

Utah Fire and Life

JUNE 2010

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Fire Prevention Week 2010



Fire Prevention Week • October 2010

Smoke Alarms:
A sound you can live with



“Smoke Alarms: A sound you can live with” is the theme of Fire Prevention Week 2010.

Many people who die in a fire do not wake up in time to escape for several reasons but not hav-

ing the right, working smoke alarm is the most common factor.

The alarm may be disabled due to neglect or to avoid nuisance alarms.

The alarm may not detect the smoldering synthetic fire.

The alarm may be too quiet to wake because it is on the other side of a closed door and/or on another floor.

The nearest alarm to the occupant may be too far from the fire to provide early notification.

The occupant may not wake due to their sleep patterns or hearing ability during sleep.

This newsletter will look at recent research concerning each of these points and includes standardized educational messaging for smoke alarms.

Fire Prevention Week is October 3 – 9, 2010. Fire Prevention Week is a program of the National Fire Protection Association. Find more at www.firepreventionweek.org or www.nfpa.org

Utah Fire and Life Safety Education Association Meeting

June 16, 2010

9:00 A.M.—12:00 P.M. Training

1:00 P.M.—2:00 P.M. Business Meeting

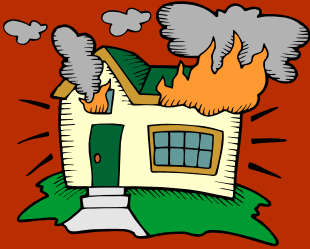
SLCC Miller Campus

Public Safety Education & Training Center

410 W 9800 S #207, Sandy

This is the building farthest southwest on the campus.

Faster, More Dangerous House Fires



Underwriters Laboratories and The Fire Protection Research Foundation, "Smoke Characterization Study" (Smoke Characterization Project) April 2007. Retrieved from <http://www.ul.com/global/eng/pages/corporate/newsroom/storyideas/smokecharacterization-study/>

The average time for a modern, synthetic-filled room to flash over is between three and four minutes.

Smoke particles, especially large ones from smoldering fires, join together over time making them heavier. This happens at a faster rate when the ceiling is cool,

such as a vaulted ceiling or during winter.

When the smoke particles collect, they become heavier and sink one to two feet from the ceiling where alarms are installed. Alarms often stop sounding when the air clears.

Is the Alarm You Installed Still Working?

"Randomized controlled trial of ionization and photoelectric smoke alarm functionality" B A Mueller, E A Sidman, H Alter, R Perkins and D C Grossman; *Injury Prevention* 2008; 14;80-86 Retrieved from: <http://injuryprevention.bmj.com/cgi/content/full/14/2/80>

During this trial, either a photoelectric or an ionization alarm was installed in low- to mid-level income households in King County, Washington.

Nine months and 15 months later the alarms were checked for functionality and how often they experienced nuisance alarms.

After nine months (and it stayed true after 15 months), 20% of ionization and 5% of photoelectric alarms were non-functional. The two most common reasons were a disconnected or an absent battery.

The most common reason for nuisance alarms were

cooking (93% in ionization and 74% in photoelectric), low batteries (5% in ionization and 22% in photoelectric), fire places (2% for both groups), and steam (1% ionization, 2% photoelectric). Other reasons for nuisance alarms were smoking, incense, candles, construction, and heat from lights.

There was no correlation between the difference in occupant characteristics (age, income, etc.) and the alarm being non-functional.

Can You Hear Your Alarm?

US Consumer Product Safety Commission: "The Audibility of Smoke Alarms in Residential Homes." Retrieved from <http://www.cpsc.gov/LIBRARY/FOIA/foia05/os/audibility.pdf>. Published 2005, September; revised 2007, January .

This study compared the sound loss from a smoke alarm in actual homes and the sound levels required to alert adults without hearing or other impairment.

Single station smoke alarms in

two- or three-level homes may not be sufficient to alert occupants in all areas of the home.

