

# Consumer Product Safety Commission

## Smoke Alarms – Why, Where, and Which

### CPSC Document #559

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.

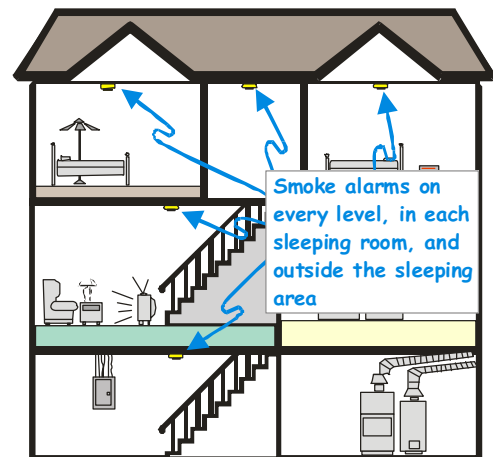


About two-thirds of home fire deaths occur in homes with no smoke alarms or no working smoke alarms. Properly installed and maintained smoke alarms are considered to be one of the best and least expensive means of providing an early warning of a potentially deadly fire and could reduce the risk of dying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

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 Better?**

Although there are several choices to make in selecting the right smoke alarms to buy, the most important thing to remember is that smoke alarms save lives. For that reason, you should install a smoke alarm if your home does not have one.

### **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.

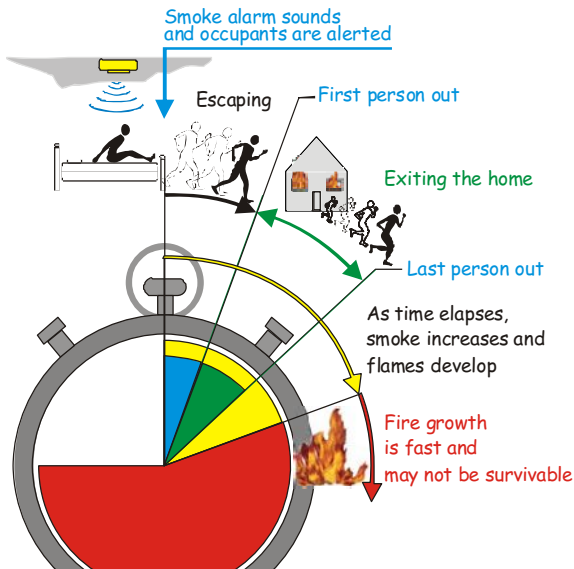
Ionization detectors contain a chamber with two plates that generate a small, continuous electric current. When smoke enters the ionization chamber, the smoke particles disrupt the current flow, which triggers the alarm.

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.



### Smoke Alarm Sounds

Do not waste any time saving property.

The fire has already developed and the closest smoke alarm has detected the smoke.

### Escaping

It may be smoky; getting low may make it easier to breathe and see. Smoke contains toxic gases which can disorient you or, at worst, overcome you.

The time it takes to get out depends on many factors including mobility, helping others, escape route, time of day, smoke, fire, and the location of the fire relative to you.

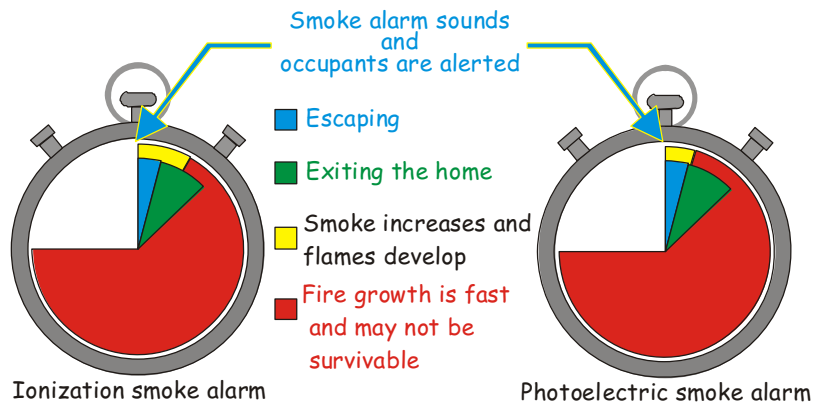
### Exiting the Home

Once you are out of the home, never re-enter the home. **ONCE OUT - STAY OUT!**

The type of fire, slow smoldering or fast flaming, can determine the amount of time you have to escape before being overcome by smoke, heat, and toxic gases. A slow smoldering fire may go undetected for a long period of time before it erupts into dangerous flames and high heat. A fast flaming fire has a very short amount of time before flames and heat become intense. In either type of fire, once out – stay out

### Fast Moving Flaming Fire

Fast flaming fires don't leave much time for escape. An ionization smoke alarm may be seconds faster than a photoelectric smoke alarm, and those seconds will count in a fast moving flaming fire.

