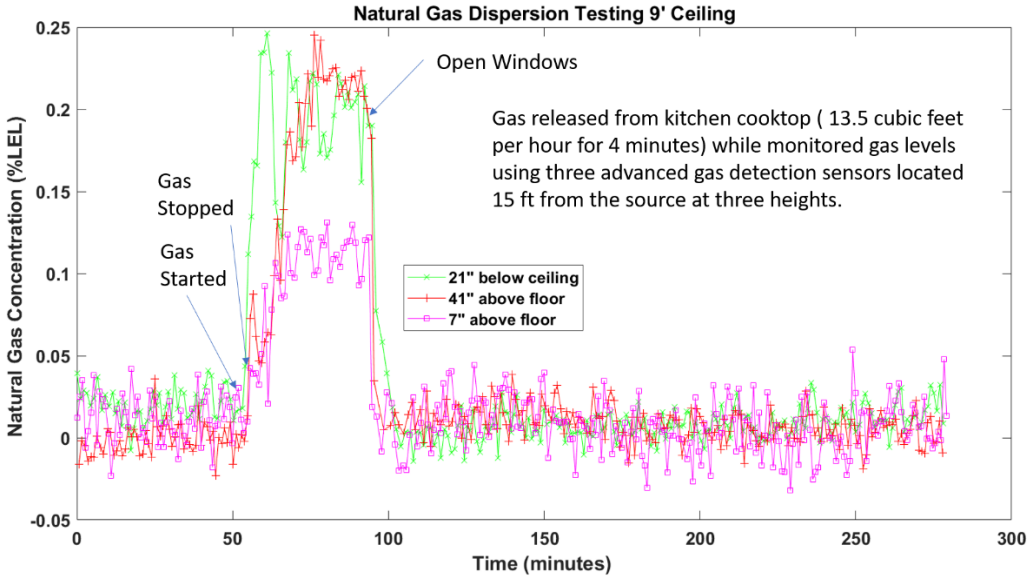
A.3.3.17.2 Advanced Fuel Gas Detector

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

A.5.8.5.3.1.2(1)

Advanced fuel gas detectors need not be constrained to being 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. To demonstrate this, methane measurements were taken at 3 heights off the ceiling in an 8,300 cubic foot single story home. Gas was released from a cooktop stove located in the kitchen for a total duration of 4 minutes at approximately 13.5 cubic feet per hour (~1 cubic foot total). All measurements were taken at the same horizontal location, 15 feet from the source. The height of the ceiling was 9 feet. The HVAC in the home system was turned off and all windows were closed at the start of measurements. All windows in the home were opened approximately 90 minutes after the start of measurements. Methane levels 21" below the ceiling, 41" above the floor, and 7" above the floor are shown in figure 1. Methane concentration levels 21" below the ceiling and 41" above the floor were similar at 0.25% LEL. Methane concentration levels at 7" off the floor were 0.1% LEL. If we again scale the 21" measurements, this time by a factor of 40, the methane levels at 21" below the ceiling and 41" above the floor would be ~10% LEL while methane concentration levels at 7" off the floor would be 4% LEL, each well above the 1% LEL or less threshold for advanced fuel gas detectors. Repeating the test produced similar results.

The data suggests the mechanisms for gas propagation through a structure is dispersion and methane buoyancy when the windows are closed and the HVAC system is not operating. The data presented from this study implies a competing process where buoyancy first dominates the transport mechanism then dispersion overwhelms buoyancy effects. The 10%LEL alarm requirement for gas fuel detectors, takes advantage of buoyancy transport by requiring that the detector be installed within 12" of the ceiling in the same room as permanently installed fuel-gas burning appliances. This seems a prudent requirement for detectors with a 10% LEL alarm threshold since the 12" location requirement takes advantage of the buoyancy before dispersion acts to dilution the gas. However, for advanced fuel gas detectors with detection thresholds below 1% of the lower explosion limit, gas dilution is compensated by higher sensitivity. Therefore, advanced fuel gas detectors can take advantage of dispersion's transport of the gas in both the vertical and horizontal directions. As a result of higher sensitivity, advanced fuel gas detectors can be located at heights other than 12" below the ceiling and still meet the requirement to detect a natural gas leak before certain hazardous conditions arise.



Gas Concentrations at 20" off the ceiling are roughly equivalent to those made 41" above the floor

Figure 1: Methane measurements were taken at 3 heights off the ceiling in an 8,300 cubic foot single story home.

A.5.8.5.3.1.2(2)

Advanced fuel gas detectors can be installed beyond the 10 ft (3 m) in a horizontal flow path from permanently installed fuel-gas-burning appliance requirement of fuel gas detectors. Presented are two examples demonstrating the utility of advanced fuel gas detectors in a residential structure at distances greater than 10 ft from a natural gas source. When a sensor is placed at distances greater than 10ft from fuel-gas-burning appliances, gas dispersion

necessitates a detection threshold below 10% LEL if a natural gas leak is to be detected before certain hazardous conditions arise. This statement is true when the sensor is in the same room as a leak. It is also true when the sensor is in an adjacent room as long as the gas can propagate from the source to the sensor.

Figure 2 shows measurements of a natural gas release in an 18,500 cubic foot, two-story home. In this case, four cubic feet of natural gas from a cooktop stove located in the kitchen was released. Four advanced fuel gas detectors were placed at locations, both downstairs and upstairs within the home and monitored methane concentration levels at their respective locations. In this case the HVAC in the home system was turned off and all windows were closed at the start of measurements. To clear out the gas, the windows to the home were opened approximately 90 minutes after measurements began. Figure 3 shows a layout of the home and a photo of the stairway between the first and second floors. Because the HVAC system was turned off and all windows were shut, the mechanisms for gas propagation through the home were dispersion and methane buoyancy. As seen in figure 2, when 4 cubic feet of natural gas was released in the kitchen, methane was measured by all four gas detectors, irrespective of their location in this two-story home. The maximum methane concentration reached in the kitchen (six feet from the source) was a little less than 1% LEL while a methane concentration of 0.25 %LEL was detected in the upstairs hallway far from the source. Scaling all advanced leak detector measurements by a factor of 10 times, the maximum concentration seen in the kitchen, after scaling, would have been ~10% LEL while the corresponding maximum concentrations in the family room, dining room, and upstairs hallway would be 7% LEL, 3%LEL, and 2.5% LEL, respectively. Thus if methane concentrations exceeded 10% LEL at distance of 6 ft from the source in the kitchen, methane concentration levels as measured by all four advanced fuel gas detectors at other locations in this 18,500 cubic foot, two-story home would have exceed an alarm concentration threshold of 1% LEL.

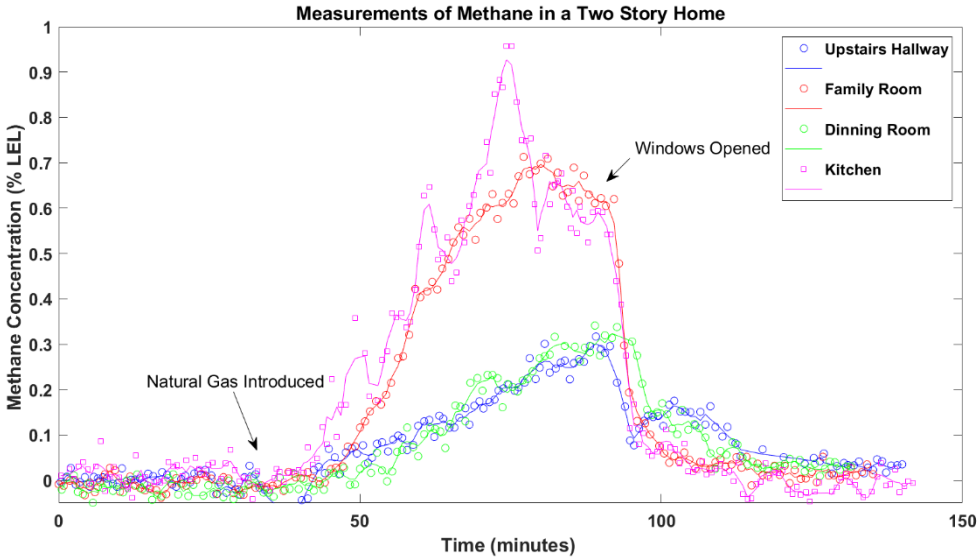


Figure 2: Natural gas propagation in a large two-story home

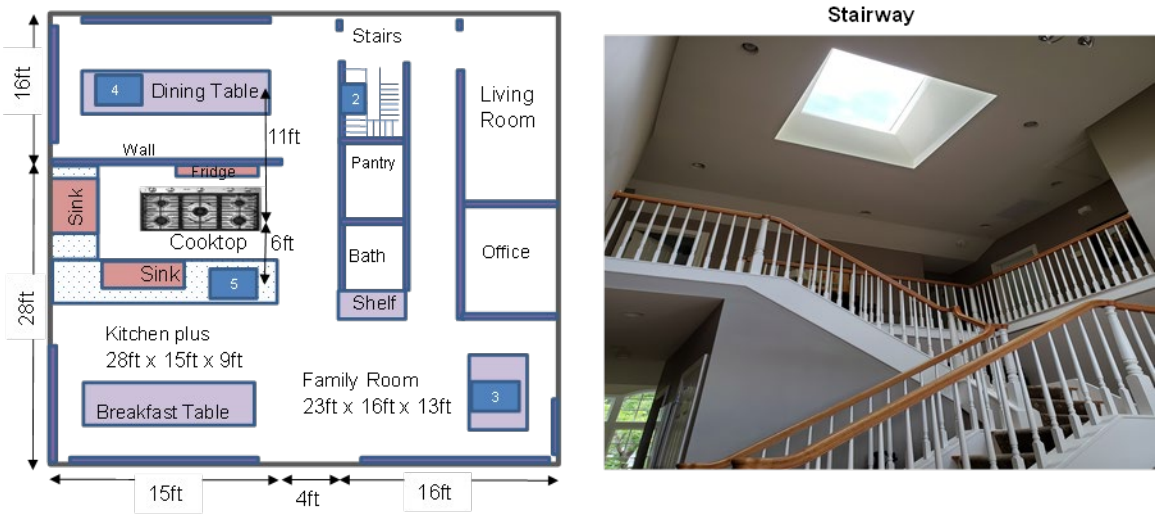


Figure 3: Layout of the two-story home and a photo of the stairway

In a second example, natural gas was released in a 25,000 cubic foot, tri-level home. Methane measurements made in this home are shown in figure 4. Figure 5 shows a layout of the home and a photo of the kitchen and a photo of the stairway between the mid- and upper-level of the home. Gas was released from a cooktop stove located in the kitchen for a total duration of 20 minutes at approximately 15.0 cubic feet per hour (5 cubic feet total). Five advanced fuel gas detectors were placed within the home and setup to monitor methane concentration levels at their respective locations. One advanced fuel gas detector was located on the mid-level of the three-level home, four feet from the gas source. A second advanced fuel gas detector was placed in the living room, also located on the mid-level of the home. One advance fuel gas detector was placed in the lower level family room and two were placed on the upper level, one in the hallway and the other in the exercise room. The HVAC in the home system was turned off and all windows were closed at the start of measurements. To clear out the gas, the windows to the home were opened at 110 minutes. As seen in figure 3, when 5 cubic feet of natural gas was released in the kitchen, methane was measured by all five fuel gas detectors, irrespective of their location in this tri-level story home.

The maximum methane concentration reached in the kitchen (four feet from the source) was 1% LEL. Once the gas dispersed, the concentration stabilized at 0.4% LEL in the kitchen while a methane concentration of 0.08 %LEL was measured at the most distance detector located in the upstairs exercise room. Scaling all advanced fuel gas detector measurements by a factor of 25 times, the maximum concentration seen in the kitchen would be ~10% LEL while the corresponding maximum concentrations in the family room, living room, and upstairs exercise room and upstairs hallway would be 7.5% LEL, 2.5%LEL, 2% LEL and, 1% LEL respectively. Thus when methane concentrations exceeded 10% LEL at distance of 4 ft from the source after scaling, methane concentrations as measured by all five advanced fuel gas detectors at other locations in the home would have met or exceed an alarm concentration threshold of 1% LEL.

