



## Fire Prevention and Safety 6-8

### Fire Preparedness

## LESSON PLAN 4

# Before the Fire

According to the National Fire Protection Association (NFPA), in the year 2005, 3,675 people and another 87 firefighters died in reported fires in the United States—more than 10 people each day. The good news is that most structure fires are preventable.

### Key Terms and Concepts

Consumer Product Safety Commission	flash point	renter's insurance
fire codes	homeowner's insurance	smoke alarm
fire suppression	ignition temperature	sprinkler system
flame retardant	ionization chamber	
	photoelectric	

### Purpose

To help the students learn how fire-suppression and fire-warning systems along with insurance can diminish the impact of residential fires, and to inform the community of these

### Objectives

The students will—

- Use *Sprinkler Systems* and *Smoke Alarms* to learn how fire-suppression and smoke-alert systems function.
- Investigate federal, state and local fire-suppression and fire-warning regulations.
- Use *Fire-suppression and Fire-warning Research* to compare technology designed to protect against a fire disaster.
- Educate family members on the importance of using fire-suppression and warning technology in the home with the help of the handout *Smoke Alarms*. (Home Connection)
- Investigate the role of fire insurance in mitigating the losses from fires. (Linking Across the Curriculum)
- Design a service project to improve the fire preparedness of the families in their community.
- Research to discover the roles and responsibilities of a town's fire inspector, property owners (single family or multifamily), renters, contractors and family members in keeping communities fire-safe. (Linking Across the Curriculum)

### Activities

- “The Science of Fire-suppression and Fire-warning Systems”
- “Community Service Project”



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at [www.redcross.org/disaster/masters](http://www.redcross.org/disaster/masters)



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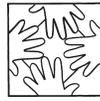
### Before the Fire

#### Materials

- *Sprinkler Systems*, 1 copy per student
- *Smoke Alarms*, 1 copy per student
- *Fire-suppression and Fire-warning Research*, 1 copy per student



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## "The Science of Fire-suppression and Fire-warning Systems"

**SET UP** 10 minutes **CONDUCT** two 50-minute sessions, plus homework

**Language Arts: Research, Communication and Vocabulary; Science: Technology**

1.  Introduce the class to these words and phrases selected from Key Terms and Concepts.

fire codes	flash point	smoke alarm
fire suppression	ignition temperature	sprinkler system
fire warning	ionization chamber	
flame retardant	photoelectric	

In the research that follows, the students will encounter each term. Provide them with a variety of resources, including the Internet. Working in small groups, have them look for the meaning of each term and find illustrations of the term, if appropriate. The groups will then compile their information to write clear and accurate definitions. The students can use these definitions to help them with their research.

2. Ask the students what would happen if their school caught fire. How would the students be notified of the fire? How would the fire be extinguished? (Fire alarms would sound, the students would leave the building in an orderly fashion, and firefighters would arrive to extinguish the blaze. Many schools have a sprinkler system that would be activated in a fire to suppress the blaze.)
3. Does your school have a sprinkler system? Why or why not? Does your home have a sprinkler system? Can you think of buildings that are equipped with sprinkler systems? Why are these structures protected with fire-suppression systems? (Some schools have sprinkler systems, while others do not. Whether or not sprinklers are present depends on the age and size of the structure and the local fire codes. Most single-family homes do not have sprinkler systems, but many apartments, condominiums and town houses do have them. Generally, newer and larger structures have sprinklers.)
4. Where are the smoke alarms located in your home? Do you know how these devices work? How often must they be tested? How do you test them? (Answers will vary, but all homes must be equipped with working smoke alarms, and they must be tested regularly. Most function using household current and/or batteries.)



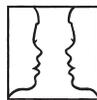
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## LESSON PLAN 4 Before the Fire

5. What objects in the classroom are most likely to catch fire? For an object to catch fire, explain that it must first reach a high enough temperature—its ignition temperature (or in the case of a liquid, its flash point). Inform the students that the Consumer Product Safety Commission has set guidelines for the flammability of items such as clothing, tents, furniture and other household products. Flame-retardant chemicals are applied to products to increase the ignition temperature, thereby reducing the risk of fire.