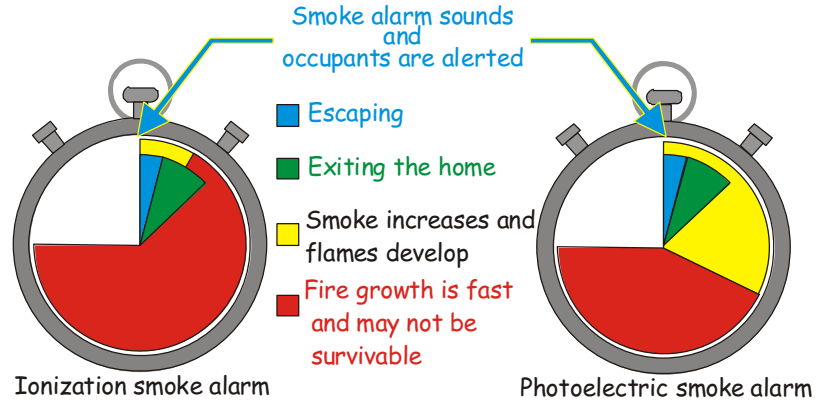


In a flaming fire, the CPSC staff recommends:

- ✓ 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.

### Smoldering Fire

Smoldering fires develop slowly. A photoelectric smoke alarm can be minutes faster than an ionization smoke alarm in responding to a smoldering fire. Regardless of the type of smoke alarm, as soon as the smoke alarm sounds, leave the home as fast as possible.



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**

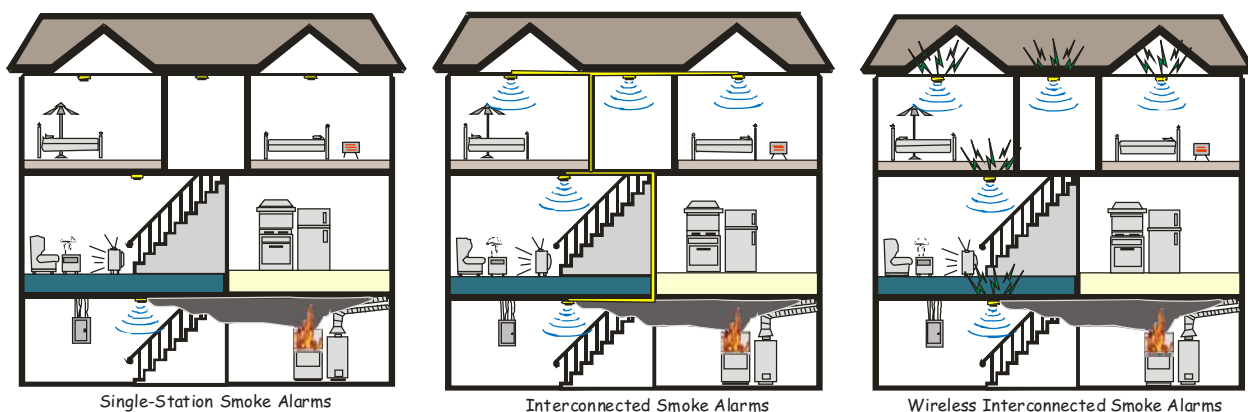
Smoke alarms can be connected to the home's wiring system, battery powered, or a combination of both. Smoke alarms most often fail to alarm because of missing, drained, or disconnected batteries. A good reminder to replace the batteries in smoke alarms is in the fall or spring when resetting the clocks.

For older homes, battery-only smoke alarms are the simplest to install. For homes under construction, smoke alarms are typically connected to the household wiring (hard-wired). 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. Smoke alarms with sealed lithium batteries can last up to 10 years; after 10 years, the entire unit is disposable.