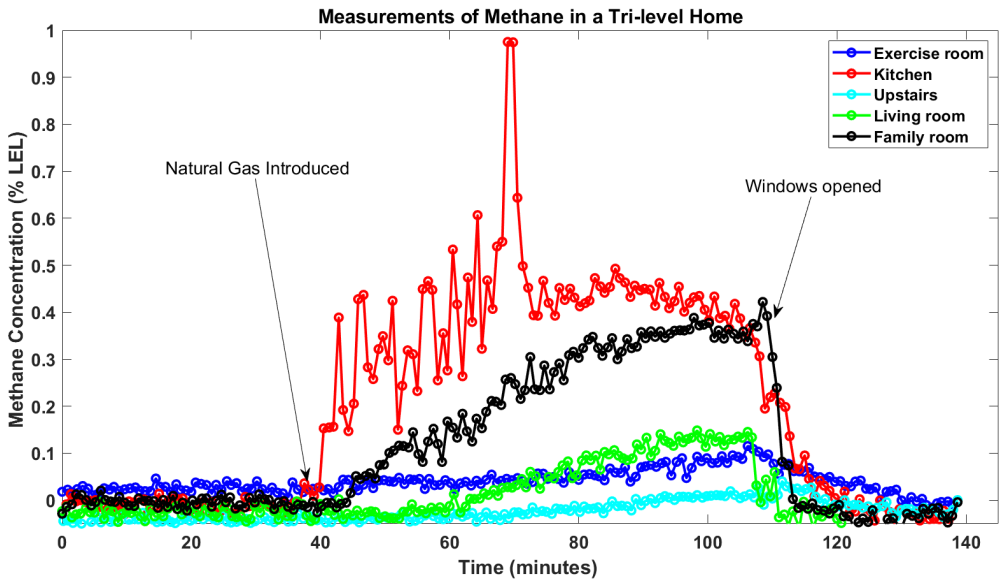


Figure 4: An example of natural gas propagation from a source in a large tri-level home.

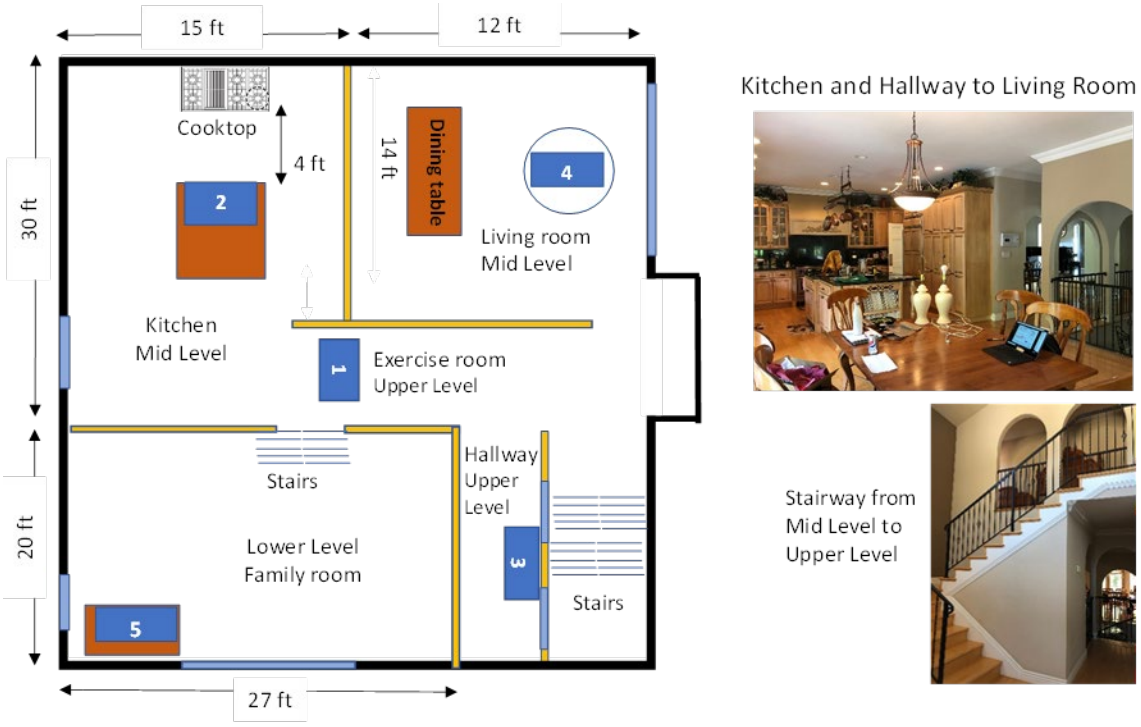


Figure 5: A layout of the tri-level home and a photo of the kitchen and a photo of the stairway between the mid- and upper-levels.

A.5.8.5.3.1.2(3)

Advanced fuel gas detectors take advantage of the transport mechanisms and dilution of supply and return registers (and doorway openings). The advanced fuel gas detector low alarm threshold overcomes the dilution effects thereby enabling their location directly in the airstream of supply and return registers or directly above doorway openings while meeting the requirement to detect a natural gas leak before certain hazardous conditions arise.
Methane measurements in a single-story home with the windows closed and the HVAC operational are shown in figure 6. Natural gas was released from a stove in the kitchen. If we scale these measurements by a factor of 10 times the peak methane results would be 10% LEL, 2.5% LEL, 1.5% LEL and 1.0% LEL, in the kitchen, dining room, den and bedroom, respectively. Although the measurements were not made exactly at supply and return registers, concentration levels of methane indicate that natural gas released in the kitchen permeated the entire home. After scaling, projections are that gas levels would be at or above the advanced gas detector alarm threshold of 1% LEL throughout the home. Therefore, gas at return registers and ducts of the HVAC system as well as doorways should be at similar levels and meet the advanced gas detector alarm threshold of 1% LEL.
For supply registers it is less clear. This is because the air supply in an HVAC can sometimes be partially diluted by outside air. If this is the case, advanced fuel gas detectors located at supply registers may or may not meet the advanced fuel gas detector alarm threshold of 1% LEL at all supply registers.

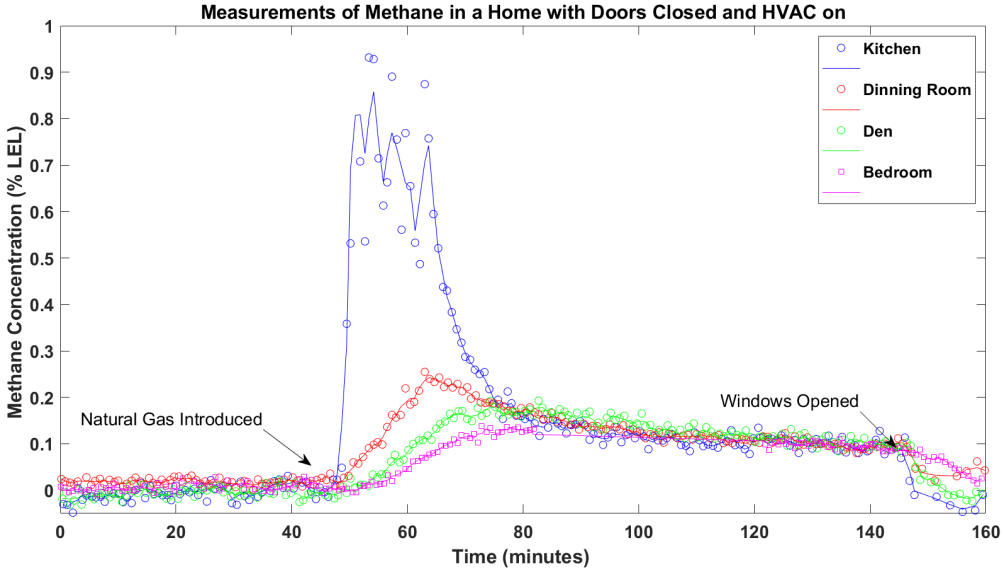


Figure 6: Methane measurements in a single story home with the windows closed and the HVAC on.

Public Comment No. 45-NFPA 715-2021 [Section No. 5.8.5.3.1]

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 as close to the ceiling as practiable 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, the entire detector shall be installed as close to the floor as practiable, on the wall within ~~18 in~~ , with the bottom of the detector within 12 in . (~~457 mm~~ 305 mm) of the floor in the same room as permanently installed fuel-gas-burning appliances.

*

(3)

(4) 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.~~

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

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

(7) 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 fuel gases detector.

(8) Detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2.

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon Study and Presentations

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:

Zip:
Submittal Date: Mon May 10 17:06:45 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The reference to adding a detector as close to the ceiling or floor as practicable is very subjective, and is included as an annex note. There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 12 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 12 inches of the floor. It is recognized that detectors closer to the floor or ceiling will probably generate an alarm signal sooner than those further away. Current annex language encourages installers to install these detectors as close as practicable to the floor or ceiling. Removing the requirements for detectors to be installed more than 3 ft. from fuel gas burning appliances raises concerns about potential nuisance alarms from transient gas releases from spark ignitors and other sources associated with normal operation of the fuel burning appliance.

Public Comment No. 59-NFPA 715-2021 [Section No. 5.8.5.3.1]

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, 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 fuel gases detector~~ manufacturer's installation instructions .

(7) Detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2.

Statement of Problem and Substantiation for Public Comment

Deferring to the requirements for fuel gas detectors may not be the most appropriate solution. Has there been information presented that indicates the frequency of gas leaks exceeds the frequency of carbon monoxide incidents? Will deferring to the fuel gas provisions (especially in buildings using propane), may severely hinder the ability of a combination detector to detect carbon monoxide. There may be an optimum height or location at which to locate the combination detector and determining that location should be the purview of the detector manufacturer.

Related Item

• FR No. 19

Submitter Information Verification

Submitter Full Name: Bruce Swiecicki
Organization: National Propane Gas Associati
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 14:49:00 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-66-NFPA 715-2021

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.

Public Comment No. 8-NFPA 715-2021 [Section No. 5.8.5.3.1]

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, the entire detector shall be installed on the wall within ~~18~~ 6 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 fuel gases detector.

(7) Detectors shall be installed based on a performance-based design in accordance with 5.8.5.3.2.

Statement of Problem and Substantiation for Public Comment

TG4 discussions regarding the propane detector distance from the floor resulted in a concern that the 18 inch distance, which was determined based on typical electrical outlet height off the floor, per the Gexcon report would result in a significant amount of non-detects. As such this PI is being submitted for full TC contemplation of a lower height for propane detectors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 11-NFPA 715-2021 [Section No. A.5.8.5.3.1(2)]	

Related Item

- FR-19

Submitter Information Verification

Submitter Full Name: Rick Trieste
Organization: Consolidated Edison Company of
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 13 11:13:45 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 6 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 6 inches of the floor. It is recognized that detectors closer to the floor will generate an alarm signal sooner than those higher up on the wall. Current annex language encourages installers to install these detectors as close as practicable to the floor.

Public Comment No. 16-NFPA 715-2021 [Section No. 5.8.5.3.3]

5.8.5.3.3* Alarm Threshold. Avangrid Supports the alarm limits of 10% lel on residential fuel gas alarm detectors. The lower alarm threshold provides early warnings to customers for increased safety and provides first responders increase time to address fuel gas concentrations to save life and property.

5.8.5.3.3.1*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors.*

5.8.5.3.3.2*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and meet the sensitivity testing and alarm thresholds of UL 1484, *Residential Gas Detectors.*

5.8.5.3.3.3

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

Statement of Problem and Substantiation for Public Comment

Avangrid supports the 10% LEL

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 17-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 18-NFPA 715-2021 [Section No. 9.6.1.2]	

Related Item

- Utility

Submitter Information Verification

Submitter Full Name: Carrie Berard
Organization: NYSEG
Affiliation: NYSEG and RGE (Avangrid)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 13:51:44 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 2-NFPA 715-2021 [Section No. 5.8.5.3.3]

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

5.8.5.3.3* Alarm Threshold.

