

FIRE SAFETY AND EARLY WARNING/EARLY PROTECTION FOR THE HOME

PART I

In the United States and Canada, three home fires are reported to fire departments every four minutes. Every hour, there are an average of two reported injuries and hundreds of unreported injuries. Many injuries are serious enough to require hospitalization. Some lead to lengthy treatment or permanent damage. Ten times a day, on average, someone in the United States or Canada dies in a home fire.

Fire can happen in any home. Understanding the information and following advice contained in this series of trainings can save lives and minimize injury and property loss from fire. This three part series will focus on four basic defenses against fire in the home.

1. Keeping fire out of the home
2. Installing early-warning systems to alert your household to a fire in time to escape safely.
3. Having an escape plan that can save your life and other lives in a fire
4. Forming fire-safe habits and knowing how to respond to fire emergencies

The facts and advice in this series of trainings are based on the research and experience of the nation's top fire safety experts at the National Fire Protection Association (NFPA), headquartered in Quincy, Massachusetts. These recommendations have been proven in real fires. They do save lives. They could save yours and the ones you love. The first step is to know your enemy: Learn how fire happens and how it kills.

FIRE BASICS

How fires happen

All fires require fuel, heat, and oxygen. In school, you may have learned about the "fire triangle" ---- a standard three-sided diagram showing the relationship between those trios of the basic fire ingredients. To better understand how fires work, modern experts have expanded that model to include a fourth element ---

the complex molecular chain reactions, created between fuel and oxygen, that keep a fire burning once it has started. This more accurate, four sided picture of how fire works is called the “fire tetrahedron.”

Understanding exactly how fires burn helps experts to develop and test better ways of extinguishing fires. Oxygen is all around us and almost any material can become fuel for a fire: clothing, furniture, wood, paper, plastics and flammable gases and liquids, such as gasoline. All it takes is a human act or oversight, a mechanical or electrical malfunction, or some natural event (e.g., lightning) to bring oxygen, fuel and heat together.

Fires can be extinguished by removing the fuel, cutting off the supply of oxygen, reducing fuel’s temperature, or in some way disrupting the molecular chain reaction that keeps the fire going.

How fires kill:

Death caused by severe burns is only one fatal danger of fire. In fact, only about one-fourth of home fire victims die from burns. The rest die from inhaling poisonous gases found in smoke or from lack of oxygen.

Reduced Oxygen:

Once a fire starts, it can quickly make your home a deadly place. Fire consumes oxygen. Normally, the air we breathe is 21 percent oxygen. During a fire, that level drops rapidly. If it drops below 17 %, people breathing the air will have difficulty thinking clearly and controlling their muscles. They may become irrational and uncoordinated, making escape more difficult. When oxygen in the air drops into the 10-to-6 % range, a person’s breathing stops. After 4 to 6 minutes without oxygen, brain death occurs.

Poisonous Smoke:

Fires also produce smoke and poisonous gases. Smoke inhalation is the leading cause of death in fires. It can kill you long before the flames reach you. The majority of fatal home fires happen at night when people are asleep. A sleeping

person who inhales poisonous gases may never wake up or may pass out as soon as he or she sits up to escape.

There are four common deadly gases associated with fires in the home which are:

Carbon monoxide is poisonous and displaces oxygen from the blood. It is the most abundant of all fire gases and is produced by all fires.

Hydrogen cyanide is also a deadly poison, produced by burning wool, silk, nylon, and some plastic (common elements in blankets, upholstered furniture, curtains and clothing).

Hydrogen chloride irritates the eyes and throat, increasing the breathing rate and making it difficult to see to escape.

Carbon dioxide in the air causes a person to breathe faster, increasing the intake of other poisonous gases released by the fire.

Smoke also includes particles that obscure light and vision and irritate your eyes.

Heat:

Fires produce intense heat – which can exceed 1000 F (approximately 500 C) – that can damage the body by severe burns to exposed tissue or by overall heat stress. Breathing superheated air can cause rapid and severe lung damage. None of the human body's natural temperature regulating mechanisms, such as breathing and perspiration, can keep pace with the heat levels of a well-developed home fire. Heat at such high levels can cause unconsciousness in minutes.

