

Smoke Alarms

Residential smoke alarms are under-appreciated by the general public for the life-saving devices they truly are. Recent statistics show a death rate twice as high in homes without a functioning smoke alarm as in home fires with such protection. Your chances of surviving a house fire are vastly improved when the residence is equipped with a complete working smoke alarm system. When you consider their value versus relatively low cost, smoke alarms are priceless.

Yet the average homeowner or tenant ignores their smoke detectors until there is a problem, which can be a fatal oversight. To be functional and reliable, smoke alarms require periodic testing and maintenance. Surprisingly, 20% of all homes with smoke alarms were surveyed to find that *none of them worked!*

Some residents disconnect or defeat their smoke detectors if they experience false alarms. Instead of doing this, they should learn how to make them work properly and keep them functional.

In addition to testing and maintenance, the quantity, type and location of detectors should also be reviewed over time.



If you don't have smoke alarms, or your alarms are not functioning, take action now to get the recommended detectors in place and working.

A note about terminology:

The terms "smoke detector" and "smoke alarm" are used interchangeably in this presentation. Technically, a smoke detector is a component of a smoke alarm system. However, for the vast majority of residential smoke alarm systems, the detector and the alarm are the same unit.

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Location of Alarms

Smoke alarms were first available commercially in 1969. As smoke alarm statistics have grown over time, their benefit has become more evident. In recent years building code requirements for smoke alarms has expanded. Many local codes in the US follow the guidelines of the National Fire Protection Association (NFPA). Consult the NFPA for the latest smoke detector recommendations:

<http://www.nfpa.org/>

The NFPA guidelines are a minimum; some states, counties and municipalities add even more requirements. Check with your local building code agency to determine how many smoke alarms are required and where they need to be placed. If your home is more than ten years old, it is wise to review the need to update your smoke alarm system.

New residential construction requires multiple alarms in specific locations, wired to house power with their alarms interconnected.

Older homes can be retrofit per the guidelines, but wiring is often expensive or challenging, so battery-powered units can be used here. Maximum protection is achieved with wired, interconnected alarms.

General guidelines are for smoke alarms in each bedroom, outside the bedroom and on each level of the dwelling. This means a typical two-story, four-bedroom home with a basement will have seven or eight smoke alarms.

Avoid installing alarms where there might be natural smoke (kitchen, garage, fireplace), steam (laundry, bathroom) or dust. The ambient temperature must also be within the alarm's operating range.

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Types of Alarms

As required by code for new construction, wired smoke alarms have two advantages. First, they are powered by 120V house wiring so that if the batteries are neglected, the alarms will still function as long as AC power is on. Second, most wired units communicate with each other so that if one alarm sounds, they all will. This is a wonderful feature for sound sleepers or for people with limited hearing.

Battery-powered alarms are useful in older homes where the residence was not pre-wired for smoke detectors. The disadvantage to these types is that they are wholly dependent on the battery and they do not communicate with other alarms (although special wireless types can be purchased to do this).

Avoid off-brand units; buy only name brand smoke alarms with UL or ETL certification from reputable retailers.

The preferred scheme is to have smoke alarms wired to house power with inter-communication. If you have an older home, consider having this done. If adding a lot of wiring just doesn't make sense or is too expensive, installing battery units is still better than having too few or none at all.

If you have a security system in your home, you can also add a smoke sensor (and heat sensor) to it for added protection. A real advantage to this is that the alarm system will automatically report a fire even when you are away from home.



Smoke Sensor Wired to Security Alarm

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Types of Sensors

As just discussed, there are two types of smoke alarms: wired and battery-powered. There are also two types of smoke sensors, and both have advantages.

The most common unit has an ionization-type sensor which responds to changes in electric charge caused by smoke particles. These tend to respond more quickly to flaming fires which produce small particles.

The alternative is a photoelectric sensor which senses smoke by diffraction of light beams. This detector has a superior response to larger smoke particles found in smoldering fires.

For maximum protection against both kinds of fire, you can choose an alarm which has both sensor types (called a dual or combination unit). These are more expensive but benefit from the advantages of both sensor technologies.

Additionally, sensor type is a consideration for the kitchen. Since photoelectric sensors are less sensitive to cooking products of combustion, they can be placed closer to the kitchen. To minimize nuisance alarms, ionization-type detectors should not be placed near the kitchen.

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Maintenance

Most residents are aware of the need to replace smoke alarm batteries periodically. However, there are other maintenance tasks which should be performed for all smoke alarms in the home. There is also the need for troubleshooting when an alarm misbehaves.

For maintenance and troubleshooting smoke alarms, the product manual is essential. If you don't have it already, find the manufacturer and model for your units and download the instruction manual from the manufacturer's website. Identification markings will always be visible somewhere on the unit, although you will probably have to open the battery door or remove the alarm from its mounting ring to find an ID label.