5.8.5.3.3.1*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors.*

5.8.5.3.3.2*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and meet the sensitivity testing and alarm thresholds of UL 1484, *Residential Gas Detectors.*

5.8.5.3.3.3

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

Statement of Problem and Substantiation for Public Comment

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

Related Item

• Supports provision 5.8.5.3.3

Submitter Information Verification

Submitter Full Name: charles rayot
Organization: Ameren Illinois
Street Address:
City:
State:
Zip:
Submittal Date: Mon Mar 15 14:30:35 EDT 2021
Committee:

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 39-NFPA 715-2021 [Section No. 5.8.5.3.3]

5.8.5.3.3* ~~Alarm Threshold. Fuel Gas Detector Threshold.~~

Through December 31, 2025, fuel gas detectors shall be designed to alarm at a maximum concentration threshold no higher than 25 percent LEL for the methane and propane and LEL concentrations presented in Table B.1. Fuel gas detectors may be designed to alarm at a lower maximum concentration threshold. Maximum concentration threshold shall be marked on detectors, product packaging, and installation instructions.

5.8.5.3.3.1*

~~Each~~ After December 31, 2025, fuel gas ~~detector~~ detectors shall be designed to alarm at a maximum concentration threshold ~~at or below~~ no higher than 10 percent LEL for methane and ~~be listed in accordance with UL 2075, Gas and Vapor Detectors and Sensors~~ propane and the LEL concentrations presented in Table B.1. Maximum concentration threshold shall be marked on detectors, product packaging, and installation instructions.

5.8.5.3.3.2*

Maximum detection thresholds shall be used to calculate upper detection thresholds (*U*) for detectors according to UL 1484, *Residential Gas Detectors,* Fifth Edition, Section 49.1.10 where *U* represents the detection threshold after the detector has been subjected to condition tests in Sections 49.2.1 through 49.17.6 of that standard, *K* represents the maximum concentration thresholds complying with Section 5.8.5.3.3 or 5.8.5.3.3.1 of this standard, and (*I)* represents the initial detection threshold of the detector prior to the conditioning tests .

5.8.5.3.3.~~2~~ * 3

Each fuel gas detector shall be designed ~~to alarm at a concentration threshold at or below 10 percent LEL and meet the sensitivity testing and alarm thresholds of UL 1484, Residential Gas Detectors~~ and be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors* .

5.8.5.3.3.

~~3~~

4

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

Statement of Problem and Substantiation for Public Comment

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, Residential Gas Detectors currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in Section 5.8.5.3.3.1 and that has been proposed to UL 1484. Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 5.8.5.3.3.1 compliant maximum threshold products becoming widely available.

The minimum detection threshold transition from 25% to 10% LEL is supported by the August 2020 Gexcon US Inc. report “Combustible Gas Dispersion in Residential Occupancies & Detector Location Analysis”, sponsored by the NFPA Fire Protection Research Foundation. 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). Further, a Fire & Risk Alliance LLC 2018 study “Natural Gas Dispersion Testing” for the gas industry determined that a 10% alarm threshold could identify a gas concentration ~11 minutes sooner than a 25% alarm threshold. Given first responders such as jurisdictional Fire Departments can respond in about 5 minutes, a lower alarm threshold will alert a gas concentration sooner which will reduce the risk of a gas explosion through early detection.

Industry experience has shown that a 10% LEL alarm threshold will not generally result in the generation of false/nuisance alarms.

Related Item

• A5.8.5.3.3 • A5.8.5.3.3.1

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 15:31:43 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]

5.8.5.3.3* Alarm Threshold.

5.8.5.3.3.1*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors.*

5.8.5.3.3.2*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and meet the sensitivity testing and alarm thresholds of UL 1484, *Residential Gas Detectors.*

5.8.5.3.3.3

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

Statement of Problem and Substantiation for Public Comment

Southwest Gas Corporation supports the reduction of the alarm threshold from 25% LEL to 10% LEL, but only after the UL 1484 standard is revised to require a threshold from 25% LEL to 10%LEL. We agree with the Technical Committee's statement that "early detection from a lower alarm threshold [] provides a significant opportunity to alert consumers sooner than a higher alarm threshold which provides first responders more time to address a fuel gas concentration prior to the formation of a hazardous gas build-up." Further, we believe this revision will incentivize manufacturers to develop consumer-grade fuel detection and warning equipment that can reliably activate at 10% LEL. The current text of NFPA 715 makes reference to the 2016 edition of the UL 1484 standard and we believe that NFPA 715 should not introduce an alarm threshold that conflicts with the refenced UL standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	

Related Item

- FR-9-NFPA 715-2020

Submitter Information Verification

Submitter Full Name: Craig Roecks
Organization: Southwest Gas Corporation
Affiliation: Southwest Gas Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 12:08:49 EDT 2021

Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 28-NFPA 715-2021 [Section No. 5.8.5.3.3.1]

5.8.5.3.3.1*

Each fuel gas detector shall be designed to alarm at a concentration threshold at or below 10 percent LEL and be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors.*

Additional Proposed Changes

File Name	Description	Approved
Support.NFPA.715.pdf	Statement of Support from Southern Company Gas for the 10 % LEL threshold.	

Statement of Problem and Substantiation for Public Comment

This is a statement of support.

Related Item

• FR-9

Submitter Information Verification

Submitter Full Name: Andrea Papageorge
Organization: Southern Company Gas
Street Address:
City:
State:
Zip:
Submittal Date: Fri May 07 14:24:59 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Statement of Southern Company Gas

in Support of

NFPA 715

Southern Company Gas (hereafter called "the Company") would like to express our support for the 10% LEL provision in the new publication NFPA 715.

The Company currently provides clean, safe, and reliable natural gas to natural gas for approximately 4.2 million customers through our regulated distribution companies in four states. The Company has been providing natural gas to its customers since 1856.

In supporting the 10% minimum threshold, the Company agrees that this lower threshold will "sound the alarm" sooner and thus would give the consumer and first responders more time to deal with the gas leak before it reaches more dangerous proportions. With the current alarm threshold at 25%, many consumers could smell gas prior to the alarm sounding. This could result in a false sense of security if the consumer reasons that the smell can't be natural gas because the detector is not alarming.

Further, testing at GTI through OTD of commercially available residential methane detectors from North American and abroad show that some models can already meet the 10% LEL limit with no false positives or nuisance alarms from common household chemicals.

Setting a 10% threshold for residential methane detectors would motivate manufacturers to develop products that would improve the margin of safety, benefitting customers, responders, and the public in general.

Public Comment No. 60-NFPA 715-2021 [Section No. 5.8.5.3.6]

5.8.5.3.6*~~*~~

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

(1) ~~Temperature below 32°F (0°C)~~

(2) ~~Temperature above 120°F (49°C)~~

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

in conditioned and unconditioned indoor spaces and in outdoor locations shall comply with 4.11.1.

Statement of Problem and Substantiation for Public Comment

Section 4.11.1 includes more comprehensive requirements for installations in these locations.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
Public Comment No. 61-NFPA 715-2021 [Section No. A.5.8.5.3.6]	
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
Public Comment No. 61-NFPA 715-2021 [Section No. A.5.8.5.3.6]	

Related Item

• First Revision No. 37

Submitter Information Verification

Submitter Full Name: Howard Hopper
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Submittal Date: Tue May 11 15:06:32 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-68-NFPA 715-2021

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.

Public Comment No. 40-NFPA 715-2021 [Section No. 8.7]

8.7 Single- and Multiple-Station Fuel Gas Alarms.

The manufacturer shall provide residential customers with printed instructions indicating the following recommended inspection, maintenance and replacement requirements:

8.7.1

Single- and multiple-station fuel gas alarms and all connected appliances shall be inspected and tested in accordance with the manufacturer's published instructions at least monthly.

8.7.2

Alarms shall be replaced in the following instances:

(1) When either the end-of-life signal is activated or the manufacturer’s replacement date is reached

(2) When the alarm fails to respond to operability tests

8.7.3

Any combination of smoke/carbon monoxide/fuel gas alarms shall be replaced when the end-of-life signal activates or 10 years from the date of manufacture, whichever comes first, unless otherwise provided by the manufacturer's published instructions.

8.7.4

Where batteries are used as a source of energy for alarms, the batteries shall be replaced in accordance with the alarm equipment manufacturer’s published instructions.

8.7.5*

The occupant of a dwelling unit shall be deemed qualified to perform inspection, testing, and maintenance on single- and multiple-station fuel gas alarms and all connected appliances protecting that dwelling unit when provided with the manufacturer’s published instructions.

Statement of Problem and Substantiation for Public Comment

As stated , the inspection, testing and maintenance requirements are unenforceable.

Related Item

• none are available

Submitter Information Verification

Submitter Full Name: Robert Torbin
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Submittal Date: Mon May 10 16:07:53 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The Technical Committee does not change the text because there is no reasoning provided to why this portion of the code is not enforceable as written. It is already the manufacturer's responsibility to provide instructions with the product in accordance with UL 1484 and UL 2075 requirements.

Public Comment No. 41-NFPA 715-2021 [Section No. 8.8]

8.8 Household Fuel Gas Detection Systems.

The manufacturer shall provide residential customers with printed instructions indicating the following recommended testing, maintenance and replacement requirements:

8.8.1 Testing of Household Fuel Gas Detection Systems.

8.8.1.1*

Household fuel gas detection systems shall be tested by a qualified service technician at least every 3 years according to the methods in Table 8.4.3.

8.8.1.2

Fuel gas detectors used in household fuel gas detection systems shall be tested in accordance with the manufacturer's published instructions.

8.8.1.3

Fuel gas detectors shall be replaced when the end-of-life signal is actuated, the manufacturer's replacement date is reached, or when they fail to respond to operability tests, whichever comes first.

8.8.2 Maintenance of Household Fuel Gas Detection Systems.

Maintenance of household fuel gas detection systems shall be conducted according to the manufacturer's published instructions.

8.8.3* Qualifications.

The occupant of a dwelling unit shall be deemed qualified to perform inspection, testing, and maintenance on household fuel gas detection systems protecting that dwelling unit when provided with the manufacturer's published instructions.

Statement of Problem and Substantiation for Public Comment

as stated, the required testing, maintenance and replacement is unenforceable.

Related Item

• none available

Submitter Information Verification

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Submittal Date: Mon May 10 16:12:47 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The Technical Committee does not change the text because there is no reasoning provided to why this portion of the code is not enforceable as written. It is already the manufacturer's responsibility to provide instructions with the product in accordance with UL 1484 and UL 2075 requirements.

Public Comment No. 36-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~~ more restrictive requirements shall prevail.

Statement of Problem and Substantiation for Public Comment

The proposed change will avoid conflicts with the design, installation and operation in accordance with the manufacturer's requirements but insuring that the most restrictive practices prevail.

Related Item

• none available

Submitter Information Verification

Submitter Full Name: Robert Torbin
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Street Address:
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Submittal Date: Mon May 10 15:09:55 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-11-NFPA 715-2021
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.

Public Comment No. 24-NFPA 715-2021 [New Section after 9.4.1.1]

Advanced Fuel Gas Detector

9.4.1.1.2*

Advanced fuel gas alarms or advanced fuel gas detectors shall be installed as follows:

(1)* Advanced fuel gas alarms or or advanced detectors need to only be installed in accordance with the manufacturer's published instructions for horizontal flow path distances from permanently installed fuel-gas-burning appliances.

(2)* Advanced fuel gas alarms or advanced fuel gas detectors shall be installed in basements or other subgrade rooms that have foundations penetrations that might convey migrating fuel gas leaks from outside the occupancy.

(3)* Advanced fuel gas alarms or advanced fuel gas detectors shall be installed in attached garages where the fuel gas delivery point is within a garage or is adjacent to an exterior garage wall.

(4)* Where interconnection of alarms is required by 9.6.4, advanced fuel gas alarms shall be located outside of each separate sleeping area in the immediate vicinity of the bedroom.

(5) Advanced fuel gas alarms or advanced fuel gas detectors needs to only be installed in accordance with the manufacturer's published instructions for locations directly in the airstream of supply and return registers or directly above doorway openings.

