

# Smoke Alarms – Why, Where, and Which



U.S. Consumer Product Safety Commission Document #559

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A smoke alarm is critical for the early detection of a fire in your home and could mean the difference between life and death. Fires can occur in a variety of ways and in any room of your home. But no matter where or how, having a smoke alarm is the first key step towards your family's safety.

This document is not intended to be all inclusive, but it is intended to inform the reader about some of the safety aspects and importance of having and maintaining working smoke alarms.

## Why Are Smoke Alarms Important?



Every year in the United States, about 3,000 people lose their lives in residential fires. In a fire, smoke and deadly gases tend to spread farther and faster than heat. That's one reason why most fire victims die from inhalation of smoke and toxic gases, not as a result of burns.

A majority of fatal fires happen when families are asleep because occupants are unaware of the fire until there is not adequate time to escape. A smoke alarm stands guard around

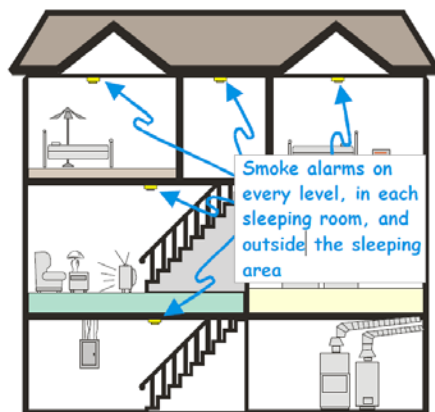
the clock and, when it first senses smoke, it sounds a shrill alarm. This often allows a family the precious but limited time it takes to escape.

About two-thirds of home fire deaths occur in homes with no smoke alarms or no working smoke alarms. Properly installed and maintained smoke alarms are considered to be one of the best and least expensive means of providing an early warning of a potentially deadly fire and could reduce the risk of dying from a fire in your home by almost half.

## Where Should Smoke Alarms Be Installed?

**Smoke alarms should be installed on every level of the home, outside sleeping areas, and inside bedrooms.** A smoke alarm should be installed and maintained according to the manufacturer's instructions. When installing a smoke alarm, many factors influence where you will place it, including how many are to be installed.

Consider placing alarms along your escape path to assist in egress in limited visibility conditions. In general you should place alarms in the center of a ceiling or, if you place them on a wall, they should be 6 to 12 inches below the ceiling.



Replace batteries every year  
Replace smoke alarms every 10 years

## Smoke Alarms – Why, Where, and Which (continued)

### CPSC staff recommends the following:

- Install a working smoke alarm on every level of the home, outside sleeping areas, and inside bedrooms.
- Replace smoke alarm batteries at least annually, such as when resetting clocks in the fall or spring.
- Test all smoke alarms in your house once a month.
- Do not place a smoke alarm too close to a kitchen appliance or fireplace, as this may result in nuisance alarms.
- Avoid locating alarms near bathrooms, heating appliances, windows, or ceiling fans.
- Replace smoke alarms that are more than 10 years old. Smoke alarms don't last forever.
- Develop and practice a fire escape plan, because working smoke alarms and a fire escape plan will increase your protection in case of a fire.

### Which Smoke Alarm Type Is Best?

**Smoke alarms may contain different or multiple sensors.** There are two main types of smoke alarms, which are categorized by the type of smoke detection sensor, ionization and photoelectric, used in the alarm. A smoke alarm uses one or both methods, sometimes with a heat detector, to warn of a fire.

Ionization detectors contain a chamber with two plates that generate a small, continuous electric current. When smoke enters the ionization chamber, the smoke particles disrupt the current flow, which triggers the alarm.

Photoelectric detectors use a light beam and light receptor (photocell). When smoke is present between the light and receptor, depending on the type of smoke chamber configuration, the reduction or increase of light on the photocell sensor triggers the alarm.

**Smoke alarms may perform differently.** Both ionization and photoelectric detectors are effective smoke sensors. Even though both types of smoke detectors must pass the same tests to be certified to the voluntary standard for smoke alarms, they can perform differently in different types of fires.

Ionization detectors respond quickly to flaming fires with smaller combustion particles; photoelectric detectors respond more quickly to smoldering fires. There are combination smoke alarms also that combine ionization and photoelectric detectors into one unit, called dual sensor smoke alarms.

The amount of time a person may have to escape depends on many factors, such as the type of fire, location of the fire, and the closest smoke alarm.