The complexity of the path that the sound must travel can reduce the alarm signal . Narrow hallways and turns reduce sound.

Closing a lightweight door reduces the signal between 10 to 20 dBA, leaving an alarm outside the sleeping area at 50 dBA in the closed room. This is the lowest level to awaken an unimpaired adult with no other ambient noise.

Each level of the home the sound travels reduces the signal about 20 dBA. It is unlikely someone sleeping on the second floor will hear an alarm in the basement.

A basement alarm would only be around 30 dBA in the second floor bedroom. This is as loud as a quiet whisper.

Multiple alarms and interconnected smoke alarms improve the chance an alarm will be heard compared to a single station smoke alarm.

Resource List

USFA Campaign – Install. Inspect. Protect. Smoke Alarms Save Lives
<http://www.usfa.dhs.gov/smokealarms>

NFPA Smoke Alarms – fact sheets, research, and videos
<http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Safety%20Information/For%20consumers/Fire%20&%20safety%20equipment/Smoke%20alarms>

Home Safety Council "My Safe Home" online home safety tour is a great source of home safety information
<http://www.mysafehome.net/>

Home Safety Council smoke alarm info http://homesafetycouncil.org/SafetyGuide/sg_alarms_w001.asp

Safe Kids USA <http://www.safekids.org/our-work/programs/fire-burn-prevention/>

Safe Kids Utah <http://www.safekidsutah.org/safety-tips/fire>

Utah Office of the State Fire Marshal <http://publicsafety.utah.gov/firemarshal/smokealarms.html>

All of these sources have information and further links about fire safety and alarms for people with disabilities.

What Type of Alarm is Best for Adults Who are Hard of Hearing?

“Optimizing Fire Alarm Notification for High Risk Groups Research Project: Waking effectiveness of alarms (auditory, visual and tactile) for adults who are hard of hearing”. D Bruck, I Thomas, The Fire Protection Research Foundation, June 2007. Retrieved from: <http://www.nfpa.org/assets/files//PDF/Research/hardofhearing&alarms.pdf>

Participants were adults with mild to moderately severe hearing loss. No adults who were deaf participated. The study tested 6 signals during the deeper part of sleep:

- 400 Hz square wave signal in T-3 pulse
- 520 Hz square wave signal in T-3 pulse
- 3100 Hz pure tone in T-3 pulse (most popular alarm tone)
- Bed shaker (under mattress) in T-3 pulse
- Pillow shaker in T-3 pulse
- Strobe light in T-3 pulse (modified)

The lower 520 Hz square wave T-3 wakened 92% of hard of hearing participants when at or below 75 dBA (many alarms are at or above 85 dBA) and 100% at 95 dBA. The 400 Hz was almost as good. The 3100 Hz awoke 56% at or below 75dBA.

In other studies, the 520 Hz alarm has also shown to be most effective in waking children, sober young adults, alcohol intoxicated young adults, older adults and people who are hard of hearing. These studies also

show that the 3100 Hz to be the least effective.

Bed and pillow shaker devices used alone woke 80 – 83% of the participants.

Those over 60 years of age were less likely to awaken to the bed (mattress) shaker than those under age 60. Age was not significant with any other signals.

Though not studied, there was tentative evidence that using both a pillow shaker and an audible alarm would perform better than only one signaling device.

Strobe lights alone were not effective with only 27% waking to the lowest strobe light intensity which is more intense than required by NFPA 72, 2002 (current code for this study).

Based on questionnaires, most of the participants underestimated their need for specialty smoke alarms. Add to this the fact that many people are not aware of their hearing loss.

With these facts in mind, the researchers suggest that standard audible smoke alarm for the general population be designed to use signals that will awaken most people who are hard of hearing.

*Smoke alarm manufacturers and NFPA 72 have moved in this direction..

Photoelectric Verses Ionization

“Performance of Home Smoke Alarms: Analysis of the Response of Several Available Technologies in Residential Fire Settings”, NIST Technical Note 1455-1. February 2008 Revision. Retrieved from <http://smokealarm.nist.gov/>.

