

NFPA 72, Chapter 29 Nuisance Alarm Requirements

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Introduction:

Smoke alarms and detectors are designed to detect a fire in its early stages and alert people so they have time to safely escape the dwelling unit or building. The smoke detection industry has experienced substantial growth since the model codes began requiring the installation in one- and two-family dwellings in 1976. Since then, fire fatalities have decreased in all majority occupancy classifications. During the development of the 2010 and 2013 edition of NFPA 72, *National Fire Alarm and Signaling Code*®, the Technical Committee on Single- and Multiple-Station Alarms and Household Fire Alarm Systems (SIG-HOU) reviewed the available reports on the occurrence of nuisance alarms and concluded that the primary nuisance alarm source is cooking activities, accounting for about one-third of the nuisance sources.

The 2010 edition of NFPA 72 added new installation requirements that addressed how close smoke alarms/detectors could be located to stationary or fixed cooking appliances. For the 2013 Edition of NFPA 72, a provision was added to require smoke alarms/detectors to have a cooking-resistant listing when installed between 6 feet and 20 feet from a stationary or a fixed cooking appliance. At present there is no cooking-resistance test in ANSI/UL 217 or ANSI/UL 268; therefore, new performance test protocols need to be developed and added to the UL smoke detection product standards in order to meet the NFPA 72-2013 requirement.

Origin of Smoke Detection Requirements in Model Codes

The genesis of code requirements for smoke detection installation came from a 1968 Act (signed by President Johnson) to form a commission to assess the nation's fire problem and to find measures to reduce fire losses. In 1973, the commission delivered its report to President Nixon. The landmark report, *America Burning*, had 90 recommendations to reduce America's fire loss and also called for the formation of the U.S. Fire Administration (USFA). At that time, a hodgepodge of local, state, and federal agencies conducted research and issued regulations, but there was no single entity coordinating all these activities and local fire departments had no formal representation in the federal government.

The report also urged Americans to install smoke alarms in their homes and recognized the need to promulgate regulations for the installation of smoke alarms. The next major step occurred in 1976 when UL 217, *Single and Multiple Station Smoke Alarms*, was published. This was the first smoke detection product standard. NFPA 101, *The Life Safety Code*®, added requirements that same year for the installation of smoke alarms in one- and two-family dwellings. That was followed by the three regional code organizations requiring the installation of smoke alarms in one- and two-family dwellings in 1979. Since then, the number of U.S. homes with smoke alarms has increased from 22% in 1977 to 96% in 2004.

Importance of Smoke Detection

Numerous reports show that fire fatalities have decreased in all majority occupancy classifications. According to a 2011 NFPA report¹, home fatalities in the U.S. have decreased from 6,015 in 1978 to 2,644 in 2010: an overall reduction of 44% in 32 years. NFPA classifies homes as one- and two-family dwellings, manufactured homes, or multi-family housing. According to another NFPA² study, non-home fire fatalities have decreased from 640 in 1977 to 120 in 2011. A 2012 NFPA report³ concludes that fire fatalities in hotels and motels have declined from 62 in 1980 to 16 in 2010. During the same time period, the U.S. population increased by 97 million. Not all of the fatality reductions can be solely attributed to the use of smoke detection and fire alarm systems, but many researchers agree that smoke detection has contributed to the substantial reductions.

Concern with Nuisance Alarms

In 2007, the SIG-HOU Committee became concerned with the widespread use of manmade synthetic materials used in modern furnishings. In the mid 1970's, synthetic fabrics began replacing natural materials like cotton, wool, linen, and silk because they are easier to clean and more resistant to normal wear. Modern furniture utilizes polyurethane foam for padding and polyester or nylon for furniture coverings, carpet, and drapes. Armed with this information, the SIG-HOU Committee wanted to ascertain if current smoke detection technologies provide enough available safe egress time (ASET) for people during a fire. A Task Group was formed to determine the effectiveness of smoke detection used in dwellings for life safety and escape. The Task Group issued a report⁴ with the following observations:

- Nuisance alarms are the leading cause of occupants disabling their smoke alarms
- Disabled smoke alarms account for roughly 20% of the smoke alarms installed in U.S. homes, and that number may be higher in high-risk areas, such as inner cities and rural communities
- Cooking is the leading cause of nuisance alarms
- Ionization and photoelectric type detectors are both sensitive to cooking aerosols such as pan frying, baking, or sautéing.
- Ionization type alarms/detectors installed too close to a cooking appliance have a higher frequency of nuisance alarms than photoelectric type detectors
- A nuisance alarm does not mean the smoke detection device is not operating properly. Instead a nuisance alarm may be the activation of a properly functioning smoke detection device by incipient fire sources not imminently threatening to life or property such as cooking activities.
- Even though the smoke alarm is alarming to a non-hazardous source, it is actually detecting particles of combustion that may not be visible to the occupant.
- Most often the occupant perceives frequent nuisance alarms as inconvenient or annoying and they subsequently disconnect the power from the smoke alarm, leaving the residence unprotected.