Links to the largest smoke alarm manufacturer's websites are on the last page of this presentation.

The manual gives all the information you need to install the unit, plus guides for battery replacement, testing, cleaning and operation, plus troubleshooting. Information about indicator lights is particularly helpful, since they can help diagnose problems.

Not all smoke alarms work the same way so it is important to get the manual for your specific units.

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Batteries

The general recommendation is to replace smoke alarm batteries once a year. They might last longer than this but it's a good conservative guideline.

Most all smoke alarms will signal with a brief chirp that the 9V battery is getting low. If you change your batteries annually, it's unlikely that you'll ever be awakened in the middle of a winter's night by a chirping smoke alarm for a low battery condition. Battery voltage is lower when cold and the coldest time in a house is usually in the wee hours in winter.

If you have a newer home with more than six alarm units, replacement can be a bit of trouble and cost. But you don't need the more expensive alkaline batteries for smoke alarms; cheaper heavy-duty 9V batteries work fine for these low-drain units.

If you are averse to replacing batteries, you can buy special 10-year life lithium batteries. While not cheap, you will never need to replace it over the life of the alarm.

You can also buy sealed smoke alarms with 10-year batteries built in. Again, these last the life of the unit.

Whatever unit you have, the manual gives instructions on how to replace the battery. It's usually fairly obvious how to do this. Typically a cover or door opens or a battery tray pivots out.



Typical Battery Replacement

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Cleaning

Dust or debris around the smoke detector causes two problems: First, dust particles can cause false alarms which are a nuisance. Worse, dust in the detector openings can obstruct real smoke particles in case of a fire, delaying or even preventing an alarm.

To minimize these situations, all smoke detectors should be gently cleaned with a soft brush attachment on a vacuum cleaner. This will dislodge and suck away any troublesome dust or debris from the sensor.

Cleaning should be done at least once every six months. More frequently is better, perhaps when the air filters are changed every month or two. You are likely to have the vacuum and dusting brush out for this maintenance task anyway.

If there is a ceiling fan located near any smoke sensors, the fan blades should also be cleaned. These tend to throw dust particles all around and a few end up at the detector, which may cause false alarms.

Regular cleaning should take care of most nuisance alarms, especially those that just go off for a few seconds once in a great while.

Vacuuming around the sensor is also a good technique for making a smoke alarm stop sensing when it has registered real smoke (once you have taken care of the smoke source, of course).



Cleaning the Smoke Alarm

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Testing

To ensure they are working and communicating, smoke detectors should be tested periodically. Manufacturers typically suggest weekly tests while the US Consumer Product Safety Commission and other agencies recommend monthly testing.

Basic alarm testing involves simply pushing the test button provided on every unit. The alarm should sound (ear plugs are recommended since you are within arm's reach) and all other alarms in the house should sound with it if they are interconnected.

While this testing is valuable, it does not verify the alarm's ability to actually detect smoke. Instead it checks the alarm's siren and communication capabilities.



Testing the Smoke Alarm

To really test smoke alarms, you should use a can of aerosol smoke tester which simulates smoke particles. These are hard to find locally but can be ordered from many sources on the internet. Search for aerosol smoke tester.

Other methods of live smoke testing are possible with caution. A smoldering cotton string is often suggested and is perhaps the next best method. However, using real smoke from any burning object is potentially hazardous and may leave residue. Use your own judgment here.



Testing the Smoke Sensor

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10 Year Life

Most people are unaware that smoke alarms have a ten year life span. The sensors and especially the electronics in the alarm become statistically unreliable after ten years. Even if an older alarm tests OK, it may fail the next day.

Every authority on fire safety recommends replacement after ten years, not just the manufacturers (who might be suspected of drumming up more business).

If you aren't sure how old yours are, there should be a manufacturer's date code somewhere on the unit. If it is discolored, crusty and cracked or just looks old, it probably is more than ten and should be replaced.

Replacement of 6 to 10 alarm units can be a real expense, so budget for it. Or you can replace one or two a month to spread out the cost. Start with the ones that cover a wider general area.

Replacement time is also a good opportunity to review the number, type and location of your alarms. You may want to make some changes or add features.



Old Unit Ready for Retirement

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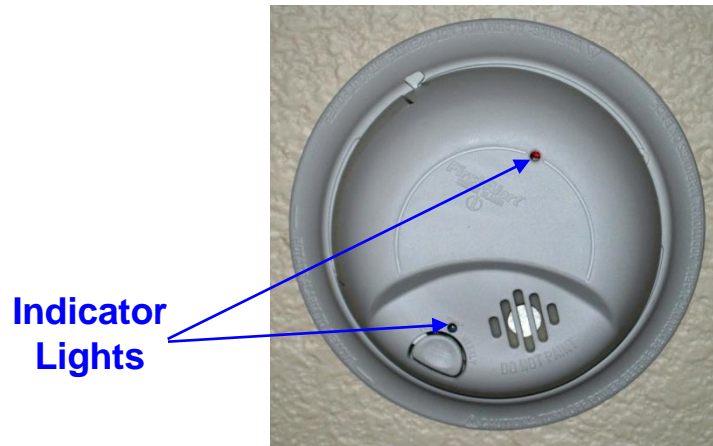
Troubleshooting

When a smoke alarm misbehaves, the best resource is the product manual or manufacturer's website. The good news is that most modern smoke alarms have some diagnostic features to help determine the problem.