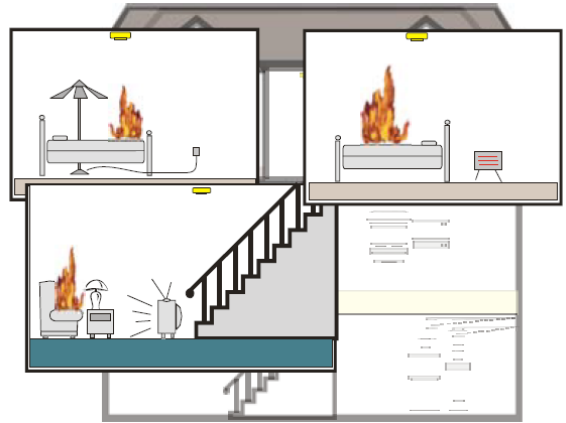
### In a flaming fire, the CPSC staff recommends:

- A fire escape plan will help reduce the amount of escape time required for you and your family to get out safely.
- These types of fires can develop rapidly; leave the home as fast as possible because the flames, heat, and toxic gases will become too intense in a short time.
- If your primary escape path is blocked by smoke, flames, and heat, use your secondary escape method, such as an alternative door or window.

## Smoke Alarms – Why, Where, and Which (continued)

### In a smoldering fire, the CPSC staff recommends:

- A fire escape plan will help reduce the amount of escape time required for you and your family to get out safely.
- When the smoke alarm sounds, leave the home as fast as possible; it is unpredictable when the smoldering fire may burst into a flaming fire.
- These types of fires produce a lot of smoke; getting low may make it easier to breathe and see. The smoke contains toxic gases which can disorient you or, at worst, overcome you.
- If your primary escape path is blocked by smoke, flames, and heat, use your secondary escape method, such as alternative door or window.



### What Features Come on Smoke Alarms?

In addition to the type of smoke detection sensor, ionization and photoelectric, used in the alarm, smoke alarms can be powered differently or be interconnected or single station alarms. Considering all of the available options will enable you to select the smoke alarms that may work best in your situation to effectively detect a fire.

**Power.** Smoke alarms can be connected to the home's wiring system, battery powered, or a combination of both. Smoke alarms most often fail to alarm because of missing, drained, or disconnected batteries.

A good reminder to replace the batteries in smoke alarms is in the fall or spring when resetting the clocks.

Smoke alarms connected to household wiring with battery back-up will provide protection even during power outages. Consider upgrading smoke alarms to hard-wired with battery back-up during a renovation or remodeling project.

If your smoke alarm begins to chirp, signaling low battery power, replace the batteries immediately to prevent you and your family from being unprotected. Also make sure that everyone in the house understands how important it is to have working batteries in every smoke alarm and how dangerous it is to remove the batteries even for a short time.

**Interconnection.** Interconnected smoke alarms may provide improved protection and offer more escape time in a fire.

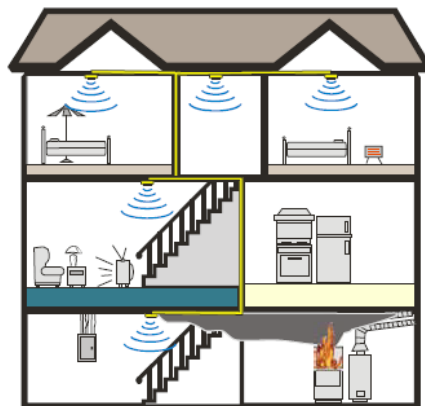
This type of smoke alarm allows all smoke alarms to sound if one has detected smoke. With interconnected smoke alarms, a fire in the basement, for example, will trigger the closest smoke alarm and alert all the occupants in the home by sounding all the smoke alarms.

## Smoke Alarms – Why, Where, and Which (continued)

Not all homes have interconnected smoke alarms. Prior to 1989, existing homes typically had independent single-station, battery-only-powered smoke alarms. After 1989, new homes included hard-wired, interconnected smoke alarms.

Interconnected smoke alarms are typically connected using a wire, but newer wireless technology is available that allows smoke alarms to be interconnected without using wires. This allows easier and less costly upgrade to interconnected smoke alarms for older homes.

Not all homes may need interconnected smoke alarms. Small, single-level homes may not benefit from interconnected smoke alarms because of the close proximity between smoke alarms.



Interconnected Smoke Alarms

### Which Smoke Alarm to Install?

Because both ionization and photoelectric smoke alarms are better at detecting distinctly different yet potentially fatal fires, and because homeowners cannot predict what type of fire might start in a home, the CPSC staff recommends using these guidelines to help best protect your family:

- Install a working smoke alarm on every level of the home, outside sleeping areas, and inside bedrooms.
- Install both ionization and photoelectric type smoke alarms.
- Install interconnected smoke alarms.
- Install smoke alarms using house wiring with battery back-up.

Regular testing is the only way to make sure your smoke alarms are working. The CPSC staff recommends testing your smoke alarms once a month and installing more than one smoke alarm. If you test it less often and only have one smoke alarm, a non-working smoke alarm may leave you and your family unprotected.