The report provided two recommendations relating to nuisance alarm reduction:

1. Restrict the use of ionization smoke alarms/detectors within 25 feet of a fixed cooking appliance, unless listed for this application
2. Restrict the use of any smoke alarm or detector within a specified distance from cooking appliances

NFPA 72-2010 Nuisance Alarm Requirement

The SIG-HOU Committee added a new provision that addresses how close smoke alarms/detectors could be located to a stationary or fixed cooking appliance:

29.8.3.4(4) Smoke alarms and smoke detectors shall not be installed within an area of exclusion determined by a 10 ft (3.0 m) radial distance along a horizontal flow path from a stationary or fixed cooking appliance, unless listed for installation in close proximity to cooking appliances. Smoke alarms and smoke detectors installed between 10 ft (3.0 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be equipped with an alarm-silencing means or use photoelectric detection.

In many small living spaces, it may not be possible to place a smoke alarm/detector greater than 10 feet from a fixed cooking appliance. For example, section 29.5.1.1(2) requires smoke detection to be installed outside the bedroom. If the door to the bedroom is less than 10 feet from a fixed cooking appliance, then it is not possible to maintain the 10 foot area of exclusion required in section 29.8.3.4(4). For these applications, there is an exception to 29.8.3.4(4) permitting a photoelectric alarm to be installed up to 6 feet from a fixed cooking appliance:

Exception: Smoke alarms or smoke detectors that use photoelectric detection shall be permitted for installation at a radial distance greater than 6 ft (1.8 m) from any stationary or fixed cooking appliance when the following conditions are met:

- a) The kitchen or cooking area and adjacent spaces have no clear interior partitions or headers and*
- b) The 10 ft (3.0 m) area of exclusion would prohibit the placement of a smoke alarm or smoke detector required by other sections of this code.*

NFPA 72-2013 Nuisance Alarm Requirement

The Automatic Fire Alarm Association (AFAA) submitted a proposal to reduce nuisance alarms by requiring smoke alarms/detectors installed between 10 feet and 20 feet from a cooking appliance to be listed for the application. The SIG-HOU Committee added two new sections to Chapter 29:

29.8.3.4(5) Effective January 1, 2016, smoke alarms and smoke detectors used in household fire alarm systems installed between 6 ft (1.8 m) and 20 ft (6.1 m) along a horizontal flow path from a stationary or fixed cooking appliance shall be listed for resistance to common nuisance sources from cooking.

29.7.3 Effective January 1, 2019, smoke alarms and smoke detectors used in household fire alarm systems shall be listed for resistance to common nuisance sources.

At present, there is no cooking resistance test in ANSI/UL 217 or ANSI/UL 268. New performance test protocols need to be developed and added to the UL smoke detection product standards in order to meet 29.8.3.4(5). Due to the lack of technical data needed to develop repeatable performance tests, the January 1, 2016 effective date for a cooking-resistant listing is unachievable. During the First Draft meeting for the 2016 edition of NFPA 72, a Committee Input (CI) was approved to push out the effective date from January 1, 2016 to January 1, 2019.

It will require a minimum of five years to gather the technical data, develop the performance tests, and obtain approval from the UL 217 Standards technical Panel (STP), as well as to allow time for manufacturers to design, test, and list product. The breakdown for each task is as follows:

- One year of research to characterize common nuisance sources for the development of new performance test protocols
- Six months for the UL Task Group to prepare a proposal and send it to the STP
- Six months for the proposal to work its way through the UL STP process
- Minimum three years for manufacturers to design, test, and list product

Challenge Facing the Fire Protection Research Foundation (FPRF) Nuisance Alarm Project

In 2013, the FPRF established a project for the development of new test protocols in ANSI/UL 217 and ANSI/UL 268 to meet the NFPA 72-2013 cooking-resistant requirement. One of the project's biggest challenges is to collaborate with the UL Polyurethane Project to prevent unintended consequences that will reduce public life safety. The goal of the UL project is to address the transition from natural materials used in interior furnishings to synthetic manmade materials by adding polyurethane foam fire tests to the product standards. The FPRF and UL projects may produce opposite changes to the activation limits.

The UL Polyurethane Project may necessitate increasing smoke detection sensitivity. If this happens, it will make smoke alarms more prone to nuisance alarms and the FPRF Nuisance Alarm Project may result in reduced smoke detection sensitivity. If this happens, it will delay the alarm signal when a real fire occurs and reduce the available safe escape time (ASET) for the building occupants.

References

1. *Smoke Alarms in U.S. Home Fires, NFPA 2011*
2. NFPA [non-home structure fires](#)
3. *U.S. Hotel and Motel Structure Fires, NFPA Ben Evarts July 2012*
4. *Minimum performance requirements for Smoke Alarm Detection Technology, February 22, 2008*