We already discussed that smoke alarms usually chirp when the battery is low. There are often one or two indicator lights on each alarm which reveal information about power (AC and battery) as well as alarm status.

The product manual will tell you what the various lights indicate.

This can be particularly helpful in case of random, brief false alarms or failing detectors. These nuisance alarms can be a real mystery with a large group of interconnected alarms—how to tell which one is acting up? Check your manual; it is likely that one of the lights indicates which alarm went off. The light should stay on until the test/reset button is pushed, so you can track down the offending alarm that way. If cleaning doesn't help, at least you know which one to replace.



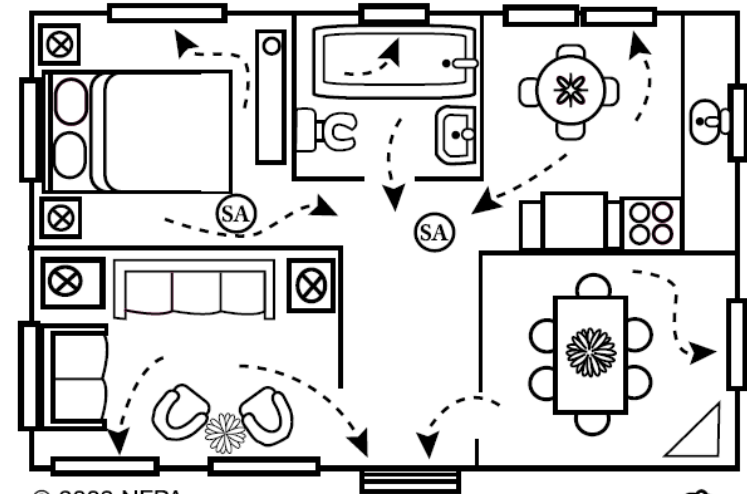
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Escape Plan

Functional smoke alarms are only half the home fire safety equation. You also need a plan to get people out of the house in case of smoke or fire.

Consider how people would get out of every room to safety regardless where the fire is. This may be complicated if the bedrooms are upstairs and a fire is blocking the stairs. There are many resources for figuring this out, along with a lot of helpful information on how to survive smoke and fire. Your local fire department would almost certainly help if you can't work this out.

Make a plan and practice it with your family members.



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Meeting Place

Smoke Alarms

Related Safety Alarms

Also consider the need for a carbon monoxide (CO) alarm. These are similar to smoke alarms but instead of sensing smoke they are looking for CO, a lethal gas that is odorless and invisible. CO can be produced by faulty gas appliances such as furnaces, water heaters, dryers or stoves.

If you have natural gas appliances in your home, it is recommended that you have at least one carbon monoxide alarm installed.

CO alarms come in different packages. Some are wall or ceiling mount like a smoke alarm. Others plug into standard wall power outlets, and some stand up like a photo frame.

You can even buy alarm units that combine smoke and CO detection, which is an easy way to keep your home extra safe.



Carbon Monoxide Alarm

Web links to smoke alarm information:

[http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Safety Information/For consumers/Fire safety equipment/Smoke alarms](http://www.nfpa.org/categoryList.asp?categoryID=278&URL=Safety%20Information/For%20consumers/Fire%20safety%20equipment/Smoke%20alarms)

US National Fire Protection Association

http://www.philliesfireco.com/smoke_detector_facts.htm

General Smoke Alarm Facts

<http://www.firesafefhome.org/smoke-alarm-facts/>

Residential Fire Safety Institute

<http://www.cpsc.gov/cpsc/pub/pubs/smokealarms.pdf>

US Consumer Product Safety Commission

http://www.usfa.dhs.gov/citizens/all_citizens/home_fire_prev/alarms/

US Fire Administration

<http://www.homesafeguard.com/faq.htm>

Recommended aerosol smoke detector tester

<http://www.youtube.com/watch?v=4LQ6uhXAzvk>

NFPA Smoke Alarm Basics Video

Web links to major smoke alarm manufacturers:

<http://www.firstalert.com/>

FirstAlert (BRK)

<http://www.brkelectronics.com>

BRK

<http://www.kidde.com/>

Kidde

<http://www.firexsafety.com/>

FireX (now Kidde)