6.  After discussing the four topics—fire alarms, smoke alarms, sprinklers and flame retardants—divide the class into four groups and assign one topic to each group. Distribute copies of *Sprinkler Systems*, *Smoke Alarms* and *Fire-suppression and Fire-warning Research*. The students will use these in conjunction with various media resources to research the science behind fire alarms, smoke alarms, sprinklers and flame retardants. In addition, have the students use *Fire-suppression and Fire-warning Research* to note any federal, state or local fire codes that regulate fire-suppression or fire-warning systems in your area.

Students may also research valuable information in manuals for the consumer describing the basic elements of the state or county building code at the local public library.



### Wrap-Up

Have each group make a presentation to the class using PowerPoint slides, posters, overhead projection or other visual aids to reinforce their written information and give clarity to complex technical concepts.



### Home Connection

Send *Smoke Alarms* home with students to share with their families. Based on their research, challenge them to educate their families on this important and easily used technology to protect their home and family against a fire disaster.



### Linking Across the Curriculum

#### Social Studies: Economics; Science: Technology

Have the students research the Internet to learn more about insurance in case of fire.

- What does the insurance typically cover?
- Should renters have insurance?
- What preparedness activities might help homeowners lower their policy rates?



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## LESSON PLAN 4 Before the Fire

**TEACHING NOTE** Below are several sites to help the students find the answers to their questions.

- Arizona Department of Insurance: Homeowners Insurance FAQ  
<http://www.id.state.az.us/consumerhomefaq.html>
- Ways You May Be Able to Affect Your Premium  
<http://homeownersinsuranceguide.flash.org/affectyourpremium.htm>
- American Red Cross—Prepare Financially: “Buy Insurance”  
[www.redcross.org](http://www.redcross.org) Search Key Words: Prepare Financially
- Financial Planning—A Guide for Disaster Preparedness: “Protecting Your Property” [www.redcross.org](http://www.redcross.org) Search Key Words: Financial Planning

Challenge the students to use their findings to prepare questions focusing on insurance protection and residential fire for a panel of experts, which could include a firefighting representative, a Red Cross volunteer and an insurance salesperson. After the visit, ask the students to create fliers or brochures to help others in the community use the homeowner’s insurance data to best effect.



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### LESSON PLAN 4 Before the Fire



## “Community Service Project”

SET UP 5 minutes CONDUCT 50 minutes, plus implementation

### Language Arts: Communication; Science: Technology

1. Discuss with the students what they have learned about fire-suppression, fire-warning systems and fire insurance. What information is essential to a well-prepared community?
2. Ask the students to find the best way to impart this information to the community. In small groups, have the students consider the following:
  - Who has to know? (Target audience)
  - Why must they know? (Reasoning)
  - What information must they know? (Data)
  - What is the best method for presenting the information? (Product)
  - What is the best means of spreading the word? (Dissemination)
3. After the groups share their plans, the class will select one or two targets for the community outreach project. Based on these targets, consider the group plans and decide on the best method of presentation and dissemination. Put the class plan into outline form answering each of the five questions above.



### Wrap-Up

Challenge the class to accomplish the community service project it has outlined. Put the project into development and work out a dissemination timetable.



### Linking Across the Curriculum

#### Social Studies: Civics

Help the students understand the responsibilities each person or group has in preparedness. Divide the class into groups of four. Assign each person in a group a role:

- Fire Inspector
- Property Owner (apartment building)
- Renter (family member)
- Contractor

Talk about new construction fire codes. Assign some students to research community fire codes by contacting the local fire department while others compare the cost of installing sprinklers in new construction to retrofitting existing buildings.



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Have the students role-play the following scenario:

*The fire inspector inspects a rental property. There are some code violations that need to be corrected, including replacing smoke alarms and replacing emergency lighting in the hallways.*

Consider the following questions. Discuss who is responsible for each area and what actions need to be taken to improve fire safety.

- What are other safety items the fire inspector looks for? (Get a list from the local fire department.)
- Who might do the work? How much do these improvements cost?
- What happens if the improvements are not made? Whose safety is in danger? Who is held responsible for making sure the improvements are done?
- After the smoke alarms are replaced, who needs to care for them and how? What else can this person do to ensure the safety of the people living there?