(6) Advanced fuel gas alarms or advanced fuel gas detectors shall be installed in other locations where required by application laws, codes, or standards.

Additional Proposed Changes

File Name	Description	Approved
210507_Advanced_Fuel_Gas_Detector_Explanatory_Materials.pdf	Advanced Fuel Gas Detector Explanatory Materials that could be included in Annex A	

Statement of Problem and Substantiation for Public Comment

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

Related Item

• FR [3.3.17], [5.8.5.3.1], [9.4.1.1], [9.4.1.2]

Submitter Information Verification

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Zip:
Submittal Date: Fri May 07 11:24:13 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: This comment is not being accepted for the following reasons: 1. No data was provided to show that detection at 1% LEL would not generate nuisance alarms due to low levels of fuel gases near fuel burning appliance that are operating normally, such as in proximity to a gas cooktop with a spark igniter. 2. The standard currently does not preclude detection below 10 % LEL, despite the lack of nuisance alarm data. However no data was provided to show that the advanced fuel gas detectors can be listed as required by this standard. You may wish to work with the UL STP that develops fuel gas detector standards to see if this technology can be recognized. 3. The proposed wording in 9.4.1.1.2 (1) indicates that these detectors “need only be installed” per specific requirements, which does not fit in with how the overall standard is structured. 4. No annex material was provided that corresponded with the (*) notes. 5. The performance based option is not currently recognized in Chapter 9.

Annex A Explanatory Materials

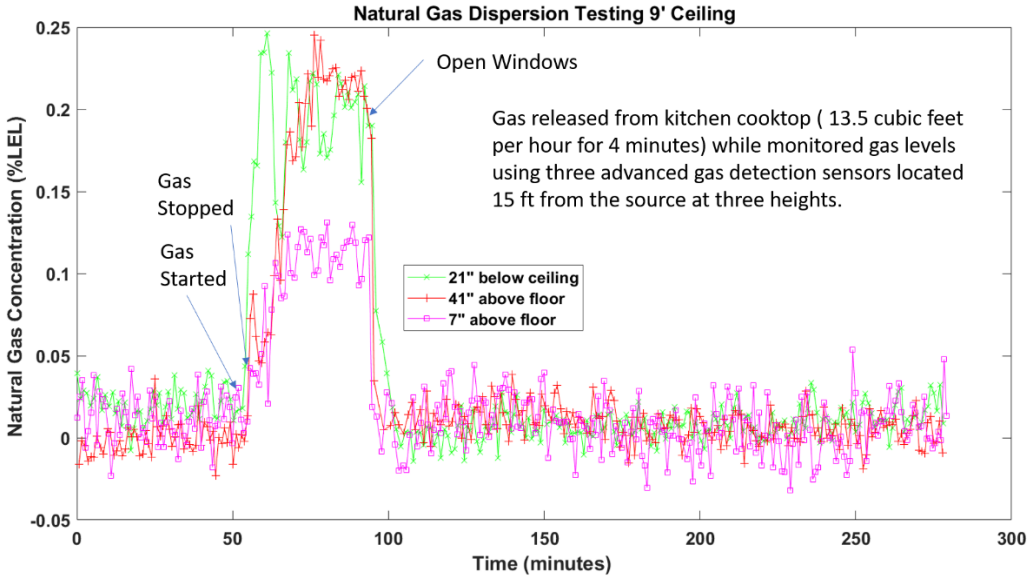
A.3.3.17.2 Advanced Fuel Gas Detector

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

A.5.8.5.3.1.2(1)

Advanced fuel gas detectors need not be constrained to being 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. To demonstrate this, methane measurements were taken at 3 heights off the ceiling in an 8,300 cubic foot single story home. Gas was released from a cooktop stove located in the kitchen for a total duration of 4 minutes at approximately 13.5 cubic feet per hour (~1 cubic foot total). All measurements were taken at the same horizontal location, 15 feet from the source. The height of the ceiling was 9 feet. The HVAC in the home system was turned off and all windows were closed at the start of measurements. All windows in the home were opened approximately 90 minutes after the start of measurements. Methane levels 21" below the ceiling, 41" above the floor, and 7" above the floor are shown in figure 1. Methane concentration levels 21" below the ceiling and 41" above the floor were similar at 0.25% LEL. Methane concentration levels at 7" off the floor were 0.1% LEL. If we again scale the 21" measurements, this time by a factor of 40, the methane levels at 21" below the ceiling and 41" above the floor would be ~10% LEL while methane concentration levels at 7" off the floor would be 4% LEL, each well above the 1% LEL or less threshold for advanced fuel gas detectors. Repeating the test produced similar results.

The data suggests the mechanisms for gas propagation through a structure is dispersion and methane buoyancy when the windows are closed and the HVAC system is not operating. The data presented from this study implies a competing process where buoyancy first dominates the transport mechanism then dispersion overwhelms buoyancy effects. The 10%LEL alarm requirement for gas fuel detectors, takes advantage of buoyancy transport by requiring that the detector be installed within 12" of the ceiling in the same room as permanently installed fuel-gas burning appliances. This seems a prudent requirement for detectors with a 10% LEL alarm threshold since the 12" location requirement takes advantage of the buoyancy before dispersion acts to dilution the gas. However, for advanced fuel gas detectors with detection thresholds below 1% of the lower explosion limit, gas dilution is compensated by higher sensitivity. Therefore, advanced fuel gas detectors can take advantage of dispersion's transport of the gas in both the vertical and horizontal directions. As a result of higher sensitivity, advanced fuel gas detectors can be located at heights other than 12" below the ceiling and still meet the requirement to detect a natural gas leak before certain hazardous conditions arise.



Gas Concentrations at 20" off the ceiling are roughly equivalent to those made 41" above the floor

Figure 1: Methane measurements were taken at 3 heights off the ceiling in an 8,300 cubic foot single story home.

A.5.8.5.3.1.2(2)

Advanced fuel gas detectors can be installed beyond the 10 ft (3 m) in a horizontal flow path from permanently installed fuel-gas-burning appliance requirement of fuel gas detectors. Presented are two examples demonstrating the utility of advanced fuel gas detectors in a residential structure at distances greater than 10 ft from a natural gas source. When a sensor is placed at distances greater than 10ft from fuel-gas-burning appliances, gas dispersion

necessitates a detection threshold below 10% LEL if a natural gas leak is to be detected before certain hazardous conditions arise. This statement is true when the sensor is in the same room as a leak. It is also true when the sensor is in an adjacent room as long as the gas can propagate from the source to the sensor.

Figure 2 shows measurements of a natural gas release in an 18,500 cubic foot, two-story home. In this case, four cubic feet of natural gas from a cooktop stove located in the kitchen was released. Four advanced fuel gas detectors were placed at locations, both downstairs and upstairs within the home and monitored methane concentration levels at their respective locations. In this case the HVAC in the home system was turned off and all windows were closed at the start of measurements. To clear out the gas, the windows to the home were opened approximately 90 minutes after measurements began. Figure 3 shows a layout of the home and a photo of the stairway between the first and second floors. Because the HVAC system was turned off and all windows were shut, the mechanisms for gas propagation through the home were dispersion and methane buoyancy. As seen in figure 2, when 4 cubic feet of natural gas was released in the kitchen, methane was measured by all four gas detectors, irrespective of their location in this two-story home. The maximum methane concentration reached in the kitchen (six feet from the source) was a little less than 1% LEL while a methane concentration of 0.25 %LEL was detected in the upstairs hallway far from the source. Scaling all advanced leak detector measurements by a factor of 10 times, the maximum concentration seen in the kitchen, after scaling, would have been ~10% LEL while the corresponding maximum concentrations in the family room, dining room, and upstairs hallway would be 7% LEL, 3%LEL, and 2.5% LEL, respectively. Thus if methane concentrations exceeded 10% LEL at distance of 6 ft from the source in the kitchen, methane concentration levels as measured by all four advanced fuel gas detectors at other locations in this 18,500 cubic foot, two-story home would have exceed an alarm concentration threshold of 1% LEL.

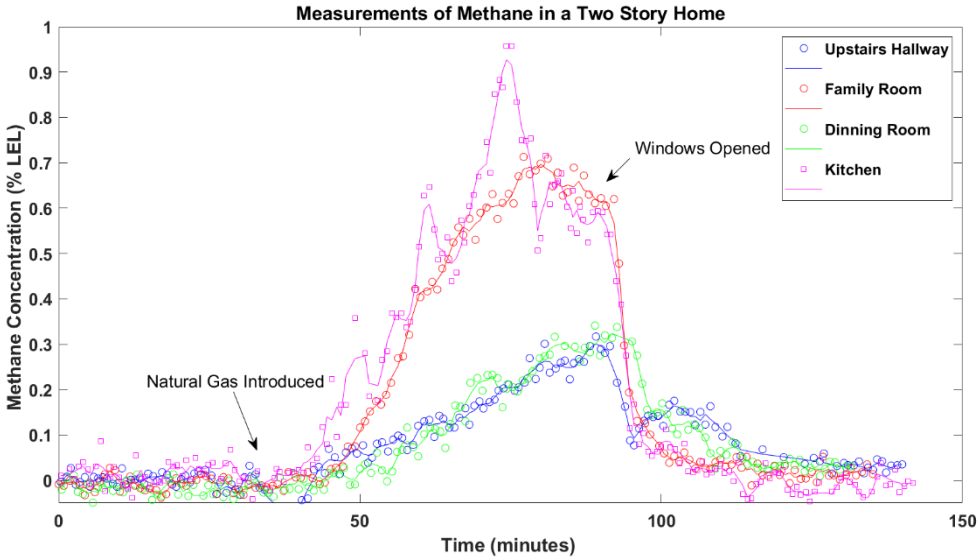


Figure 2: Natural gas propagation in a large two-story home

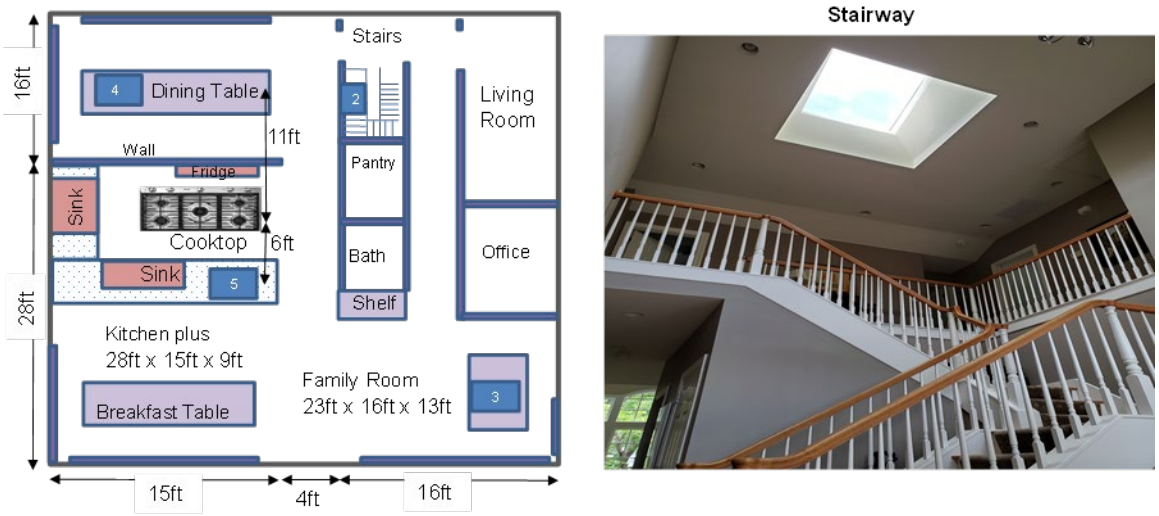


Figure 3: Layout of the two-story home and a photo of the stairway

In a second example, natural gas was released in a 25,000 cubic foot, tri-level home. Methane measurements made in this home are shown in figure 4. Figure 5 shows a layout of the home and a photo of the kitchen and a photo of the stairway between the mid- and upper-level of the home. Gas was released from a cooktop stove located in the kitchen for a total duration of 20 minutes at approximately 15.0 cubic feet per hour (5 cubic feet total). Five advanced fuel gas detectors were placed within the home and setup to monitor methane concentration levels at their respective locations. One advanced fuel gas detector was located on the mid-level of the three-level home, four feet from the gas source. A second advanced fuel gas detector was placed in the living room, also located on the mid-level of the home. One advance fuel gas detector was placed in the lower level family room and two were placed on the upper level, one in the hallway and the other in the exercise room. The HVAC in the home system was turned off and all windows were closed at the start of measurements. To clear out the gas, the windows to the home were opened at 110 minutes. As seen in figure 3, when 5 cubic feet of natural gas was released in the kitchen, methane was measured by all five fuel gas detectors, irrespective of their location in this tri-level story home.

