

## Background for the Teacher

Fire prevention and preparedness education can decrease the number of harmful fires and lessen the adverse effects of fire on young children and their families. Your role in providing students and their families with information about fire and with messages about how to prevent fire and what to do if one occurs is vitally important. With this Fire Prevention and Safety curriculum, you can help your students and their families stay safe.

### WHY TALK ABOUT FIRE?

Residential fire is the fifth leading cause of unintentional death due to injury in the United States. Fires and burns also rank as the number one cause of residential death for children under the age of 15.

Roughly 85 percent of all fire deaths occur in residential structures, such as homes, dormitories, barracks, and hotels. The majority of fatal fires occur at night when people are likely to be less alert. Nearly one-half of reported residential fire deaths occur between 11:00 p.m. and 6:00 a.m.

Most structure fires are preventable, including arson fires. More than half (54 percent) of the people arrested in 1999 for arson were under 18 years of age. With education and counseling, fire-setting behavior can be prevented or deterred.

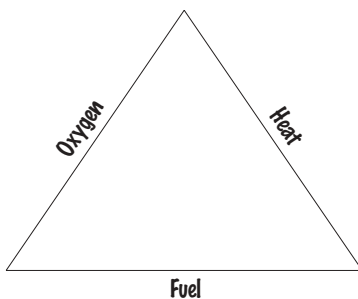
According to the National Fire Protection Association (NFPA), in the year 2002, 2,670 people died in reported home fires in the United States—roughly seven people per day. In addition, thousands of people were injured, many of them hospitalized for severe burns and some disfigured for life. Victims are disproportionately young children or older adults. One-third of the fire-related deaths of young children result from children playing with fire.

In residential fires, asphyxiation kills nearly five times more people than burns. Fire consumes the oxygen in the air, while increasing the concentration of deadly carbon monoxide and other toxic gases in the atmosphere. Inhaling carbon monoxide can cause loss of consciousness or death within minutes.

The heat from a fire exceeds anything to which a person is normally exposed. A fully developed room fire has temperatures over 1,100° F (593° C).

### FACTS ABOUT FIRE

Fire is uncontrolled burning. All fires start with ignition, which occurs when sufficient levels of fuel, heat, and oxygen exist simultaneously. Ignition occurs when the temperature rises high enough to produce a flame. A chemical reaction takes place when the “fire triangle” is present.



Any combustible/flammable substance is considered to be a fuel. Fuels come in many forms:

- Gases (for example, methane, propane) are the easiest to burn because gas and oxygen can mix easily, and the resulting heat from combustion leads to further burning.
- Liquids (for example, gasoline, diesel fuel, kerosene) ignite above the surface of the fuel in the vapor created when heat is applied.
- Solids (for example, wood, coal, plastics, paper, cotton) burn when heat from a fire decomposes the fuel into vapor that mixes with oxygen.

Fuels are everywhere in our homes—in bedding, furniture, curtains, walls, floors, etc. When all the fuel is used up, a fire will go out.

Oxygen must be present for combustion to occur. A colorless gas, oxygen comprises nearly 21 percent of Earth's atmosphere. The combustion of fuel and oxygen gives off heat. More available oxygen accelerates combustion. If the oxygen is removed, the fire will go out.

Heat is essential to fire, and it must be high enough to spark ignition. During a fire, heat moves away from the flame and into an adjacent area where there is fresh fuel. Remove the heat and the fire will go out.

Principles of physics, chemistry, and fluid flow are at work in fire. Smoldering occurs when burning is slow, without flames. When burning is extremely fast, as when a gas leak mixes with air, an explosion can occur. Fire that is burning faster than smoldering, but slower than an explosion, is a flaming fire. A continuous chemical reaction between particles of fuel and oxygen, fire spreads because of heat transfer. The chemical reaction will cease and the fire will go out if the fuel or heat or oxygen is removed.

Heat transfer—the movement of heat—is important in a fire. Movement occurs in three ways: conduction, convection, and radiation.

- Conduction—Heat is transferred through a solid surface from a heated to an unheated area (for example, a hand touching a hot solid surface).
- Convection—Heat is transferred by moving particles of liquids or gases, from a heat source to a cooler area (for example, heat from boiling water in a flow of steam).
- Radiation—Heat is transferred by electromagnetic waves (for example, heat from a space heater that can be felt without touching the heater).

During a fire, a plume of hot, smoky air rises from the flames. In an enclosed space, like a room, hot smoke transfers heat to the ceiling and walls by convection. The fire radiates heat to other parts of the room. Hot smoke radiates heat downward toward the floor and the entire room is involved very quickly.