This study looked at the time photoelectric, ionization, CO, and heat alarms provided for escape. They measured from the time the alarm sounded until any part of the main path of egress was untenable 5 feet above the floor.

This research demonstrated that adding interconnected smoke alarms in bedrooms increased the escape time for all types of fires, especially smoldering fires. This is most significant in manufactured homes.

Fire sprinklers responded well to flaming fires and smoldering fires

after transitioning to flames. They should be used in conjunction with smoke alarms.

Install alarms, especially ionization alarms, at least 25 feet from any cooking appliance to reduce nuisance alarms.

The study confirmed that ionization alarms provide earlier notification of a flaming fire and photoelectric alarms of smoldering fires.

However, the difference in times was more significant than commonly perceived. The impact on escape varies from fire to fire and home to home.

When a two-story home had interconnected alarms, most alarms provided adequate notification to escape all tested fire scenarios.

There were three main exceptions to note.

First, the egress was untenable 4 – 32 seconds

before a theoretical older adult couple with two young children in the home could escape when a flaming fire was detected by a photoelectric smoke alarm. The theoretical younger adult couple would have adequate time to escape.

Second, the egress was untenable 74 to 144 seconds before a theoretical younger adult couple with two young children could escape when a smoldering fire was detected by an ionization alarm. The older adult couple would need additional time to escape.

This means egress was most often untenable before the ionization alarm sounded.

Third, the ionization alarms did not sound during every smoldering fire test. This means that some theoretical occupants had no notification of the fire.



Educational Messages Advisory Committee on Smoke Alarms

1.0 Smoke alarms

1.1 Fire deaths – no smoke alarms or no working smoke alarms

1.1.1 Working smoke alarms save lives and should be installed and maintained in every home.

1.1.2 Roughly two-thirds of home fire deaths result from fires in homes with no smoke alarms at all or no smoke alarms that work.

1.2 Installation

1.2.1 As a minimum, install smoke alarms in every sleeping room, outside each separate sleeping area, and on every level of the home, including the basement. Larger homes may require additional smoke alarms to provide a minimum level of protection.

1.2.2 For the best protection, interconnect all smoke alarms throughout the home. When one sounds, they all sound.

1.2.3 Wireless battery-operated interconnected smoke alarms are now available.

1.2.4 An ionization smoke alarm is generally more responsive to flaming fires and a photoelectric smoke alarm is generally more responsive to smoldering fires. For the best protection or where extra time is needed to awaken or assist others, both types of alarms or combination ionization and photoelectric alarms are recommended.

1.2.5 Choose a smoke alarm that has the label of a recognized testing laboratory.

1.2.6 Smoke alarms should be installed away from the kitchen to prevent false alarms. Generally, they should not be closer than 10 feet to a cooking appliance.

1.2.7 A smoke alarm between 10 and 20 feet of a cooking appliance must have a hush feature, which temporarily reduces the sensitivity of the alarm, or be a photoelectric type.

EMAC on Smoke Alarms, cont.

1.3 Testing

1.3.1 Test smoke alarms at least once a month using the test button.

1.3.2 Make sure everyone in your home knows the sound of the smoke alarm.

1.4 Deaf

1.4.1 Smoke alarms are available for people who are deaf. These alarms use strobe lights to wake the person. Vibration equipment - pillow or bed shakers- is now required. This equipment is available and is activated by the sound of the smoke alarm.

1.5 Older Adults or hard of hearing

1.5.1 Recent research has shown that as people age, their ability to hear high-pitched sounds decreases. A smoke alarm accessory that has a low pitched sound is more effective for all age groups. This equipment is now required and is activated by the sound of the smoke alarm.