YOU CAN SURVIVE A FIRE IN YOUR HOME

To survive a fire in your home, you must take immediate action when a fire starts. You need to have fire protection systems, such as smoke alarms and automatic fire sprinkler systems that can detect and/or control a fire quickly. And to respond quickly in a fire emergency, you need to know what to do.

EARLY WARNING/EARLY PROTECTION

More than half of all fatal home fires strike at night when people are sleeping. The sooner a sleeping person wakes up and begins to react, the greater his or her chances are of surviving the fire. Inexpensive smoke alarms can cut your risk of dying in a fire in half and automatic fire sprinkler systems can contain or extinguish a fire – protecting your property, reducing smoke and toxic fumes and giving you more time to escape safely.

Smoke alarms:

Fire experts consider smoke alarms to be the most effective low cost early-warning device available. They are easy to acquire and simple to install and maintain. Most people who die in home fires don't die in the room where the fire began. Smoke alarms alert you to developing fires and give you time to escape.

WHAT TO BUY:

As with all safety equipment and appliances, the first rule is: don't buy any smoke alarm unless it bears the label of an independent testing laboratory. There are several common types of home smoke alarms and options are simplest to understand.

Power. Some smoke alarms are powered by batteries; others are designed to be plugged or hard-wired into a household electrical system. Battery-powered alarms are easy to install and conform to most jurisdictions' codes and bylaws. Models using conventional household batteries should have their batteries replaced at least once a year or whenever the low-battery indicator sounds. Alarms that use lithium power-cells that are designed to last for 10 years and eliminate the need for annual battery changing. This may be attractive to older adults or anyone who would have difficulty changing batteries. All smoke alarms require monthly testing.

Sensing systems. Most smoke alarms use one of two common sensing systems for detecting a fire. All tested and labeled smoke alarms offer adequate protection.

- ~ **Ionization type.** These smoke alarms pass an electric current through a sensing chamber. When smoke enters the chamber it interrupts the flow of current and activates the alarm.
- ~ **Photoelectric type.** These smoke alarms aim a light source into a sensing chamber. Smoke entering the sensing chamber reflects the light onto the photocell and activates the alarm.

Some newer models smoke alarms offer special features.

- ~ **Hush buttons.** Smoke alarms with an alarm-pause (or “hush”) feature allows you to shut off the unit temporarily. They are intended to allow people to respond to “nuisance alarms” triggered by non-threatening circumstances, such as burnt toast or a smoky oven. Pressing the pause or hush button deactivates the alarm for 8 to 10 minutes after which it reactivates automatically.

Alarms with this feature are intended to discourage the dangerous practice of disconnecting alarm batteries.

For the hearing impaired. Alarms are available that flash a strobe-like light in addition to sounding a sonic alarm. There is also an alarm on the market with lower-pitched alarm sounds that may be easier for hearing-impaired people to hear.

Heat detectors. Where smoke alarms are not recommended, such as the kitchen and bathrooms, you can install heat detectors increase your protection. But never substitute heat detectors for smoke alarms outside these specific areas. Generally, smoke alarms are triggered sooner than heat detectors are. The delay could be fatal.

HOW MANY SMOKE ALARMS DO YOU NEED?

Smoke alarms should be installed on every level (floor) of your home including the basement. Install smoke alarms outside each separate sleeping area. NFPA recommends that you sleep with bedroom doors closed to slow the spread of smoke and fumes if there is a fire. If people in your household sleep with the

doors closed, install interconnecting alarms inside the sleeping areas as well. (National Fire Alarm Code, NFPA 72, requires builders to install smoke alarms inside interconnected sleeping rooms in new construction.)

For added protection, you can install smoke alarms in other rooms, such as dining rooms, furnace and utility rooms and hallways. Smoke alarms are not recommended for kitchens, bathrooms, attics or garages because nuisance alarms caused by cooking fumes, steam or automobile exhaust are common in these areas.

Some small children don't wake up to the sound of smoke alarms. Test the alarms outside children's bedrooms while the children are asleep to check their responses. Consider installing alarms inside children's sleeping areas.

INSTALLATION

HOW. To install most battery-operated smoke alarms, all you need are a screwdriver and a drill. Follow the manufacturer's installation instructions and be sure your alarms are securely in place.