As the smoky gas layer becomes hotter, it radiates more and more heat to the rest of the materials in the room and everything that can burn suddenly ignites. This is called flashover. At this point, the fire spreads to other rooms and is extremely difficult to control.

## **FIRE PREVENTION**

Home fires are almost always preventable. Everyone must constantly be aware of the possibility of fire in the home and take positive measures to practice fire prevention daily. Children must know that matches and lighters are tools for adults.

(Research by the National Fire Protection Association (NFPA) shows that children associate tools with adults.) Instruct children to tell an adult right away if they find matches or lighters or see someone playing with fire, matches, or lighters.

Children should also know that candles are a frequent cause of devastating fires in homes. Candles must be kept well away from any combustible/flammable items or materials and must never be left unattended. The increasing popularity of candle usage has led to a dramatic increase in the number of tragic fires. In case of a power outage, families should use flashlights for emergency lighting, not candles.

Fire Safety Checklists, which are specific to homes and individual rooms in the home, can be found at the end of this Background for the Teacher section. You may want to duplicate them for use in the classroom or send them home with your students.

## **ABOUT FIRE PREPAREDNESS**

### **1. Develop a Family Disaster Plan**

- Install and maintain smoke alarms inside and outside each sleeping area, right outside the kitchen, and on each additional level of your home, in accordance with local codes. Smoke alarms cut *nearly in half* your chances of dying in a home fire. Smoke alarms sense abnormal amounts of smoke or invisible combustion gases in the air. They can detect both smoldering and flaming fires. The National Fire Alarm Code® (NFPA 72) now requires hard-wired smoke alarms in new homes (both apartments and houses).
- Install carbon monoxide (CO) alarms following the manufacturer's instructions. It is especially important to have one near sleeping areas. Test and maintain them according to directions.
- Draw a floor plan of your home; mark two fire escape routes for each room. In thick, heavy, dark smoke it is easy to become disoriented. Creating a floor plan with two exits from each room greatly helps everyone understand the safest routes during an emergency.
- Consider escape ladders for sleeping areas on the second or third floor. Learn how to use them, and store them near the window. If smoke or fire blocks the main escape routes via stairs, the windows may be your only alternative. Escape ladders permit quick exits, reducing time spent in toxic environments.
- Burglar bars and locks that block outside window entry must be easy to open from the inside. If a key is required to open bars or locks, keep one near each window to use for escape. Quick-release devices are available for security bars. If smoke or fire blocks the main exit, you must be able to use alternative routes quickly. Fire deaths have occurred when people were trapped by security bars and were unable to get out while firefighters were unable to get in.
- Select a safe outside place for everyone to meet after escaping from a fire. Make sure it will be a safe distance from heat, smoke, and flames. Family members may use different escape routes, exiting on different sides of the home. Gathering at a specific meeting place right outside your home will quickly let you know who is out, and allow you to advise firefighters of who may need help and their probable locations inside.
- Conduct a home fire drill at least twice a year with all members of your family. Fires produce thick, dark smoke that irritates the eyes and breathing passages and can cause confusion. Practicing your plan makes your response more automatic, requiring less thinking and saving precious time during an emergency situation.
- Practice alerting other family members. Yell "Fire!" several times during your escape. In a real fire this will alert family members to get out.

- Practice a crawl-low escape from your bedroom, as if you were crawling under a layer of smoke. Fires produce many toxic gases. Some are heavy and sink low to the floor; others rise, carrying soot toward the ceiling. Crawling with your head at a level of one to two feet above the ground will provide the best air. Close doors behind you.
- Practice evacuating blindfolded. In a real fire situation, the amount of smoke generated by a fire will most likely make it impossible to see.
- Learn to call 9-1-1 or your local emergency services number. After evacuating, you will need to call this number from a payphone, a cell phone, or a neighbor's phone.
- Teach family members to get out first, and then call for help from a neighbor's home or outside phone. Get out of your home, away from toxic smoke and gases. Use your neighbor's phone, a cell phone, or a pay phone.
- Teach children that it is a firefighter's job to rescue people and pets, not theirs. Their job is to get out quickly and stay out.
- Teach family members to tell the responding firefighters where they think their pet is. In many cases, pets are able to get out on their own. Only trained firefighters, who have proper breathing apparatus and protective clothing, should go into a burning or smoky building.
- Practice getting out of your home during the day and night. Fire can happen at any time. Practicing your routes at night will help you move more quickly should a fire strike in the dark.
- Remember, in case of a real fire, once you are out, stay out.
- Discuss fires with your family. All family members should know what to do in case they are not together. Discussing disaster ahead of time helps reduce fear and lets everyone know how to respond during a fire. Not discussing fires and other disasters in advance can lead to confusion during an emergency and more long-term emotional problems afterward. Develop a contact plan to use in case your family has a fire while a family member is out of town.