The maximum methane concentration reached in the kitchen (four feet from the source) was 1% LEL. Once the gas dispersed, the concentration stabilized at 0.4% LEL in the kitchen while a methane concentration of 0.08 %LEL was measured at the most distance detector located in the upstairs exercise room. Scaling all advanced fuel gas detector measurements by a factor of 25 times, the maximum concentration seen in the kitchen would be ~10% LEL while the corresponding maximum concentrations in the family room, living room, and upstairs exercise room and upstairs hallway would be 7.5% LEL, 2.5%LEL, 2% LEL and, 1% LEL respectively. Thus when methane concentrations exceeded 10% LEL at distance of 4 ft from the source after scaling, methane concentrations as measured by all five advanced fuel gas detectors at other locations in the home would have met or exceed an alarm concentration threshold of 1% LEL.

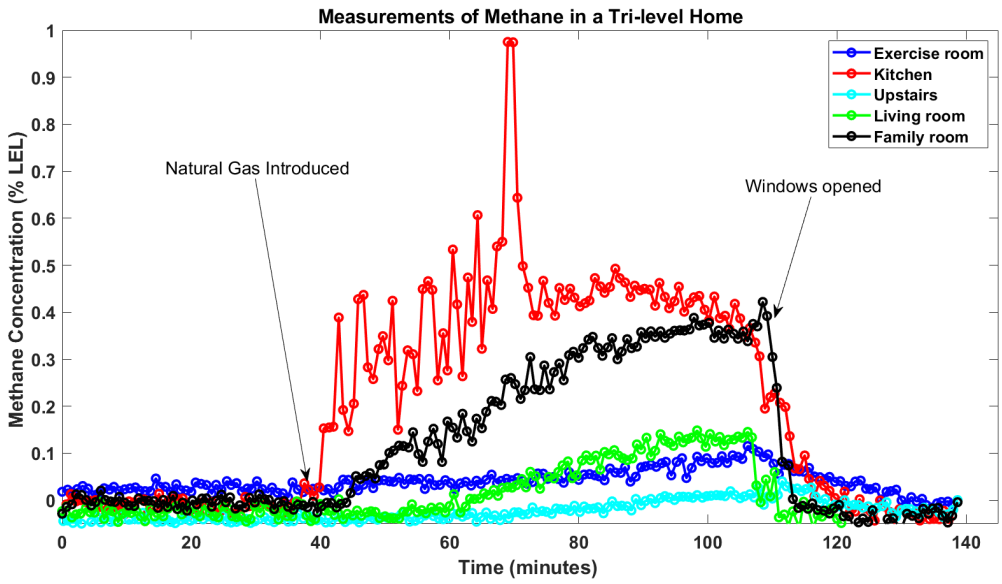


Figure 4: An example of natural gas propagation from a source in a large tri-level home.

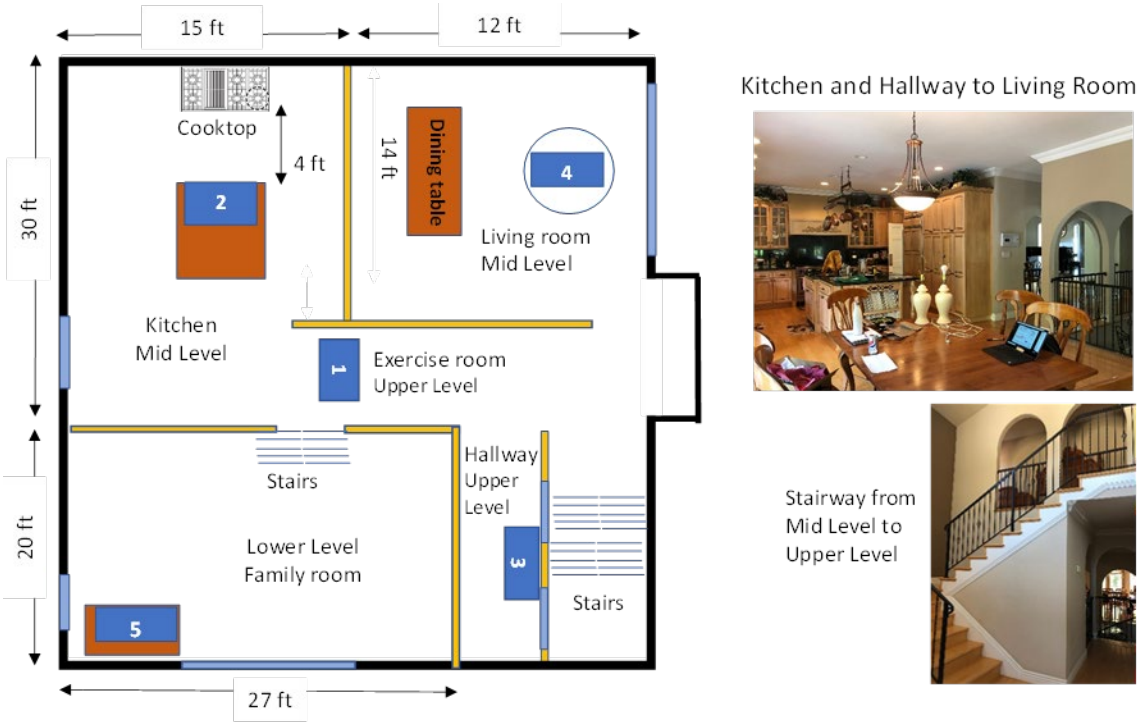


Figure 5: A layout of the tri-level home and a photo of the kitchen and a photo of the stairway between the mid- and upper-levels.

A.5.8.5.3.1.2(3)

Advanced fuel gas detectors take advantage of the transport mechanisms and dilution of supply and return registers (and doorway openings). The advanced fuel gas detector low alarm threshold overcomes the dilution effects thereby enabling their location directly in the airstream of supply and return registers or directly above doorway openings while meeting the requirement to detect a natural gas leak before certain hazardous conditions arise.
Methane measurements in a single-story home with the windows closed and the HVAC operational are shown in figure 6. Natural gas was released from a stove in the kitchen. If we scale these measurements by a factor of 10 times the peak methane results would be 10% LEL, 2.5% LEL, 1.5% LEL and 1.0% LEL, in the kitchen, dining room, den and bedroom, respectively. Although the measurements were not made exactly at supply and return registers, concentration levels of methane indicate that natural gas released in the kitchen permeated the entire home. After scaling, projections are that gas levels would be at or above the advanced gas detector alarm threshold of 1% LEL throughout the home. Therefore, gas at return registers and ducts of the HVAC system as well as doorways should be at similar levels and meet the advanced gas detector alarm threshold of 1% LEL.
For supply registers it is less clear. This is because the air supply in an HVAC can sometimes be partially diluted by outside air. If this is the case, advanced fuel gas detectors located at supply registers may or may not meet the advanced fuel gas detector alarm threshold of 1% LEL at all supply registers.

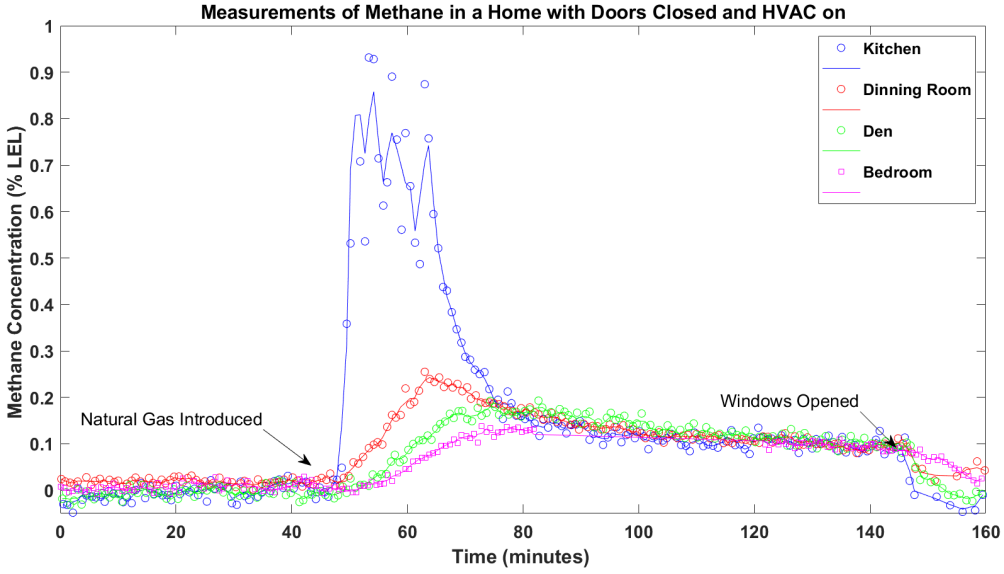


Figure 6: Methane measurements in a single story home with the windows closed and the HVAC on.

Public Comment No. 22-NFPA 715-2021 [Section No. 9.4.1.1]

9.4.1.1*

Fuel gas alarms or detectors shall be installed 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~~ propane leaks from outside the occupancy.

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

(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.

(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

Statement of Problem and Substantiation for Public Comment

I have not seen actual loss data that documents that the following scenarios create a credible problem:
1. Lighter than air natural gas leaks from outside a building will enter the basement through cracks or openings and achieve ignitable concentrations within the basement. And if it does, will the detection be required near the basement ceiling or floor?
2. A gas leak from the exterior of a garage will enter and accumulate in the garage and achieve an ignitable concentration within the garage.
Theoretically these situations could present a concern, but the coat-benefits of requiring this detection needs to be considered.

Related Item

• First Revision No. 22

Submitter Information Verification

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Submittal Date: Fri May 07 11:08:50 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-16-NFPA 715-2021

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.

Public Comment No. 38-NFPA 715-2021 [Section No. 9.4.1.1]

9.4.1.1*

Fuel gas alarms or detectors shall be installed as follows:

(1) *Where practical, 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 each permanently installed fuel-gas-burning appliance or group of appliances in the same area .

(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.~~

* ~~Alarms or detectors shall~~

(3) The following installations do not require an alarm or detector;

(4) outdoor appliances in close proximity to the house such as power generator or cooking station

(5) ancillary buildings not occupied such as pool cabanas or maintenance sheds

(6) appliances contained within a chase or enclosure vented to the outdoors

(7) *When the gas service penetrates the foundation below grade, a single alarm or detector shall be installed in the basement or other subgrade room near the point of entry .

(8) *A single alarm or detector shall be installed in attached garages where the fuel gas point of delivery ~~point~~ is within ~~a garage or is adjacent to an exterior garage wall.~~ the garage

(9)* 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 or group of bedrooms .

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

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

(12) Multiple alarms are not required in areas where two or more of the above listed requirements are present

Statement of Problem and Substantiation for Public Comment

Modify detector and alarm locations to reflect requirements of the 3 fuel gas codes and traditional gas appliance installations.

Related Item

• none available

Submitter Information Verification

Submitter Full Name: Robert Torbin
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State:
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Submittal Date: Mon May 10 15:27:55 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-16-NFPA 715-2021
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.

Public Comment No. 49-NFPA 715-2021 [Section No. 9.4.1.1]

9.4.1.1*

Fuel gas alarms or detectors shall be installed 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~~ in the same room, as close as practicable to permanently installed installed fuel-gas-burning appliances or piping connections .

(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.

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

(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.

(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

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon and Fire Risk Alliance Studies

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 17:54:56 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-16-NFPA 715-2021

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.