1.6 Voice alarms

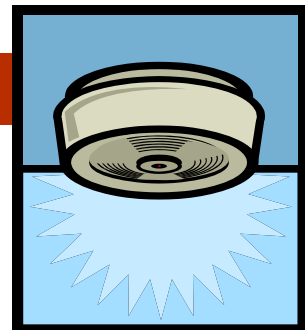
1.6.1 Smoke alarms that include a recordable voice announcement in addition to the usual alarm sound may be helpful in waking children with the use of a familiar voice.

1.7 Battery replacement

1.7.1 Smoke alarms with non-replaceable batteries are designed to remain effective for 10 years. If the alarm chirps, warning that the battery is low, replace the entire smoke alarm right away. For smoke alarms with any other type of battery, replace batteries at least once a year. If that alarm chirps, replace only the battery.

1.8 Smoke alarm replacement

1.8.1 Replace all smoke alarms when they are 10 years old or sooner if they do not respond properly when tested.





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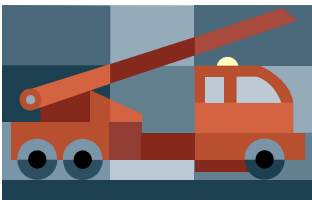
Our Mission is to identify, develop, and promote ways and means of protecting life and property from fire-related perils through direct action and coordination of Utah Fire Services.

Utah Fire and Life is an electronic newsletter dedicated to sharing information, resources, and news with the fire and life safety educators in Utah and our friends across the country.

The first electronic edition was published October 2008 as the *Utah Public Fire Educator*. Past editions can be downloaded at <http://publicsafety.utah.gov/firemarshal/newsletter.html>

The Utah Office of the State Fire Marshal provides this newsletter through their outreach efforts. Any comments and questions may be directed to Monica Colby at the contact information to the left.

Utah 2008 Fire Loss



Every **hour and 40 minutes** a fire department responded to a fire.

One vehicle fire was reported every **9 hours and 16 minutes**.

One outside fire was reported every **34 hours and 21 minutes**.



One structure fire was reported every **5 hours and 27 minutes**.



One civilian fire injury was reported every **5 days**.

One civilian fire death occurred every **61 days**.



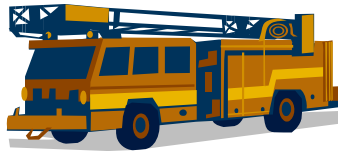


One-Stop Data Shop
 Fire Analysis and Research Division
 One Batterymarch Park, Quincy, MA 02169
 Email: osds@nfpa.org
 www.nfpa.org

2008 United States Fire Loss Clock



One vehicle fire was reported every **134 seconds**.



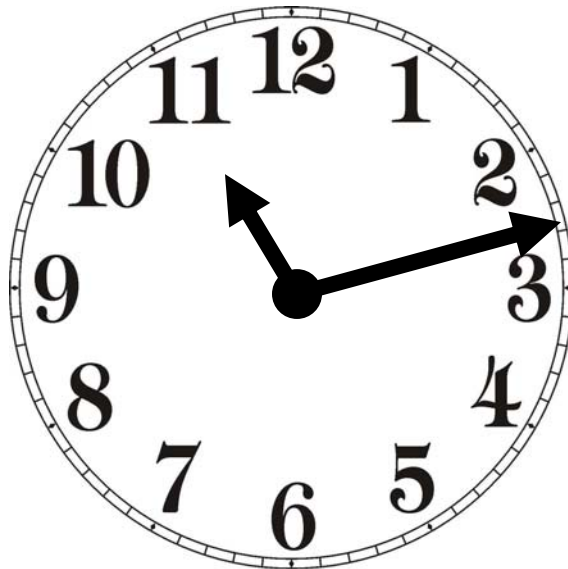
Every **22 seconds** a fire department responded to a fire.



One structure fire was reported every **61 seconds**.



One outside fire was reported every **45 seconds**.



One civilian fire injury was reported every **31 minutes**.



One home structure fire was reported every **82 seconds**.



One civilian fire death occurred every **2 hours and 38 minutes**.