## 2. Protect Your Property

Install and maintain fire-prevention and fire-suppression equipment in your home.

- **Smoke Alarms**

Install smoke alarms inside and outside each sleeping area, right outside the kitchen, and on each level of your home, in accordance with local codes. If fire occurs inside the sleeping area, dangerous gases can cause deeper sleep. Smoke alarms inside the sleeping area will be more likely to wake you.

To maintain smoke alarms, vacuum cobwebs and dust from the mechanisms once a month.

Push the test button on each alarm once a month to make sure the alarm is working. If necessary, replace the batteries immediately. The test feature tests all electronic functions, and it is safer to use the test feature than to test the alarm with a controlled fire (matches, lighters, cigarettes).

Make sure children know what your smoke alarm sounds like.

If you have battery-powered smoke alarms, replace the batteries at least once a year. Some agencies recommend that you replace batteries when the time changes from standard to daylight savings each spring and then back again in the fall: "Change your clock, change your batteries." Replacing batteries this often certainly will not hurt; however, data show that batteries will last at least a year, so more frequent replacement is not necessary. Also, Arizona, Hawaii, the eastern portion of Indiana, Puerto Rico, American Samoa, and Guam use daylight savings time.

Replace your smoke alarms every 10 years, as jointly recommended by the National Fire Protection Association, the U.S. Consumer Product Safety Commission, and the American Red Cross. Smoke alarms become less sensitive over time.

- **Carbon Monoxide (CO) Alarms**

Install carbon monoxide (CO) alarms following the manufacturer's instructions. It is especially important to have one near sleeping areas. Test and maintain them according to the manufacturer's instructions.

- **Fire Extinguishers**

Fire extinguishers are recommended for fire suppression at home. Consider having one or more in your home. All portable fire extinguishers for home use are now rated A-B-C, which means they can be used for different kinds of fires (wood, paper, grease, and electrical).

Get training from the fire department or the fire extinguisher manufacturer in how to use your fire extinguisher. Fire extinguishers from different manufacturers operate in different ways. Unless you know how to use your extinguisher, you may not be able to use it effectively. There is no time to read directions during an emergency. Only adults should handle and use extinguishers.

Install extinguishers high on the wall, near an exit, and away from heat sources. Extinguishers should be easily accessible to adults trained to use them and kept away from curious children. Heat may make the contents less effective or cause the extinguisher to lose its charge more quickly.

If you try to use a fire extinguisher on a fire and the fire does not die down immediately, drop the extinguisher and get out. Most portable extinguishers empty in 8 to 10 seconds.

Look at your fire extinguisher at least once a year to ensure that it is properly charged. It will not work properly if it is not charged properly. Use the gauge or test button to check proper pressure. Follow the manufacturer's instructions for replacing or recharging your fire extinguisher. If the unit is low on pressure, damaged, or corroded, replace it or have it professionally serviced. Small fire extinguishers are designed for one-time use and cannot be recharged.

- **Home Fire Sprinkler Systems**

Home fire sprinkler systems complement the work of smoke alarms in the home, providing a way to fight flames immediately. In less time than it would take the fire department to arrive on the scene, home fire sprinklers can contain and even extinguish a fire, decreasing damage and the chance that deadly smoke and gases will reach you. Sprinkler systems can also put out a fire when you are away from home, and, if they are connected to an alarm system, they could be set up to notify the fire department or an alarm monitoring service in case of fire.

Contrary to a popular myth, it is not true that if one sprinkler goes off, they all do. Each sprinkler head has an independent "fusible link," which melts at approximately 135° F (57° C). When a link melts, water comes out of its sprinkler. In most home fires, one or two sprinkler heads can control a fire.

## **IF A FIRE OCCURS**

If you are in a burning house or building, implement your escape plan immediately. Get out as quickly and as safely as possible. The less time you are exposed to poisonous gases, the safer you will be.