Public Comment No. 26-NFPA 715-2021 [New Section after 9.4.1.2]

Advanced Gas Fuel Detector

9.4.1.2.2*

Each advanced fuel gas alarm or advanced fuel gas detector shall be located on the wall, ceiling, or other location as specified in the manufacturer's published instructions as follows:

(1)* Advanced fuel gas detectors or advanced fuel gas alarms need to only be installed in accordance with the manufacturer's published instructions for height from the ceiling.

(2)* Combination advanced fuel gas/carbon monoxide 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 advanced fuel gases alarm or detector's installation instructions.

Additional Proposed Changes

File Name	Description	Approved
210507_Advanced_Fuel_Gas_Detector_Ceiling_height_Explanatory_Materials.pdf	Advanced Fuel Gas Detector Ceiling Height Explanatory Materials that could be included in Annex A	

Statement of Problem and Substantiation for Public Comment

The advanced fuel gas detector is defined as a sensor that responds to fuel gas at concentration levels at or below the one percent of the Lower Explosion Limit that is connected to an alarm control unit whose alarm threshold can be set at or below the one percent of the Lower Explosion Limit. The alarm threshold of advanced fuel gas detectors is, at least, an order of magnitude less than the 10% LEL alarm threshold specified for fuel gas detectors. This lower alarm threshold enables advanced fuel gas detectors to take advantage of gas dispersion properties in a structure such that advanced fuel gas detectors can be installed at locations much further from fuel-gas-burning appliances then those specified for fuel gas detectors and yet still meet the requirement to detect a natural gas leak before certain hazardous conditions arise. The benefit of the advanced fuel gas detector is that the device's installation location requirements is expanded beyond those demanded by fuel gas detectors enabling greater installation flexibility. In addition, including advanced gas detector installation location requirements enables the immediate adoption of these products into the market place without having to go through the "Performance-Based-Design" review process.

Related Item

• FR [3.3.17], [5.8.5.3.1], [9.4.1.1], [9.4.1.2]

Submitter Information Verification

Submitter Full Name: Eric Crosson
Organization: Sparrow Detect
Street Address:

City:
State:
Zip:
Submittal Date: Fri May 07 11:31:13 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: This comment is not being accepted for the following reasons: 1. No data was provided to show that detection at 1% LEL would not generate nuisance alarms due to low levels of fuel gases near fuel burning appliance that are operating normally, such as in proximity to a gas cooktop with a spark ignitor. 2. The standard currently does not preclude detection below 10 % LEL, despite the lack of nuisance alarm data. However no data was provided to show that the advanced fuel gas detectors can be listed as required by this standard. You may wish to work with the UL STP that develops fuel gas detector standards to see if this technology can be recognized. 3. The proposed wording in 9.4.1.2.2 (1) indicates that these detectors “need only be installed” per specific requirements, which does not fit in with how the overall standard is structured. 4. No annex material was provided that corresponded with the (*) notes.

Public Comment No. 50-NFPA 715-2021 [Section No. 9.4.1.2]

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 as close to the ceiling as practicable with the top of the alarm or detector within 12 in. (305 mm) of the ceiling.

(2) * For propane, the entire gas alarm or detector shall be installed as close to the floor as practicable on the wall within ~~18 in~~ 12 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 fuel gases alarm or detector's installation instructions.

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon and Fire Risk Alliance Studies

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 18:00:51 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The reference to adding a detector as close to the ceiling or floor as practicable is very subjective, and is included as an annex note. There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 12 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 12 inches of the floor. It is recognized that detectors closer to the floor or ceiling will generate an alarm signal sooner than those further away. Current annex language

encourages installers to install these detectors as close as practicable to the floor or ceiling.

Public Comment No. 62-NFPA 715-2021 [Section No. 9.4.1.2]

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, 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 ~~fuel gases~~ combination alarm or detector's installation instructions.

Statement of Problem and Substantiation for Public Comment

Deferring to the requirements for fuel gas detectors may not be the most appropriate solution. Has there been information presented that indicates the frequency of gas leaks exceeds the frequency of carbon monoxide incidents? Will deferring to the fuel gas provisions (especially in buildings using propane), may severely hinder the ability of a combination detector to detect carbon monoxide. There may be an optimum height or location at which to locate the combination detector and determining that location should be the purview of the detector manufacturer.

Related Item

• FR No. 23

Submitter Information Verification

Submitter Full Name: Bruce Swiecicki
Organization: National Propane Gas Associati
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 15:21:36 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-15-NFPA 715-2021
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.

Public Comment No. 7-NFPA 715-2021 [Section No. 9.4.1.2]

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, the entire gas alarm or detector shall be installed on the wall within ~~18~~ 6 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 fuel gases alarm or detector's installation instructions.

Statement of Problem and Substantiation for Public Comment

TG4 discussions regarding the propane detector distance from the floor resulted in a concern that the 18 inch distance, which was determined based on typical electrical outlet height off the floor, per the Gexcon report would result in a significant amount of non detects. As such this PI is being submitted for full TC contemplation of a lower height for propane detectors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 12-NFPA 715-2021 [Section No. A.9.4.1.2(2)]	

Related Item

- FR-23

Submitter Information Verification

Submitter Full Name: Rick Trieste
Organization: Consolidated Edison Company of
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 13 10:30:51 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 6 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 6 inches of the floor. It is recognized that detectors closer to the floor will generate an alarm signal sooner than those higher up on the wall. Current

annex language encourages installers to install these detectors as close as practicable to the floor.

Public Comment No. 14-NFPA 715-2021 [Section No. 9.6.1.2]

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

9.6.1.2* Alarm Threshold.

9.6.1.2.1*

Fuel gas alarms and detectors shall be designed to alarm at a concentration at or below 10 percent LEL.

9.6.1.2.2

Fuel gas detectors that are part of a household gas detection system shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors*.

9.6.1.2.3

Fuel gas alarms shall be listed in accordance with UL 1484, *Residential Gas Detectors*.

9.6.1.2.4

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

Statement of Problem and Substantiation for Public Comment

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

Related Item

• Supports provision 9.6.1.2

Submitter Information Verification

Submitter Full Name: charles rayot
Organization: Ameren Illinois
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 11:48:17 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-70-NFPA 715-2021
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.

Public Comment No. 18-NFPA 715-2021 [Section No. 9.6.1.2]

9.6.1.2* Alarm Threshold. Avangrid Supports the alarm limits of 10% lel on residential fuel gas alarm detectors. The lower alarm threshold provides early warnings to customers for increased safety and provides first responders increase time to address fuel gas concentrations to save life and property.

9.6.1.2.1*

Fuel gas alarms and detectors shall be designed to alarm at a concentration at or below 10 percent LEL.

9.6.1.2.2

Fuel gas detectors that are part of a household gas detection system shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors*.

9.6.1.2.3

Fuel gas alarms shall be listed in accordance with UL 1484, *Residential Gas Detectors*.

9.6.1.2.4

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

Statement of Problem and Substantiation for Public Comment

Support change in LEL level to 10%

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 16-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 19-NFPA 715-2021 [Section No. A.9.6.1.2]	

Related Item

- LEL

Submitter Information Verification

Submitter Full Name: Carrie Berard
Organization: NYSEG
Affiliation: NYSEG RGE (Avangrid)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 14:15:11 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-70-NFPA 715-2021

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.

Public Comment No. 34-NFPA 715-2021 [Section No. 9.6.1.2]

9.6.1.2* Alarm Threshold.

Through December 31, 2025, fuel gas detectors shall be designed to alarm at a maximum concentration threshold no higher than 25 percent LEL for the methane and propane and LEL concentrations presented in Table B.1. Fuel gas detectors may be designed to alarm at a lower maximum concentration threshold. Maximum concentration threshold shall be marked on detectors, product packaging, and installation instructions.

9.6.1.2.1*

~~Fuel gas alarms and~~

After December 31, 2025, fuel gas detectors shall be designed to alarm at a

~~concentration at or below~~

maximum concentration threshold no higher than 10 percent LEL for methane and propane and the LEL concentrations presented in Table B . 1. Maximum concentration threshold shall be marked on detectors, product packaging, and installation instructions.

9.6.1.2.~~2~~ – 2 Maximum detection thresholds shall be used to calculate upper detection thresholds (*U*) for detectors according to UL 1484, *Residential Gas Detectors,* Fifth Edition, Section 49.1.10 where *U* represents the detection threshold after the detector has been subjected to condition tests in Sections 49.2.1 through 49.17.6 of that standard, *K* represents the maximum concentration thresholds complying with Section 9.6.1.2 or 9.6.1.2.1 of this standard, and *I* represents the initial detection threshold of the detector prior to the conditioning tests.

9.6.1.2.3 _ Fuel gas detectors that are part of a household gas detection system shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors* .

9.6.1.2.

~~3~~

4 _

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

~~9.6.1.2.~~

~~4~~

~~5 Fuel gas alarms and detectors shall be marked in accordance with their listing.~~

Statement of Problem and Substantiation for Public Comment

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, Residential Gas Detectors currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in Section 9.6.1.2.1 and that has been proposed to UL 1484. Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 9.6.1.2.1 compliant maximum threshold products becoming widely available.

The minimum detection threshold transition from 25% to 10% LEL is supported by the August 2020 Gexcon US Inc. report “Combustible Gas Dispersion in Residential Occupancies & Detector Location Analysis”, sponsored by the NFPA Fire Protection Research Foundation. 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). Further, a Fire & Risk Alliance LLC 2018 study “Natural Gas Dispersion Testing” for the gas industry determined that a 10% alarm threshold could identify a gas concentration ~11 minutes sooner than a 25% alarm threshold. Given first responders such as jurisdictional Fire Departments can respond in about 5 minutes, a lower alarm threshold will alert a gas concentration sooner which will reduce the risk of a gas explosion through early detection.

Industry experience has shown that a 10% LEL alarm threshold will not generally result in the generation of false/nuisance alarms.

Related Item

• A9.6.1.2 • A9.6.1.2.1

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 14:50:33 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-70-NFPA 715-2021

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.

Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]

9.6.1.2* Alarm Threshold.

9.6.1.2.1*

Fuel gas alarms and detectors shall be designed to alarm at a concentration at or below 10 percent LEL.

9.6.1.2.2

Fuel gas detectors that are part of a household gas detection system shall be listed in accordance with UL 2075, *Gas and Vapor Detectors and Sensors*.

9.6.1.2.3

Fuel gas alarms shall be listed in accordance with UL 1484, *Residential Gas Detectors*.

9.6.1.2.4

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

Statement of Problem and Substantiation for Public Comment

Southwest Gas Corporation supports the reduction of the alarm threshold from 25% LEL to 10% LEL, but only after the UL 1484 standard is revised to require a threshold from 25% LEL to 10%LEL. We agree with the Technical Committee's statement that "early detection from a lower alarm threshold [] provides a significant opportunity to alert consumers sooner than a higher alarm threshold which provides first responders more time to address a fuel gas concentration prior to the formation of a hazardous gas build-up." Further, we believe this revision will incentivize manufacturers to develop consumer-grade fuel detection and warning equipment that can reliably activate at 10% LEL. The current text of NFPA 715 makes reference to the 2016 edition of the UL 1484 standard and we believe that NFPA 715 should not introduce an alarm threshold that conflicts with the refenced UL standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	

Related Item

- FR-9-NFPA 715-2020

Submitter Information Verification

Submitter Full Name: Craig Roecks
Organization: Southwest Gas Corporation
Affiliation: Southwest Gas Corporation
Street Address:
City:
State:
Zip:

Submittal Date: Tue May 11 12:16:49 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-70-NFPA 715-2021

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.

Public Comment No. 5-NFPA 715-2021 [Section No. A.1.1.2]

A.1.1.2

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

Additionally, see NFPA 1192 for equipment for use in recreational vehicles.

See UL 2075, *Gas and Vapor Detectors and Sensors*, and UL 1484, *Residential Gas Detectors*.