## 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. 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.

Features on smoke alarms for your home:

- ✓ Depending on your home, smoke alarms can be powered in one of several ways.
  - House wiring
  - House wiring with battery back-up
  - Replaceable batteries, such as 9 volts
  - Sealed long life batteries; smoke alarms are disposed of after 10 years.
- ✓ Interconnected smoke alarms may offer quicker escape time and improved audibility.
  - Hard-wired interconnected smoke alarms can be found in most homes built after 1989.
  - Wireless interconnected smoke alarms are an alternative for older homes using single-station smoke alarms.

## Which Smoke Alarm to Install?

### Guide to selecting the smoke alarms to protect you and your family

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:

#### BEST

- ✓ IF YOU DON'T HAVE A SMOKE ALARM INSTALLED IN YOUR HOME, GET ONE AND INSTALL IT.
- ✓ 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.

#### Better

- ✓ IF YOU DON'T HAVE A SMOKE ALARM INSTALLED IN YOUR HOME, GET ONE AND INSTALL IT.
- ✓ Install more than one smoke alarm.
- ✓ Install interconnected smoke alarms.
- ✓ Install smoke alarms with sealed 10 year batteries.

#### Good

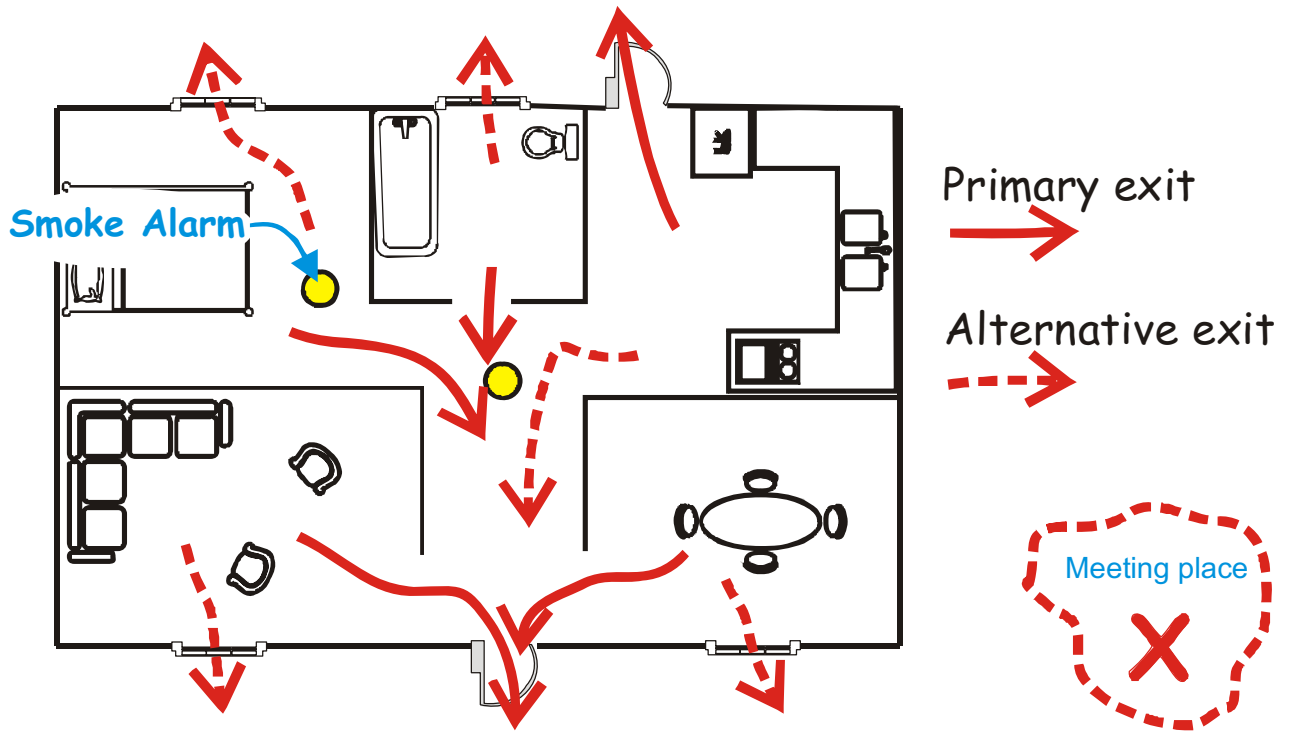
- ✓ IF YOU DON'T HAVE A SMOKE ALARM INSTALLED IN YOUR HOME, GET ONE AND INSTALL IT.