- Use stairs or a fire escape. Do not use an elevator. Stay calm. Take responsibility. Go outside to your family meeting place.
- If you are escaping through a closed door, feel the door with the back of your hand before opening the door. If it is cool and there is no smoke at the bottom or top, open the door slowly. If you see smoke or fire beyond the door, close it and use your second way out. If the door is warm, use your second way out. It is a natural tendency to automatically use the door, but fire may be right outside. Feeling the door will warn you of possible danger.
- If you see smoke or fire in your first escape route, use your second way out. The less time you are exposed to poisonous gases or flames, the safer you will be.
- If you must exit through smoke, crawl low under the smoke to your exit. Fires produce many poisonous gases. Some are heavy and sink low to the floor; others rise carrying soot toward the ceiling. Crawling with your head at a level of one to two feet above the ground will provide the best air.
- Close doors behind you as you escape to delay the spread of the fire.
- If smoke, heat, or flames block your exit routes and you cannot get outside safely, stay in the room with the door closed. Open the window for ventilation and hang a bright-colored cloth or sheet outside the window so firefighters can find you. Wait by the window for help. The first thing firefighters do when they arrive at a fire is check for trapped persons. Hanging a sheet out lets them know where to find you. If there is a phone in the room, call 9-1-1 or your local emergency services number and tell the operator your situation and location.
- Once you are out, stay out!
- If someone is still inside, direct the firefighters to that person's probable location. You may also tell them about any pets that may still be inside. Firefighters are trained and equipped to enter burning buildings, you are not.
- Get out first, away from toxic smoke and gases, then call 9-1-1 or your local emergency services number. Use your neighbor's phone, a cell phone, or pay phone to call for help.
- Give first aid where needed after calling 9-1-1 or your local emergency services number. People who are seriously injured or burned should be transported to professional medical help immediately.
- Stay out of fire-damaged homes until local fire authorities say it is safe to re-enter. Fire may have caused damage that could injure you or your family. There may be residual smoke or gases that are unsafe to breathe.
- Look for structural damage. Fire authorities may allow you to re-enter, but they may not have completed a thorough inspection. Look for damage that will need repair.
- Check that all wiring and utilities are safe. Fire may cause damage to inside walls and to utility lines not normally visible.
- Discard food that has been exposed to heat, smoke, or soot. The high temperatures of a fire and its by-products can make food unsafe.
- Contact your insurance agent. Take inventory before you discard damaged goods. Save receipts for money you spend relating to fire loss. Your insurance agent may provide immediate help with living expenses until you are able to return home and may also offer assistance for repairs.
- Remember that there are many resources to help you cope with your feelings after a fire. You may feel sadness, fear, and anxiety because of burns and injuries, loss of your personal belongings, and/or damage to your home. Explore your feelings about what has happened.
- Work with your family to make a plan to replace belongings lost to fire and smoke.

- Talk with your family, friends, clergy member, or school counselor about how to go on with your daily life, how to deal with your losses and/or injuries, and any other concerns you have.
- Investigate resources in your community that will help you return your life and your home to normal: your Red Cross chapter, other community disaster agencies, religious institutions, commercial businesses, and contractors, such as smoke-removal companies.

### **IMPORTANT INFORMATION TO EMPHASIZE WITH CHILDREN**

- Practice stop, drop, and roll. If your clothes catch on fire, know how to stop, drop, and roll. Stop what you are doing, drop to the ground, cover your face, and roll back and forth until the flames go out. **DO NOT RUN**—running makes the fire burn faster. (Note: Children tend to confuse this message with the “crawl low and go” message about how to exit a burning building. Make sure they understand that “stop, drop, and roll” is to be used only when clothing catches on fire.)
- Practice “crawl low and go.” If you must escape through smoke, crawl low, under the smoke. Fires produce many poisonous gases. Some are heavy and sink low to the floor; others rise, carrying soot toward the ceiling. Crawling with your head at a level of one to two feet above the ground will provide the best air. Close doors behind you.
- Practice getting out as safely and quickly as you can. The less time you are exposed to poisonous gases, heat, or flames, the safer you will be.
- Practice going to your family meeting place and then choosing one person to call 9-1-1 or your local emergency services number. Gathering in a specific location right outside your home will quickly let you know who is outside and allow you to tell firefighters who is still inside and their probable locations.
- Memorize the number to call in a fire or other emergency (9-1-1 or your local emergency services number).
- Remember, in a real fire, once you are out, stay out.
- It is a firefighter’s job to rescue people and pets, not your job. (Note: Often, children are concerned about the safety of their pets, so discuss this issue before a fire starts. In many cases, pets are able to get out on their own. Only trained firefighters, who have proper breathing apparatus and protective clothing, should go into a burning or smoky building.)
- Firefighters are our friends, and they will help in case of a fire. (Note: A firefighter wearing full protective gear can look frightening, and, if children do not know who is under all that equipment, they may try to hide from a firefighter during a fire. A visit to a fire station can help ease children’s fears.)

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