Smoke Alarms in Reported U.S. Home Fires



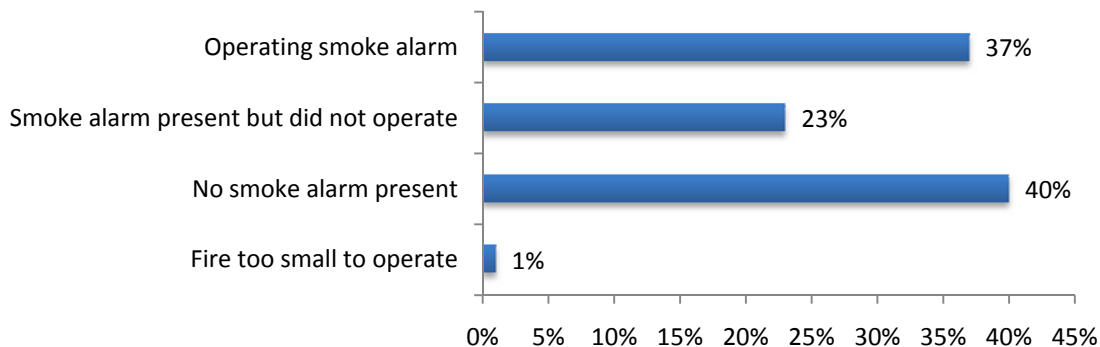
Ninety-six percent of all homes have at least one smoke alarm, according to a 2008 telephone survey. Overall, three-quarters of all U.S. homes have at least one *working* smoke alarm.

Smoke Alarm Presence and Performance

In 2003-2006, smoke alarms sounded in roughly half of the home fires reported to U.S. departments.

- Almost two-thirds of home fire deaths resulted from fires in homes with no smoke alarms or no working smoke alarms.
 - No smoke alarms were present in 40% of the home fire deaths.
 - In 23% of the home fire deaths, smoke alarms were present but did not sound.

Home Structure Fire Deaths by Smoke Alarm Performance 2003-2006



Interconnected smoke alarms on all floors increase safety

Interconnected smoke alarms were more likely to operate and alert occupants to a fire in a U.S. Consumer Product Safety Commission (CPSC) survey of households with any fires, including fires in which the fire department was not called.¹

- When on all floors, alarms sounded in 37% of fires and alerted occupants in 15%.
- When smoke alarms were not on all floors, they sounded in only 4% of the fires and alerted occupants in only 2%.
- In homes that had interconnected smoke alarms, the alarms sounded in half (53%) of the fires and alerted people in one-quarter (26%) of the fires.
 - People may learn about or be alerted to a fire without hearing a smoke alarm.

¹Michael A. Greene and Craig D. Andres, *2004-2005 Residential Fire Survey*, Presentation to the Public-Private Fire Safety Council, May 15, 2008.

Homes include one- and two-family dwellings, manufactured homes, apartments, townhouses, rowhouses, and condominiums.

Home Smoke Alarm Power Sources

- More than half of the smoke alarms found in reported fires and two-thirds of the alarms found in homes with fire deaths were powered by battery only.
- Hardwired smoke alarms tend to be interconnected so that if one sounds, all will sound.
- In fires considered large enough to activate the alarm,
 - Hardwired smoke alarms operated 91% of the time.
 - Battery-powered smoke alarms operated in 75%.

Little causal detail is required about certain categories of minor fires, identified by incident type and collectively called confined fires, by the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS). Confined fires were omitted from these calculations.

Reasons for Smoke Alarm Failure

In more than half of the reported home fires¹ in which the smoke alarms were present but did not operate, batteries were missing or disconnected. Nuisance alarms were the leading reason for disconnected smoke alarms.

- Roughly one of every five smoke alarm failures was due to dead batteries.
- Only 8% of the failures were due to hardwired power source problems, including disconnected smoke alarms, power outages and power shut-offs.

Reason Smoke Alarm Failed to Operate in Home Structure Fires 2003-2006