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.

## A Fire Escape Plan May Save You and Your Family

Installing working smoke alarms is an essential, but they don't save lives unless everyone knows how to get out of the home safely. Make sure everyone knows how to escape when the smoke alarm sounds, whether awake or sleeping at the time. In your plan, have two ways out of each room, a pre-arranged meeting place outside and, most importantly, **ONCE OUT - STAY OUT!**

Minimizing the amount of time it takes to get out can improve your chances of surviving a hazardous home fire. Having a fire escape plan for you and your family can reduce the amount of time it takes to get out. Practicing the fire escape plan will help everyone understand what to do and where to meet.



CPSC staff suggests the following when developing a fire escape plan for you and your family:

- ✓ Practice escaping from every room in the home.
- ✓ The best plans have two ways to get out of each room. If the primary way is blocked by fire or smoke, you will need a second way out.
- ✓ Practice the escape plan with your family during the day and at night. Children, older adults, and the hearing-impaired may sleep through a fire alarm or may need assistance in escaping.
- ✓ Designate a meeting location away from the home, but not necessarily across the street. For example, meet under a specific tree or at the end of the driveway or front sidewalk to make sure everyone has gotten out safely and no one will be hurt looking for someone who is already safe.
- ✓ Designate one person to go to a neighbor's home to phone the fire department.
- ✓ Practice the fire escape plan twice a year.

## Safe Practices and Preventing a Fire in the Home



There are more than 300,000 residential fires a year. Working smoke alarms are a key factor in surviving a fire, but safe practices in the home are the first line of defense in preventing a fire from ever starting. Many residential fires and fire-related deaths are preventable. A fire can occur in anyone's home and does not discriminate against age, race, or education.

The type of structure and the furnishings in a home play key roles in the type and progression of fire. It is difficult to accurately predict the type of fire that might occur in your home, but some simple safety steps can help reduce the risk of fire and better protect your family.

## Safety around cooking appliances

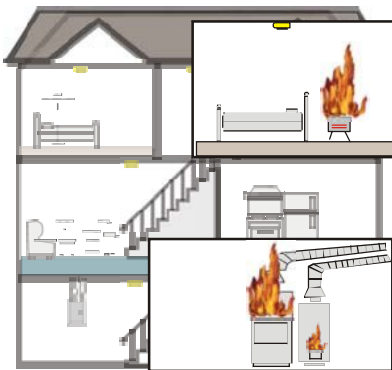


Cooking equipment accounts for the largest percentage of residential fires. Because of oils used these fires are most often flaming fires. However, normal cooking can also produce steam, smoke, and fumes that set off alarms. Disabling a smoke alarm to silence frequent nuisance alarms could be a fatal mistake. Instead, moving the smoke alarm farther away from the cooking appliance may help prevent nuisance alarms and still provide adequate detection of the small fast moving fires that occur in the kitchen.

The CPSC staff suggests taking the following steps to prevent cooking fires in the home:

- ✓ Always keep an eye on food being heated. Unattended cooking causes the majority of fires in the kitchen. If you leave the kitchen, set a timer to remind you that something is on the stove.
- ✓ Keep children away from appliances when cooking. Have a "kid-free zone" around the stove and teach youngsters not to play in that area.
- ✓ Roll-up sleeves or, if possible, wear short or tight fitting sleeves when cooking. Loose fitting clothing and sleeves can be dangerous near open flames.
- ✓ Try not to reach over the stove. You can avoid this by not storing items you use directly over or behind the stovetop.
- ✓ Turn handles inward so pots and pans won't be pulled or knocked off the stove.

## Check heating and cooling equipment



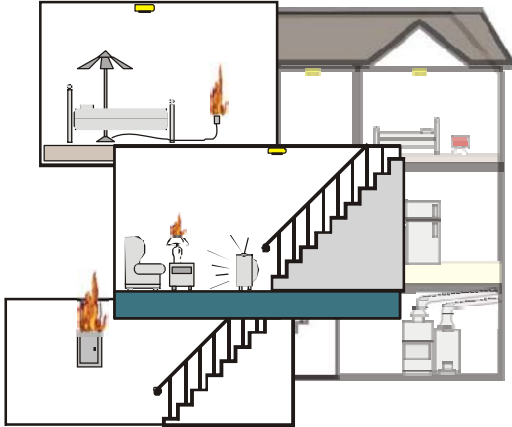
Heating and cooling equipment fires constitute the second largest share of residential fires. Home heating equipment includes central heating units, portable and stationary space heaters, fireplaces, chimneys, and heat transfer systems, as well as some devices not used to heat living spaces, most notably water heaters.