Some smoke alarms operate on household current. An alarm that plugs into an electrical outlet must be installed with a restraining device so the plug cannot be pulled out by mistake. Alarms can also be hard-wired directly into the home's electrical system. Hard-wired installations should be done by a qualified electrician. Never hard-wire an alarm into a circuit that can be turned off by a wall switch.

WHERE. Heat and smoke rise, so all smoke alarms should be installed high on a wall or on the ceiling to detect the first traces of smoke.

- ~ Wall-mounted smoke alarms should be installed so that the top of the alarm is 4 to 12 inches (10 to 30 centimeters) from the ceiling.
- ~ Ceiling-mounted alarms should be placed at least 4 inches (10 centimeters) from any wall.
- ~ If a room has a pitched ceiling, mount the unit at or near the ceiling's

highest point.

- ~ When installing an alarm in a stairway, position the alarm in the path that smoke would follow up the stairwell.
- ~ Don't install an alarm near a window, door, forced-air register, or fireplace where drafts could detour smoke away from the unit.
- ~ Install basement smoke alarms close to the bottom of the stairs. Don't install an alarm at the top of the stairs; dead air trapped near the closed door could prevent smoke from reaching the unit.

If you have any questions about where to install your smoke alarms, contact your local fire department for advice. Most departments will conduct a home smoke-alarm inspection for free or for a small fee.

MAINTENANCE

Studies have shown that roughly one-fifth of the tens of millions of smoke alarms installed in homes are not in proper working condition. These poorly maintained units endanger occupants by creating a false sense of security.

BATTERIES. Replace batteries according to the manufacturer's recommendations or at least once a year. Never borrow batteries from smoke alarms for other purposes. (Be sure every member of the household, including children, understands the risk of this dangerous practice.) Pick a day (e.g., the day you switch your clocks to or from daylight-savings time) to replace your alarm batteries each year.

TESTING. Test your smoke alarms at least once a month, following the manufacturer's instructions. It takes only a moment to test a smoke alarm that could save your life. If your alarm does not respond to the manufacturing recommended test procedure (usually pushing a test button), change its batteries. If it still does not perform, replace the alarm itself. NFPA does not recommend testing alarms with a lit candle, match or lighter because of the danger of handling an open flame. Many battery-powered smoke alarms will

“chirp” to warn you that their battery power is too low, but there are other reasons that a smoke alarm might malfunction.

Cleaning. Clean your smoke alarms at least twice a year, using a vacuum cleaner to remove cobwebs and dust that can degrade the unit’s sensitivity. Never paint any part of a smoke alarm.

Replacement. Smoke alarms don’t last forever. If your alarm is performing erratically or is 10 years old or older, replace it.

NUISANCE ALARMS

If you have problems with nuisance alarms (e. g., caused by cooking fumes), do not simply disconnect your smoke alarm. Try another location or another model of alarm, but keep your home protected. Always be sure you understand why an alarm is sounding before treating the alarm as a nuisance.

AUTOMATIC FIRE SPRINKLER SYSTEMS

Automatic fire sprinkler systems supply water to a network of individual sprinklers, each protecting the area below them from fire. These sprinklers open automatically in response to high heat and spray water on the fire. Sprinklers control fires quickly and efficiently and reduce the smoke and toxic gases. In recent years, home fire sprinklers supplied with water from household water supplies through lightweight, small diameter pipes become increasingly popular in one-and two-family dwellings.

DISPELLING SPRINKER MYTHS

Many people resist the idea of home sprinkler systems due to some common misconceptions. But the truth is ...

- ~ Only those sprinklers near the fire discharge. Your entire house will not be flooded due to a small fire in a confined area. In sprinkled residences, fires are usually contained by the operation of just one sprinkler.
- ~ Sprinklers rarely go off by mistake.
- ~ Sprinklers attack a fire before it spreads, so there’s much less water to

damage than if the fire department had to fight the fire at a more advanced stage.

~ Modern sprinklers can be inconspicuous – with fixtures mounted flush with walls or ceilings.

NOTE: Installing smoke alarms and fire sprinkler systems are effective ways to protect yourself and your family from fire. Thanks for reading this information on smoke alarms and fire sprinkler systems but don't stop here. Put what you've learned to work in your home.

The information for the On-Going Training Packet was taken from Fire In Your Home – Prevention and Survival – a booklet by the National Fire Protection Association, copyright in 1999.