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

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

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

Statement of Problem and Substantiation for Public Comment

The Annex material seems to expand the stated scope in 1.1.2. The scope should clearly express the intent of the standard. Which the Annex seems to imply extends to equipment specified in the referenced UL standards and the facilities mentioned in the annex.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 3-NFPA 715-2021 [Section No. 1.1.2]	

Related Item

- 1.1.2

Submitter Information Verification

Submitter Full Name:	Glenn McGinley
Organization:	Ohio Bureau of Workers' Compensation, Division of Safety & Hygiene

Street Address:
City:
State:
Zip:
Submittal Date: Sun Mar 21 11:19:09 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The Technical Committee does not agree that the Annex material expands the scope. The purpose of the Annex is to provide more information on a specific topic. The Annex material is meant to be explanatory and not prescriptive like the main material. The Annex isn't the standard, it is information only.

Public Comment No. 11-NFPA 715-2021 [Section No. A.5.8.5.3.1(2)]

A.5.8.5.3.1(2)

For propane, detectors located on a wall should be located no more than ~~18~~ 6 in. (457 mm) from but as close as practicable to the floor in the same room as permanently installed fuel-gas-burning appliances.

Statement of Problem and Substantiation for Public Comment

TG4 discussions regarding the propane detector distance from the floor resulted in a concern that the 18 inch distance, which was determined based on typical electrical outlet height off the floor, per the Gexcon report would result in a significant amount of non-detects. As such this PI is being submitted for full TC contemplation of a lower height for propane detectors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 8-NFPA 715-2021 [Section No. 5.8.5.3.1]	FR-19

Related Item

- FR-19

Submitter Information Verification

Submitter Full Name: Rick Trieste
Organization: Consolidated Edison Company of
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 14 08:09:17 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 6 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 6 inches of the floor. It is recognized that detectors closer to the floor will generate an alarm signal sooner than those higher up on the wall. Current annex language encourages installers to install these detectors as close as practicable to the floor.

Public Comment No. 46-NFPA 715-2021 [Section No. A.5.8.5.3.1(2)]

A.5.8.5.3.1(2)

For propane, detectors located on a wall ~~should be located no more than 18 in. (457 mm~~ with the bottom of the detector no more than 12 in. (305 mm) from but as close as practicable to the floor in the same room as permanently installed fuel-gas-burning appliances.

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon Report and presentations.

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 17:38:59 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The reference to adding a detector as close to the ceiling or floor as practicable is very subjective, and is included as an annex note. There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 12 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 12 inches of the floor. It is recognized that detectors closer to the floor or ceiling will probably generate an alarm signal sooner than those further away. Current annex language encourages installers to install these detectors as close as practicable to the floor or ceiling. Removing the requirements for detectors to be installed more than 3 ft. from fuel gas burning appliances raises concerns about potential nuisance alarms from transient gas releases from spark ignitors and other sources associated with normal operation of the fuel burning appliance.

Public Comment No. 47-NFPA 715-2021 [Section No. A.5.8.5.3.1(3)]

A.5.8.5.3.1(3)

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

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon and Fire Risk Alliance Studies

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 17:42:51 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: The reference to adding a detector as close to the ceiling or floor as practicable is very subjective, and is included as an annex note. There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 12 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 12 inches of the floor. It is recognized that detectors closer to the floor or ceiling will probably generate an alarm signal sooner than those further away. Current annex language encourages installers to install these detectors as close as practicable to the floor or ceiling. Removing the requirements for detectors to be installed more than 3 ft. from fuel gas burning appliances raises concerns about potential nuisance alarms from transient gas releases from spark ignitors and other sources associated with normal operation of the fuel burning appliance.

Public Comment No. 43-NFPA 715-2021 [New Section after A.5.8.5.3.3]

A5.8.5.3.3 Fuel Gas Detector Threshold

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, *Residential Gas Detectors* currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in Section 9.6.1.2.2 and that has been proposed to UL 1484 . Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 5.8.5.3.3.1 compliant maximum threshold products becoming widely available.

Statement of Problem and Substantiation for Public Comment

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, Residential Gas Detectors currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in Section 5.8.5.3.3.1 and that has been proposed to UL 1484. Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 5.8.5.3.3.1 compliant maximum threshold products becoming widely available.

The minimum detection threshold transition from 25% to 10% LEL is supported by the August 2020 Gexcon US Inc. report “Combustible Gas Dispersion in Residential Occupancies & Detector Location Analysis”, sponsored by the NFPA Fire Protection Research Foundation. 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). Further, a Fire & Risk Alliance LLC 2018 study “Natural Gas Dispersion Testing” for the gas industry determined that a 10% alarm threshold could identify a gas concentration ~11 minutes sooner than a 25% alarm threshold. Given first responders such as jurisdictional Fire Departments can respond in about 5 minutes, a lower alarm threshold will alert a gas concentration sooner which will reduce the risk of a gas explosion through early detection.

Industry experience has shown that a 10% LEL alarm threshold will not generally result in the generation of false/nuisance alarms.

Related Item

- A9.6.1.2

Submitter Information Verification

Submitter Full Name: Robert Wilson

Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 16:39:58 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 13-NFPA 715-2021 [Section No. A.5.8.5.3.3]

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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.

Statement of Problem and Substantiation for Public Comment

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

Related Item

• Supports Annex A.5.8.5.3.3

Submitter Information Verification

Submitter Full Name: charles rayot
Organization: Ameren Illinois
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 11:34:10 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 17-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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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. .Avangrid Supports the alarm limits of 10% lel on residential fuel gas alarm detectors. The lower alarm threshold provides early warnings to customers for increased safety and provides first responders increase time to address fuel gas concentrations to save life and property.

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.

Statement of Problem and Substantiation for Public Comment

Avangrid supports the 10% LEL

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 16-NFPA 715-2021 [Section No. 5.8.5.3.3]	LEL

Related Item

• LEL

Submitter Information Verification

Submitter Full Name: Carrie Berard
Organization: NYSEG
Affiliation: NYSEG and RGE (Avangrid)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 14:01:20 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 29-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:~~

(1) ~~Gas composition and quality~~

(2) ~~Presence and interaction of naturally occurring mercaptans and other odorants~~

(3) ~~Soil penetration capability~~

(4) ~~Odor impact ("gassy odor")~~

(5) ~~Odorization injection equipment~~

(6) ~~Freeze point~~

(7) ~~Water solubility~~

(8) ~~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:~~

(1) ~~Most common component in odorant blends today~~

(2) ~~Low odor threshold (approximately 0.5 parts per billion)~~

(3) ~~Most resistant mercaptan to oxidation~~

(4) ~~Superior soil penetrability~~

(5) ~~"Gassy odor" most recognized with pipeline natural gas~~

(6) ~~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.~~

Statement of Problem and Substantiation for Public Comment

TG3 proposes to remove this annex material. The original purpose/intent was to help NFPA 715 users understand current industry practices of odorization as a primary means of recognizing a potential fuel gas leak and the relative differences between olfactory response and alarm thresholds. The Task Group proposes to remove this Annex section in addition to Annex 9.6.1.2 and incorporate a more focused discussion into Annex B "Dangers and Properties of Fuel Gases" as B2 - Gas Odorants as Fuel Gas Leak Warning Agents. The proposed combined, streamlined, more focused explanatory section in Annex B will enhance the readers understanding of gas odorization / olfactory response while referencing the AGA Odorization Manual for additional technical details regarding the chemical properties of gas odorants. Enhancements also include improved discussions of LPG (propane) fuel gas odorization / olfactory response thresholds.

Related Item

• A9.6.1.2

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Affiliation: TG3
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 11:55:51 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-21-NFPA 715-2021

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.

Public Comment No. 55-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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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.

Statement of Problem and Substantiation for Public Comment

Southwest Gas Corporation supports the reduction of the alarm threshold from 25% LEL to 10% LEL, but only after the UL 1484 standard is revised to require a threshold from 25% LEL to 10%LEL. We agree with the Technical Committee's statement that "early detection from a lower alarm threshold [] provides a significant opportunity to alert consumers sooner than a higher alarm threshold which provides first responders more time to address a fuel gas concentration prior to the formation of a hazardous gas build-up." Further, we believe this revision will incentivize manufacturers to develop consumer-grade fuel detection and warning equipment that can reliably activate at 10% LEL. The current text of NFPA 715 makes reference to the 2016 edition of the UL 1484 standard and we believe that NFPA 715 should not introduce an alarm threshold that conflicts with the refenced UL standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	
Public Comment No. 57-NFPA 715-2021 [Section No. A.9.6.1.2]	

Related Item

- FR-9-NFPA 715-2020

Submitter Information Verification

Submitter Full Name: Craig Roecks
Organization: Southwest Gas Corporation
Affiliation: Southwest Gas Corporation
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 12:11:56 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 44-NFPA 715-2021 [Section No. A.5.8.5.3.3.1]

A.5.8.5.3.3.~~1~~ — 3

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

Statement of Problem and Substantiation for Public Comment

Renumbered section due to PI associated with 5.8.5.3.3

Related Item

• A5.8.5.3.3

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 16:53:12 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected
Resolution: The annex section does not need to be renumbered as a change to the body was not accepted.

Public Comment No. 61-NFPA 715-2021 [Section No. A.5.8.5.3.6]

~~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.~~

Statement of Problem and Substantiation for Public Comment

This annex note is not needed if the base requirement is revised to reference 4.11.1.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
Public Comment No. 60-NFPA 715-2021 [Section No. 5.8.5.3.6]	
Public Comment No. 27-NFPA 715-2021 [Section No. 4.11.1]	
Public Comment No. 53-NFPA 715-2021 [Section No. 4.3.1]	
Public Comment No. 58-NFPA 715-2021 [New Section after 4.5.3.4]	
Public Comment No. 60-NFPA 715-2021 [Section No. 5.8.5.3.6]	

Related Item

• First Revision No. 37

Submitter Information Verification

Submitter Full Name: Howard Hopper
Organization: UL LLC
Street Address:
City:
State:
Zip:
Submittal Date: Tue May 11 15:14:06 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-68-NFPA 715-2021
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.

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

A.9.4.1.1(1)

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

Statement of Problem and Substantiation for Public Comment

Data from both the Fire Risk Alliance LLC 2018 Study "Natural Gas Dispersion in Residential Occupancies & Detector Location Analysis" as well as the NFPA Foundation sponsored study conducted by Gexcon suggests that the proximity for natural gas detectors as close to the ceiling as practicable and for propane, as close to the floor as possible can maximize protection of premises and occupants. The studies further supported little or no significant impacts resulting in false positive responses due to typical delayed ignition of appliances. Overall, the studies supported placement of detectors within the same room and as close as practicable to fuel burning equipment / gas connections.

Related Item

• Gexcon and Fire Risk Alliance Studies

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 18:06:46 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-16-NFPA 715-2021
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.

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

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~~ fuel burining equipment, metering and pressure regulating equipment from within an attached garage or gas migrating from outside sources adjacent to the garage and piping and piping connections located within an attached garage supplying the home with fuel gas. Alarm or detector location and spacing should be based ~~on an engineering evaluation that~~ the liklihood of a release of fuel gas within the structure 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.

Statement of Problem and Substantiation for Public Comment

Proposed changes consider the practical nature and likelihood of a fuel gas release within an attached garage including use of fuel burning equipment within garage utility rooms, piping systems and connections from outside the garage, traveling through the garage and into a residence.

Related Item

• Practical experience of Utility Operators

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 18:09:26 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-16-NFPA 715-2021
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.

Public Comment No. 12-NFPA 715-2021 [Section No. A.9.4.1.2(2)]

A.9.4.1.2(2)

For propane, alarms or detectors located on a wall should be no more than ~~18~~ 6 in. (457 mm) from but as close as practicable to the floor, in the same room as permanently installed fuel-gas-burning appliances.

Statement of Problem and Substantiation for Public Comment

TG4 discussions regarding the propane detector distance from the floor resulted in a concern that the 18 inch distance, which was determined based on typical electrical outlet height off the floor, per the Gexcon report would result in a significant amount of non-detects. As such this PI is being submitted for full TC contemplation of a lower height for propane detectors.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 7-NFPA 715-2021 [Section No. 9.4.1.2]	

Related Item

- FR-23

Submitter Information Verification

Submitter Full Name: Rick Trieste
Organization: Consolidated Edison Company of
Street Address:
City:
State:
Zip:
Submittal Date: Wed Apr 14 08:20:50 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: There are features in typical homes such as floor molding, or under cabinet kick plates that preclude ready installation within 6 inches of the floor. There is concern that vacuum cleaners, floor finishers, floor cleaning operations, dust and chemicals might adversely impact detectors located within 6 inches of the floor. It is recognized that detectors closer to the floor will generate an alarm signal sooner than those higher up on the wall. Current annex language encourages installers to install these detectors as close as practicable to the floor.