The CPSC staff suggests taking the following steps to prevent heating and cooling appliance fires in the home:

- ✓ Have a professional technician inspect your heating, cooling, and water appliances annually.
- ✓ Have the fireplace chimney checked and cleaned routinely by a chimney "sweep" at least once a year.
- ✓ Do not leave a portable heater operating unattended or operating while sleeping. Portable electric air heaters are designed for use only as temporary supplemental heating and only while attended.
- ✓ Look for portable heaters that are listed by a nationally-recognized testing laboratory. These heaters have been tested to meet specific safety standards, and manufacturers are required to provide important use and care information to the consumer.



## Check electrical cords and lighting



Electrical fires from wiring and lighting are the third leading cause of residential fires. Fire deaths are highest in winter months which call for more indoor activities and an increase in lighting, heating, and appliance use. Most electrical fires result from problems with installed wiring such as faulty electrical outlets and old wiring. Problems with cords and plugs, such as extension and appliance cords, also cause many home electrical fires.

The CPSC staff suggests taking the following steps to prevent electrical fires in the home:

- ✓ Do not use any electrical cord that is stiff or cracked. The insulation on electrical cords can become damaged by wear, flexing, or age.
- ✓ Inspect electrical cords for frayed wires, which can cause fires. Replace all worn, old or damaged cords immediately.
- ✓ Install additional receptacles where needed. Extension cords should never be used as a long-term solution to the need for installing additional receptacles.
- ✓ Never use damaged electrical cords. Cords can become damaged when run under rugs or furniture.
- ✓ Keep combustibles away from light bulbs. Light bulbs, especially halogen types, get very hot and can ignite combustible materials that get too close.
- ✓ Never place clothing or towels on top of a lampshade. Do not use table lamps without a shade where they might fall over onto a bed or sofa.
- ✓ Use the correct wattage bulb for the fixture. Most light fixtures are labeled to show the type of and highest wattage bulb that can be safely used in that fixture; too high a wattage bulb can cause the fixture to overheat and start a fire.

## Safety around upholstered furniture and mattresses



Upholstered furniture and mattresses and bedding are the items first ignited and involved in the greatest numbers of fire deaths. These items are commonly ignited by open flame products (such as candles, cigarette lighters, and matches) or smoking materials (primarily cigarettes). Young children playing with matches and lighters are often involved in starting these fires and, unfortunately, are also their primary victims.

The CPSC staff suggests taking the following steps to prevent fires in the home:

- ✓ Keep matches and lighters out of the reach of young children.
- ✓ Exercise caution when using candles. Do not leave candles unattended or lit while sleeping.
- ✓ Candles should be kept away from combustibles. Extinguish candles when you leave the room. If power is out, consider using flashlights instead.
- ✓ Never smoke in bed and extinguish tobacco products when tired.
- ✓ Use an ash tray when smoking.

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The U.S. Consumer Product Safety Commission is charged with protecting the public from unreasonable risks of serious injury or death from thousands of consumer products under the agency's jurisdiction. Deaths, injuries and property damage from consumer product incidents cost the nation more than \$800 billion annually. The CPSC is committed to protecting consumers and families from products that pose a fire, electrical, chemical, or mechanical hazard or can injure children. The CPSC's work to ensure the safety of consumer products - such as toys, cribs, power tools, cigarette lighters, and household chemicals - contributed significantly to the decline in the rate of deaths and injuries associated with consumer products over the past 30 years.

To report a dangerous product or a product-related injury, call CPSC's hotline at (800) 638-2772 or CPSC's teletypewriter at (800) 638-8270, or visit CPSC's web site at [www.cpsc.gov/talk.html](http://www.cpsc.gov/talk.html). To join a CPSC email subscription list, please go to [www.cpsc.gov/cpsclist.aspx](http://www.cpsc.gov/cpsclist.aspx). Consumers can obtain this release and recall information at CPSC's Web site at [www.cpsc.gov](http://www.cpsc.gov).