PHI Professional Home Inspection Co.
www.phiinspect.com

**Our Mission Statement:**
*To Help People Make Informed Real Estate Decisions*

# Ionization vs. Photoelectric Smoke Alarms

**Ionization-type smoke alarms** have a small amount of radioactive material which ionizes the air and causes current to flow between two electrically charged plates. When smoke enters the chamber, it disrupts the flow of ions, thus reducing the flow of current and activating the alarm. **Photoelectric-type smoke alarms** direct a light source into a sensing chamber at an angle away from the sensor. Smoke enters the chamber, reflecting light onto the light sensor and thus triggering the alarm.

## Types of Fires

To better understand how these different alarms perform, it is important to understand the two main types of fires: fast flame fires and smoldering fires.

Cooking/Fast Flame Fires

- **Account for: 43% of fires, 38% of injuries, and 16% of deaths**
- Cooking fires are considered open fast flames that spread quickly.
- Injured person is generally intimate or present with the fire, attempting to suppress it (grease fire, for example).

Smoldering Fires

- **Account for: 28% of fires, 29% of injuries, and 54% of deaths**
- Smoking/heater/electrical related fires are considered smoldering fires.
- Types of Injuries include persons unaware of fire, slow exits, smoke inhalation, returns to the fire for retrieval/heroics, etc.
- 2% of fires started in upholstered furniture account for 1 in 5 fire deaths.

## Statistics

- About Two-Thirds of fire death occur in homes with no functional smoke alarm.
- 96% of US homes have at least one alarm.
- 43% of fires and 64% of fire deaths occur between 8pm and 8am.
- Because of nuisance alarms, approximately half of all homes intentionally disable an alarm.
- Studies show Ionization-type smoke alarms account for almost **all nuisance alarms**.

## Study

Conclusions from a Texas A&M risk analysis of residential fire detector performance show how the two types of smoke alarms perform in both fast flame fires and smoldering fires.

Fast Flame Fires

- Ionization Alarm fast flame failure rate: 19.80%
- Photoelectric Alarm fast flame failure rate: 3.99%
- Ionization Alarms work roughly 80.2% of the time, Photoelectric Alarms work roughly 96% of the time

Smoldering Fires

- Ionization Alarm smolder flame failure rate: 55.80%
- Photoelectric Alarm smolder flame failure rate: 4.06%
- Ionization Alarms work roughly 45% of the time, Photoelectric Alarms work roughly 96% of the time

## Recommendations

Several studies suggest photoelectric-type alarms have a quicker response time, increasing the amount of time for escape in a fire. Studies also suggest photoelectric alarms have a lower occurrence of nuisance alarms compared to ionization-type alarms. The National Fire Protection Association (NFPA) recognizes the value in both types of alarms, recommending homeowners use alarms which incorporate both types of detection systems.

### Need More Information?

Please visit www.phiinspect.com, go to the "Post Inspection Support" page, and request additional documents.

WAHI Spring Conference 3/14/15 (Skip Walker speaker)
Texas A & M University Sources
National Fire Protection Association: (NFPA) www.nfpa.org
The Home Inspection Company, Inc. DBA Professional Home Inspection Company