

TOPIC: Smoke Alarms and the Firefighter-Answering the Public's Questions
Time Required: 1-2 hours

MATERIALS: Lesson Plan, Smoke Alarms, batteries, smoke alarm test spray, available Fire prevention or smoke detector/alarm handouts.

REFERENCES: U.S. Department Of Commerce, National Fire Prevention and Control Administration (NFPCA) Pamphlets: *Smoke Detectors: Moving the Public*; *Smoke Detector Technology*; and *Smoke Detector Training*; John L. Bryan, *Fire Suppression and Detection Systems, 2nd Ed.*; National Fire Prevention Association (NFPA) *Fire Protection Handbook 16th Ed.*; National Institute of Standards and Testing; *What Every Marylander Should Know about Smoke Alarms*, www.firemarshal.state.md.us/smoked.htm; *Fire Deaths in Maryland*, www.firemarshal.state.md.us/firedea.htm ; *Frequently Asked Questions and Smoke Detectors*, www.newport-news.va.us/fire/sd05.htm; *BFRL-Ask the Experts*, www2.bfrl.nist.gov/askexpert/expertview_exp.asp?FAQid=190&SortBy=topic; *What you should know about Smoke Alarms*, www.firstalert.com/SmokeAlarmDifferences.aspx; *Smoke Alarms: What you need to know*, www.usfa.fema.gov/safety/alarms/; *Smoke Alarms Replacing smoke alarms*, NFPA, www.nfpa.org; *Smoke Detectors & Radiation*, U.S. Environmental Protection Agency, www.epa.gov/cgi-bin/epaprintonly.cgi; *Fire Prevention and Preparedness*, www.disastercenter.com/guide/fire.html; *System Sensor System Smoke Detectors Application Guide*; various Manufacturers' instruction manuals; vintage smoke detector/alarm advertisements & literature.

MOTIVATION: As Fire Service personnel, you will come into contact with the public concerning their questions about smoke alarms. To the public, you are the expert. Can you truthfully answer their questions?

OBJECTIVE (SPO) 1-1: Given a smoke alarm and a location, the student will be able to properly determine the placement of a smoke alarm or alarms in a home, as per the recommendations of the manufacturer; National Bureau of Standards, Center for Fire Research; and the National Fire Protection Association (NFPA).

ENABLING OBJECTIVES:

1-1.1 The student will be able to define the difference between a smoke alarm and a smoke detector, on a written exam, with a passing score of 85%.

1-1.2 The student will be able to identify the total percentage of deaths, related to smoke and smoke and burns, on a written exam, with a passing score of 85%

1-1.3 The student will be able to describe in their own words the difference between a photoelectric smoke alarm and an ionization smoke alarm, and how they operate on a written exam, with a passing score of 85%.

1-1.4 The student will identify which type of smoke alarm is better at sensing a smoky, smoldering fire, on a written exam, with a passing score of 85%.

1-1.5 The student will know the types of power supplies for smoke alarms and their advantages and disadvantages, on a written exam, with a passing score of 85%.

1-1.6 The student will indicate how the fire service should recommend a brand of smoke alarm on a written exam, with a passing score of 85%.

1-1.7 The student will indicate which smoke alarms can be sold / installed in the State of Maryland, on a written exam, with a passing score of 85%.

1-1.8 The student will be able to summarize Maryland law, on the installation of smoke alarms in a home, on a written exam, with a passing score of 85%.

1-1.9 The student will be able to demonstrate the proper location and placement of smoke alarms in a home, in a practical pass/fail exam, with a passing score of 90%.

1-1.10 The student will be able to demonstrate the knowledge of proper maintenance of smoke alarms, on a written exam, with a passing score of 85%.

1-1.11 The student will be able to recall frequently asked questions and the proper answers to those questions, on a written exam with a passing score of 85%.

I. Define Smoke Alarm and Smoke Detector.

A. The terminology defining the term smoke detectors and smoke alarms was changed in 2003.

B. A smoke alarm has the following: a sensor, control components, an alarm notification appliance, and a power source.

C. A smoke detector does not have the alarm notification appliance. Typically detectors are part of a complete fire alarm system, where the notification devices (lights, horns, etc.) are mounted separately on the walls or ceilings.

