

How Does a Smoke Detector Work?

By

Gary Vincent

Fire Chief

Magnolia Volunteer Fire Department

Ever wonder how does a smoke detector work and why does it go off occasionally when there is not a fire?

There are two types of smoke detectors in common use today. The photoelectric type smoke detector and the ionization type smoke detector.

The photoelectric type of smoke detector contains a light source that transmits a light beam across an open space into a light receiving cell. As long as the light beam remains unbroken and the light receiving cell receives the quantity of expected light, the alarm does not sound. The basic idea is that when a fire generates smoke, the smoke will obscure or break up the light beam and the light receiving cell will not receive the light beam, triggering the alarm to sound. This type of detector is subject to “false alarms” due to dust, spray paint, or other particles breaking up the light beam and decreasing the quantity of light that reaches the light receiving cell.

The second commonly used smoke detector is the ionization type of smoke detector. The basic principle used here is to charge a small metal plate inside the detector with an electrical charge and measure the voltage. When smoke contacts the small metal plate, it acts as an insulator to reduce or drop the voltage of the small metal plate. When the voltage drops, the smoke detector sounds an alarm. Much like the photo-electric smoke detector, false alarms occur due to items such as dust particles, spray paint, sanding dust, or other particles that contact the small metal plate.

According to the National Institute of Standards and Technology, smoke alarms of either the ionization type or the photoelectric type consistently provided time for occupants to escape from most residential fires, although in some cases the escape time provided can be short. Consistent with prior findings, ionization type alarms provided somewhat better response to flaming fires than photoelectric alarms, and photoelectric alarms provide often considerably faster response to smoldering fires than ionization type alarms (NIST 2004).

Why do we need smoke detectors? The answer is simply that they are many times more effective at providing early warning to a fire than the human senses, especially while we sleep. Smoke acts as an anesthetic and puts people to sleep due to the many toxins contained in the smoke. Many times fire victims are found in their bed having never awakened to the danger of the fire. The speed in which a fire grows is incredibly fast.

Please check the Magnolia Volunteer Fire Department's website <http://www.magnoliafire.org> to view the video produced by the National Institute of Standards and Technology on fire growth. The direct link to the video is <http://www.fire.gov/flashover/Flashover.mpg>. It is an incredible video that may save your life and one of the most interesting 60 seconds you will ever see. Most people have no idea how FAST a fire grows in size. If you are considering a real Scotch Pine Christmas Tree, PLEASE watch the video before you buy one! No smoke detector will save you from a Dry Scotch Pine Christmas tree fire. There are three fires on the video, including a typical fire in a living room. PLEASE WATCH ALL THREE WITH YOUR FAMILY!

Check your smoke detector battery! It is the most likely reason that a smoke detector would not alert you to the danger of a fire. I recommend a smoke detector in each room of the house, the attic, and the garage. Stay safe and protect your family.

Gary Vincent

Fire Chief--Magnolia Volunteer Fire Department