Come together as a whole class to discuss the scenario. Have the students determine how each person or group has a civic responsibility for fire safety.



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# Sprinkler Systems

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Name \_\_\_\_\_

## Fire Sprinkler Facts

Fire sprinklers save lives, reduce property loss and can even help cut homeowner's insurance premiums.

Installing both smoke alarms and a fire sprinkler system reduces the risk of death in a home fire by 82 percent, compared with having neither.

In case of fire, only the sprinkler closest to the fire will activate, spraying water directly on the fire.

Ninety percent of fires are contained by the operation of just one sprinkler.

Nationally, on average, home fire sprinkler systems add 1 percent to 1.5 percent to the total cost of new construction.

Home fire sprinklers use only a fraction of the water used by fire department hoses.

The odds of accidental sprinkler discharge due to a manufacturing defect are 1 in 16 million.

Modern residential sprinklers are inconspicuous and can be mounted flush with walls or ceilings.

For more information visit the *Masters of Disaster* Web site at [www.redcross.org/disaster/masters](http://www.redcross.org/disaster/masters)





# Smoke Alarms

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Name \_\_\_\_\_

## What type should I buy?

There are two types of smoke alarms available:

1. **Photoelectric:** Uses a photoelectric bulb that sends forth a beam of light. When smoke enters, light from the beam is reflected from the smoke particles into a photocell and the alarm is triggered.
2. **Ionization chamber:** Contains a small, safe radiation source that produces electrically charged air molecules called ions. When smoke enters the chamber, it causes a change in the flow of ions, triggering the alarm.

Both are equally effective, and neither requires that you be familiar with its inner workings. As long as you buy an alarm that is tested by a major testing laboratory, such as Underwriters' Laboratories Inc. (UL), you can be assured it has met certain testing requirements.

## Where should I install my alarm?

Smoke rises. So, the best place to install an alarm is on the ceiling or high on an inside wall just below the ceiling. If the ceiling is below an un-insulated attic or in a mobile home, the alarm should be placed on the wall 4 inches to 12 inches (10 centimeters to 30 centimeters) below the ceiling. Install alarms inside and outside each sleeping area, right outside the kitchen, and on every level of your home.

### Remember:

- **Do not** install an alarm within 3 feet (92 centimeters) of an air supply register that might blow away the smoke.
- **Do not** install an alarm between an air return and the sleeping area. The smoke will be re-circulated and diluted, resulting in a delayed alarm.

If you are installing more than one alarm, you may want to consider purchasing units that can be interconnected. That way, when one unit detects smoke, all the alarms will sound. This is often required by newer building codes.





# Smoke Alarms

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## How are alarms powered?

### Alarms are powered two ways:

1. **Battery alarms** are the easiest to install. They require no outlets or wiring connection; however, batteries must be replaced once a year (approximately). All UL-listed battery-operated alarms are required to sound a trouble signal when a replacement is needed. The signal usually lasts seven days, so you should check the alarm if you have been away from your home for a week or more.
2. **Household current alarms** can be powered with household current two ways: They can be plugged into any wall socket or they can be wired permanently into your home's electrical system.

## How can I best care for my alarms?

Everyone in the home who is old enough should take an active role in caring for the smoke alarms and making sure they work properly. Dirt, extreme changes in temperature, and cooking exhaust can cause a false alarm or malfunction of a smoke alarm. To prevent false alarms, locate the smoke alarm away from air vents, air conditioners and fans. Keep the grillwork free of dirt with occasional vacuuming and dusting. Do not paint them. Test your smoke alarm every 30 days, or more often if necessary, to make sure it is working. This is usually done with the test button. Change the batteries in your alarms at least once a year and replace alarms every 10 years because they become less sensitive over time.





# Fire-suppression and Fire-warning Research

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Name \_\_\_\_\_

**Directions:** Research fire-suppression and fire-warning devices to find the answers to the questions below. Record your data for each device on the sheet.

TOPIC:    **Fire Alarms**      **Smoke Alarms**      **Sprinklers**      **Flame Retardants**

What are they?

Why are they important?

How do they work?

How do they save lives?

How are they maintained?

What regulations are in place concerning their use?

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Set up tasks for your group presentation. How can you most graphically depict the information for classmates?