II. Background information

A. Fire Deaths

1. Up to 90% of the fire deaths occurred in Residential Occupancies

2. In 2007 there were 93 fire deaths Maryland.
3. Smoke Inhalation caused 39 deaths or 41.9%
4. Smoke and Burns caused 37 deaths or 39.8%
5. Total - 76 fatalities or 81.7% of the total from Smoke Inhalation and Burns in the year 2007

(Source - www.firemarshal.state.md.us/firedata.htm)

B. Early Smoke alarms

1. Were developed and mass produced for the public in the 1970s.
2. They were expensive at that time, \$40-\$63 in 1976.
3. Present costs are \$5 to \$25

C. Heat Alarms vs. Smoke Alarms

1. Minimum 135 degrees in the area served before activation
2. Heat has already killed by the time the unit activated
3. Alarm activation provided by either being gas operated or a having a spring motor. (Mention about a company selling heat detector systems in the 1970s for \$1500.)

D. Carbon Monoxide Alarms

1. Carbon Monoxide or CO alarms are not smoke alarms and smoke alarms are not CO Alarms.
2. They work on different principles
3. CO alarms are sometimes sold combined with Smoke Alarms

III. Types of smoke alarms: Photoelectric and Ionization

A. Photoelectric Smoke Alarms-

1. Uses a light source in a darkened chamber. The photoelectric alarm activates when smoke enters the darkened chamber and reflects the light beam into the light sensitive cell.

2. Photoelectric smoke alarms are best at sensing smoky smoldering fires.

B. Ionization Smoke Alarms-

1. Uses a radioactive material (Americium-241) to make the air within the chamber conduct electricity (ionized). The alarm activates when the smoke enters the chamber and interferes with the flow of the electrical current in the ionization chamber.

2. Ionization smoke alarms are better at sensing fires that produce very small or invisible smoke particles.

C. Dual Sensing Chamber Alarms

1. Uses both ionization & photoelectric sensors.

2. Other combinations include Ionization with heat detector sensor.

D. Which is preferred? Both are recommended, since both small/invisible smoke particle and larger smoke particles are in the common dwelling fire.

IV. Demonstrate knowledge of choosing an alarm.

A. Which Brand does the fire service recommend? The fire service does not recommend any particular brand. To be sold in Maryland, the Alarms must have the approval of one of the following independent testing laboratories :

1. UL (Underwriter's Laboratories)

2. FM (Factory Mutual)

B. Battery Operated

1. Require maintenance and battery replacement

2. The early alarms used either special batteries or multiple batteries, which increased the cost of maintaining them.

3. Today's costs are \$2.00 -\$4.00 per yr.

4. Read the instructions for the batteries to be used with your Alarm.

DO NOT USE CHEAP BATTERIES!

C. Electrically operated

1. Some electrical units have a plug
 - a. Make sure outlet is not controlled by a switch.
 - b. Make sure heavy load appliances are not on same circuit, which can blow breaker or fuse!
 2. Direct wired electrical units
 - a. Requires Permits and a licensed electrician
- D. Dual Power
1. Are presently available
 - a. Batteries still need to be maintained
 - b. Still requires a permit and needs to be installed by an electrician in most counties in the State of Maryland
- E. Smoke Alarms for the hearing impaired.
1. Has a strong strobe light to alert occupants.
 2. Maryland has in the past, provided smoke detectors for the hearing impaired. You can contact your local State Fire Marshal Office to check for current availability.
- V. Summary of Maryland law
- A. At least one operating smoke alarm must be installed in each residential occupancy that was constructed prior to July 1, 1975
- B. The *occupant* of the home is responsible for the installation, maintenance and operation of the detector in 1, 2, and 3 family dwellings.
- C. Homes constructed between **July 1, 1975 and January 1, 1989** must have at least one operational electrically powered Smoke Alarm, permanently wired, which is required to be installed in the sleeping area at the time of construction.
- D. Homes constructed between **January 1, 1989 and July 1, 1990** are required to have smoke alarms installed outside each separate sleeping area in the immediate vicinity of the bedrooms and on each additional story of the home, including the basement. These must be interconnected, with the exception of crawl spaces and unfinished attics

E. All residential properties constructed after **July 1, 1990** -smoke alarms must be at each sleeping area, on each level and be inter-connected plus they are required to be protected by smoke alarms that operate by both electricity and battery.