Public Comment No. 37-NFPA 715-2021 [New Section after A.9.6.1.2]

A9.6.1.2 Combustible Gas Detection Threshold Transition

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, *Residential Gas Detectors* currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in Section 9.6.1.2.1 and that has been proposed to UL 1484. Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 9.6.1.2.1 compliant maximum threshold products becoming widely available.

The minimum detection threshold transition from 25% to 10% LEL is supported by the August 2020 Gexcon US Inc. report "Combustible Gas Dispersion in Residential Occupancies & Detector Location Analysis", sponsored by the NFPA Fire Protection Research Foundation. 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). Further, a Fire & Risk Alliance LLC 2018 study "Natural Gas Dispersion Testing" for the gas industry determined that a 10% alarm threshold could identify a gas concentration ~11 minutes sooner than a 25% alarm threshold. Given first responders such as jurisdictional Fire Departments can respond in about 5 minutes, a lower alarm threshold will alert a gas concentration sooner which will reduce the risk of a gas explosion through early detection.

Industry experience has shown that a 10% LEL alarm threshold will not generally result in the generation of false/nuisance alarms.

Statement of Problem and Substantiation for Public Comment

The 25 percent LEL maximum concentration threshold aligns with UL 1484, Fifth Edition, Residential Gas Detectors currently in effect and with products listed to that standard currently available on the market. Expiration of the 25 percent threshold as of December 31, 2025 facilitates implementation of a lower maximum threshold outlined in outlined in Section 9.6.1.2.1 and that has been proposed to UL 1484. Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 9.6.1.2.1 compliant maximum threshold products becoming widely available.

Related Item

• 9.6.1.2

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Street Address:
City:
State:
Zip:

Submittal Date: Mon May 10 15:16:20 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 10-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:~~

(1) ~~Gas composition and quality~~

(2) ~~Presence and interaction of naturally occurring mercaptans and other odorants~~

(3) ~~Soil penetration capability~~

(4) ~~Odor impact ("gassy odor")~~

(5) ~~Odorization injection equipment~~

(6) ~~Freeze point~~

(7) ~~Water solubility~~

(8) ~~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:~~

(1) ~~Most common component in odorant blends today~~

(2) ~~Low odor threshold (approximately 0.5 parts per billion)~~

(3) ~~Most resistant mercaptan to oxidation~~

(4) ~~Superior soil penetrability~~

(5) ~~"Gassy odor" most recognized with pipeline natural gas~~

(6) ~~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~~ Transition to a 10 percent LEL maximum concentration threshold after the expiration of the 25 percent threshold meets the need for increased detector sensitivity for life safety and property protection while allowing for alignment with proposed changes to UL 1484 and continued use of combustible gas detectors approved to UL 1484, Fifth Edition prior to Section 9.6.1.2.2 compliant maximum threshold products becoming widely available.

The minimum detection threshold transition from 25% to 10% LEL is based on Annex D references: August 2020 Gexcon US Inc. report "Combustible Gas Dispersion in Residential Occupancies & Detector Location Analysis" and Fire & Risk Alliance LLC 2018 study "Natural Gas Dispersion Testing". The Gexcon 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~~
25 percent LEL). The Fire & Risk Alliance study determined that a 10 percent LEL alarm threshold could identify a gas concentration ~11 minutes sooner than a 25 percent LEL alarm threshold. Given first responders such as jurisdictional Fire Departments can respond in about 5 minutes, a lower alarm threshold will alert a gas concentration sooner which will reduce the risk of a gas explosion through early detection .

Statement of Problem and Substantiation for Public Comment

This PC is additional Annex language to be incorporated with the PC from TC member Ted Williams. That PC will propose reinstating the 25% LEL alarm threshold removed by the FR but now with a sunsetting provision after which a 10% LEL alarm threshold will be in place.

Related Item

• FR-10

Submitter Information Verification

Submitter Full Name: Rick Trieste
Organization: Consolidated Edison Company of
Street Address:
City:
State:
Zip:
Submittal Date: Tue Apr 13 12:42:27 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 15-NFPA 715-2021 [Section No. A.9.6.1.2]

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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.

Statement of Problem and Substantiation for Public Comment

COMMENT ONLY - Ameren Illinois supports a 10% LEL alarm which will serve our customers well by ensuring technology improves since an NFPA standard that requires 10% LEL alarm will precipitate a change in UL 1484 and will likely lead to product improvements in natural gas detection for residential methane detectors.

Related Item

• Supports Annex A9.6.1.2

Submitter Information Verification

Submitter Full Name: charles rayot
Organization: Ameren Illinois
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 11:50:24 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 19-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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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.Avangrid Supports the alarm limits of 10% lel on residential fuel gas alarm detectors. The lower alarm threshold provides early warnings to customers for increased safety and provides first responders increase time to address fuel gas concentrations to save life and property.

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.

Statement of Problem and Substantiation for Public Comment

Supporting change in LEL

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 18-NFPA 715-2021 [Section No. 9.6.1.2]	

Related Item

• LEL

Submitter Information Verification

Submitter Full Name: Carrie Berard
Organization: NYSEG
Affiliation: NYSEG RGE (Avangrid)
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 03 14:19:08 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 31-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:~~

(1) ~~Gas composition and quality~~

(2) ~~Presence and interaction of naturally occurring mercaptans and other odorants~~

(3) ~~Soil penetration capability~~

(4) ~~Odor impact ("gassy odor")~~

(5) ~~Odorization injection equipment~~

(6) ~~Freeze point~~

(7) ~~Water solubility~~

(8) ~~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:~~

(1) ~~Most common component in odorant blends today~~

(2) ~~Low odor threshold (approximately 0.5 parts per billion)~~

(3) ~~Most resistant mercaptan to oxidation~~

(4) ~~Superior soil penetrability~~

(5) ~~"Gassy odor" most recognized with pipeline natural gas~~

(6) ~~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.~~

Statement of Problem and Substantiation for Public Comment

TG3 proposes to remove this annex material. The original purpose/intent was to help NFPA 715 users understand current industry practices of odorization as a primary means of recognizing a potential fuel gas leak and the relative differences between olfactory response and alarm thresholds. The Task Group proposes to remove this Annex section in addition to Annex 5.8.5.3.3 and incorporate a more focused discussion into Annex B "Dangers and Properties of Fuel Gases" as B2 - Gas Odorants as Fuel Gas Leak Warning Agents. The proposed combined, streamlined, more focused explanatory section in Annex B will enhance the readers understanding of gas odorization / olfactory response while referencing the AGA Odorization Manual for additional technical details regarding the chemical properties of gas odorants. Enhancements also include improved discussions of LPG (propane) fuel gas odorization / olfactory response thresholds.

Related Item

- A5.8.5.3.3

Submitter Information Verification

Submitter Full Name: Robert Wilson
Organization: Northeast Gas Association
Affiliation: TG3
Street Address:
City:
State:
Zip:
Submittal Date: Mon May 10 12:19:53 EDT 2021
Committee: FWE-AAA

Committee Statement

Committee Action: Rejected but see related SR

Resolution: SR-20-NFPA 715-2021

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.

Public Comment No. 57-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:

(1) Gas composition and quality

(2) Presence and interaction of naturally occurring mercaptans and other odorants

(3) Soil penetration capability

(4) Odor impact (“gassy odor”)

(5) Odorization injection equipment

(6) Freeze point

(7) Water solubility

(8) 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:

(1) Most common component in odorant blends today

(2) Low odor threshold (approximately 0.5 parts per billion)

(3) Most resistant mercaptan to oxidation

(4) Superior soil penetrability

(5) “Gassy odor” most recognized with pipeline natural gas

(6) 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.

Statement of Problem and Substantiation for Public Comment

Southwest Gas Corporation supports the reduction of the alarm threshold from 25% LEL to 10% LEL, but only after the UL 1484 standard is revised to require a threshold from 25% LEL to 10%LEL. We agree with the Technical Committee's statement that "early detection from a lower alarm threshold [] provides a significant opportunity to alert consumers sooner than a higher alarm threshold which provides first responders more time to address a fuel gas concentration prior to the formation of a hazardous gas build-up." Further, we believe this revision will incentivize manufacturers to develop consumer-grade fuel detection and warning equipment that can reliably activate at 10% LEL. The current text of NFPA 715 makes reference to the 2016 edition of the UL 1484 standard and we believe that NFPA 715 should not introduce an alarm threshold that conflicts with the refenced UL standard.

Related Public Comments for This Document

Related Comment	Relationship
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	
Public Comment No. 54-NFPA 715-2021 [Section No. 5.8.5.3.3]	
Public Comment No. 55-NFPA 715-2021 [Section No. A.5.8.5.3.3]	
Public Comment No. 56-NFPA 715-2021 [Section No. 9.6.1.2]	

Related Item

- FR-9-NFPA 715-2020

Submitter Information Verification

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Committee: FWE-AAA

Committee Statement

Committee Action: Rejected

Resolution: 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.

Public Comment No. 32-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 ruleand 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:

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

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):

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

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

Fuel Gas*	LEL (% vol)	UEL (% vol)	Specific Gravity (@ STP)
Iso-butane	1.8	8.4	2.006
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.

B2 Gas Odorants as Fuel Gas Leak Warning Agents

The addition of odorants (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. Liquified petroleum fuel gas such as propane, 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, “Odorization of Gas,” 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% LEL (i.e.,for pipeline natural gas approximately 1 percent gas-in-air and for propane approximately 0.42 percent gas-in-air). Some state jurisdictional requirements are more conservative requiring a 10%LEL minimum detectable threshold and lower (for example, in MA, the detection threshold is 0.15% 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% LEL. For pipeline natural gas, while the regulatory requirement is that gas must be odorized such that a person with an average sense of smell can recognize the odor of gas at 20 percent LEL, practical industry odorant injection rates (for example a common gas odorant tertiary butyl mercaptan (TBM) is typically 0.5lbs/MMSCF (8g/10³m³)), results in olfactory detection thresholds typically less than 10 percent LEL. Similarly, for propane, t he amount of odorant injected (for example, ethyl mercaptan is between 1 - 1.5lbs/10,000 gallons) exceeds the amount of odorant needed to meet the minimum detection threshold of 0.42% 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%) 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 age, a medical condition (for example a common cold), 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.

Statement of Problem and Substantiation for Public Comment

TG3 proposes to remove Annex material in sections 5.8.5.3.3 and 9.6.1.2 and consolidate explanatory material related to fuel gas odorization detection thresholds to help NFPA 715 users understand current industry practices of odorization as a primary means of recognizing a potential fuel gas leak

and the relative differences between olfactory response and alarm thresholds. The Task Group proposes to add section B2 in lieu of 5.8.5.3.3 and 9.6.1.2 and incorporate a more focused discussion into Annex B "Dangers and Properties of Fuel Gases" as B2 - Gas Odorants as Fuel Gas Leak Warning Agents. The proposed combined, streamlined, more focused explanatory section in Annex B will enhance the readers understanding of gas odorization / olfactory response while referencing the AGA Odorization Manual for additional technical details regarding the chemical properties of gas odorants. Enhancements also include improved discussions of LPG (propane) fuel gas odorization / olfactory response thresholds.

Related Item

• A5.8.5.3.3 • A9.6.1.2

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Committee Statement

Committee Action: Rejected but see related SR
Resolution: SR-3-NFPA 715-2021
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.

Public Comment No. 64-NFPA 715-2021 [Section No. D.1.2.7]

D.1.2.7 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 revised 2017 .

Statement of Problem and Substantiation for Public Comment

Update revised standard

Related Public Comments for This Document

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

Related Item

• FR 43

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Committee Statement

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Resolution: SR-18-NFPA 715-2021
Statement: Reference upates.