

NUCLEAR *facts*

How is nuclear technology used in smoke detectors?

MANY HOMES, BUSINESSES AND FACTORIES ARE FITTED WITH SMOKE DETECTORS THAT TRIGGER AN ALARM WELL BEFORE SMOKE FROM A FIRE CAN GET THICK ENOUGH TO SUFFOCATE OCCUPANTS, OR EVEN BEFORE A SMOLDERING FIRE BURSTS INTO FLAME.

A smoke detector also alarms well in advance of any warning which could be given by detecting a rise in temperature due to the heat produced by a fire. This is because smoke detectors can detect the presence of combustion gases from even a small open flame or from a smoldering fire.

There are two different types of smoke detectors; ionization detectors and photo-electric detectors.

Ionization smoke detectors

The ionization detector uses a small amount of radioactive material to make the air within a sensing chamber conduct electricity. When smoke particles or combustion gases enter the sensing chamber they interfere with the conduction of electricity, reducing the current and triggering an alarm.

The ionization detector can detect even invisible combustion gases produced by an open flame and will therefore respond slightly faster to an open flame fire than a photo-electric detector.



Photo-electric smoke detectors

The photo-electric detector contains a small light source that shines light into a dark sensing chamber. The chamber also contains a photo-electric cell, which converts light into a small electrical current. The light source and the cell are arranged so that the light does not normally strike the cell. When smoke particles enter the sensing chamber the light is reflected off the surface of the smoke particles, striking the cell, and increasing the voltage generated by the cell. The increase in voltage triggers the alarm.

Since smoldering fires produce large smoke particles in greatest numbers, photo-electric detectors respond slightly faster to smoldering fires than ionizing detectors.

Is one type more effective?

While there will be some variation in the detector

response time, depending on the nature of the fire and the colour of the smoke, the differences are quite small by comparison to the amount of escape time both types provide. All detectors must be tested and approved for use by the Underwriters' Laboratories of Canada and should carry a ULC stamp of approval.

Because they are easier to produce than photo-electric detectors, ionization smoke detectors are much less expensive and therefore, being more affordable, are more widely used.

What radioactive material is used in a smoke detector?

The usual radiation source used in ionization smoke detectors is a tiny amount of the radioactive metal americium-241. This is tightly bonded in a small "sandwich" of non-radioactive metal, less than half the size of a dime.



Do ionization smoke detectors emit radiation?

The very low-level radiation in close proximity to approved domestic smoke detectors is, in all cases, less than the maximum permitted from other consumer products that emit some radiation, such as colour television sets. Consumer Reports magazine has checked ionization smoke detectors with a radiation meter and, even up close, the investigators could not distinguish any radiation above the background radiation everyone is exposed to from the

Earth, building materials and outer space. It is estimated that the average annual radiation dose received from an ionization smoke detector is about 10,000 times less than the radiation dose due to natural background radiation.

How do you dispose of used ionization smoke detectors?

An international study by radiation safety experts determined that domestic smoke detectors would not pose a health or safety threat to the public, or to waste disposal workers,

if they were thrown out with regular garbage. There is therefore no need for any special care in the disposal of used smoke detectors. They can be safely included with other household waste for disposal.

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