(The only exemptions to this are dwellings that are not provided with electrical service).

VI. Demonstrate proper Location and Placement of the smoke alarm.

A. Locations will vary as to building layout

1. Single Story

a. Outside bedroom / sleeping area

2. Multi-story

a. Each level of the house

1) 1st floor

2) 2nd or all upper floors

3) Basement

Reminder: As per Maryland law all houses built since Jan. 1, 1989 are required to be interconnected.

B. Proper Placement

1. Standard recommended placement depends on the type of home and how it is constructed. The instructions for the smoke alarm will give basic diagrams for some generalized homes.

a. Proper Placement is important

b. Improper placement can delay or cause alarm failure, which is the same as no smoke alarm at all!

2. Mounting the alarm on the ceiling or wall depends on several factors in the home and how it was constructed.

a. Dead air space should be avoided

1) Dead air space is 4-6" from the ceiling or from the wall.

2) 3 feet below a ceiling on a slope, gabled or peaked ceilings

3. Ventilation Concerns

a. Keep alarms at least 36" from forced air supply & air returns

1) An air supply register will push smoke away

2) An air return will draw air away

3) Fans will push smoke away

4. Other Precautions

a. Fluorescent lights- Keep 1 ft away from Fluorescent lighting due to Electrical interference, which can cause false activation

b. Areas of sources of combustion, such as fireplaces, stoves, etc.

c. Away from the kitchen; products of combustion and steam from cooking will cause numerous faulty activations.

d. Away from bath rooms and showers; steam from the shower/ bath or sink will cause numerous faulty activations

e. Variable temperature areas

1) Normal temperature range for the proper operation of smoke alarms is 40 to 100 degrees F.

2) Operations above or below this temperature range can cause delayed or no alarm at all.

3) Also remember with battery only units,
Batteries may lose performance in cold temperatures.

Examples: Attics, crawlspaces, outside storage areas.

f. Dusty, dirty, greasy areas

1) Garages

2) Attics

3) Shop areas (sanding, drilling, etc)

4) Kitchens

VII. Maintenance

A. Change batteries at least yearly

B. Clean or vacuum monthly. Note: the alarm will usually activate when doing this, be ready to call your monitoring company (ADT, Brinks, etc.)

C. Change the light bulb in photoelectric smoke alarms every 3 years for those that use an incandescent bulb.

D. Replace your smoke alarm every 7 to 10 years.

E. Do NOT paint the smoke alarm

F. Test monthly- Remember to notify your monitoring agency if appropriate, to prevent your department from being alerted for an automatic alarm (ADT, Brinks, etc.)

VIII. Frequently Asked Questions

A. *How do I dispose the smoke alarm?*

1. Some localities require that the alarms be sent back to the manufacturer. You should check will your local waste deposal facility for proper guidance

a. Smoke alarms and other electronics contain parts that can be hazardous to the environment. Most of smoke alarms contain plastic and electronic circuit boards.

b. Ionization alarms have radioactive material (Americium-241) which has a half life of about 432 years. Battery operated alarms contain batteries, which may have lead or other toxins.

B. *How do I test my smoke alarm?*

1. Check the instruction manual

2. Many have test buttons; others can be tested with a flashlight.

3. Test sprays are available, Do not use just any spray, they could damage the electrical circuits
4. Never use a lighted piece of paper to test! This may cause a real fire.

C. Why won't my smoke alarm let me cook?

1. Bad placement, too close to kitchen area.
2. Use a photoelectric smoke alarm instead of an ionization smoke alarm.
3. Remember the alarm can not tell the difference between smoke, dusty air, steam from the bath/shower or the by products of cooking (steam, grease frying, or a boil over in the oven.

D. How many smoke alarms do I need?

1. NFPA recommends one per level and outside each sleeping area.
2. You may need more smoke alarms if the alarm is faint, muffled, or difficult to hear, or if a member of the family does not awaken when the alarm activates.
3. Remember to always follow your state or local laws requiring the number of alarms required

E. Why is my smoke alarm chirping?

1. A chirping or beeping sound indicates a low battery.
 - a. UL listed smoke alarms chirp or beep once a minute for up to seven (7) days. (This is due to families being away on vacation.)

REVIEW:

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