




FIRE DETECTION AND ALARM SYSTEM



INTRODUCTION

- ➡ Main controller is considered as the brain of the system, provides power to the system, monitors inputs and controls outputs through various circuits, performs other functions as required by the appropriate code.
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WHY ARE FIRE DETECTION AND ALARM SYSTEMS REQUIRED?

- Detect fire in the areas.
- Notify building occupants to take evasive action to escape the dangers of a hostile fire.
- Summon organized assistance to initiate or assist in fire control activities.
- Initiate automatic fire control & suppression systems & to sound alarm.
- Supervise fire control & suppression systems to assure operational status is maintained Initiate auxiliary functions involving environmental, utility & process controls.

SMOKE DETECTOR

- A smoke detector is a device that senses smoke, typically as an indicator of fire.
- Smoke detector consists of two parts:
 - A sensor to sense the smoke
 - Electronic horn to horn the people
- Two basic types of smoke detectors are used today: **ionization and photoelectric**. The sensing chambers of these detectors use different principles of operation to sense the visible or invisible particles of combustion given off in developing fires.

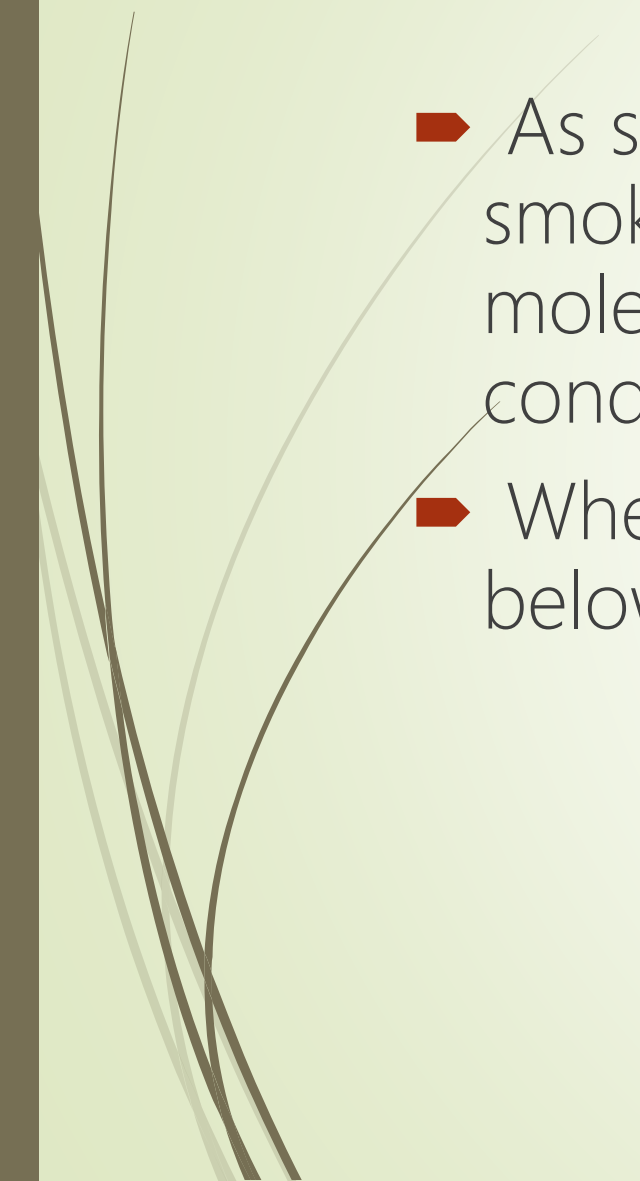


IONIZATION SMOKE DETECTOR

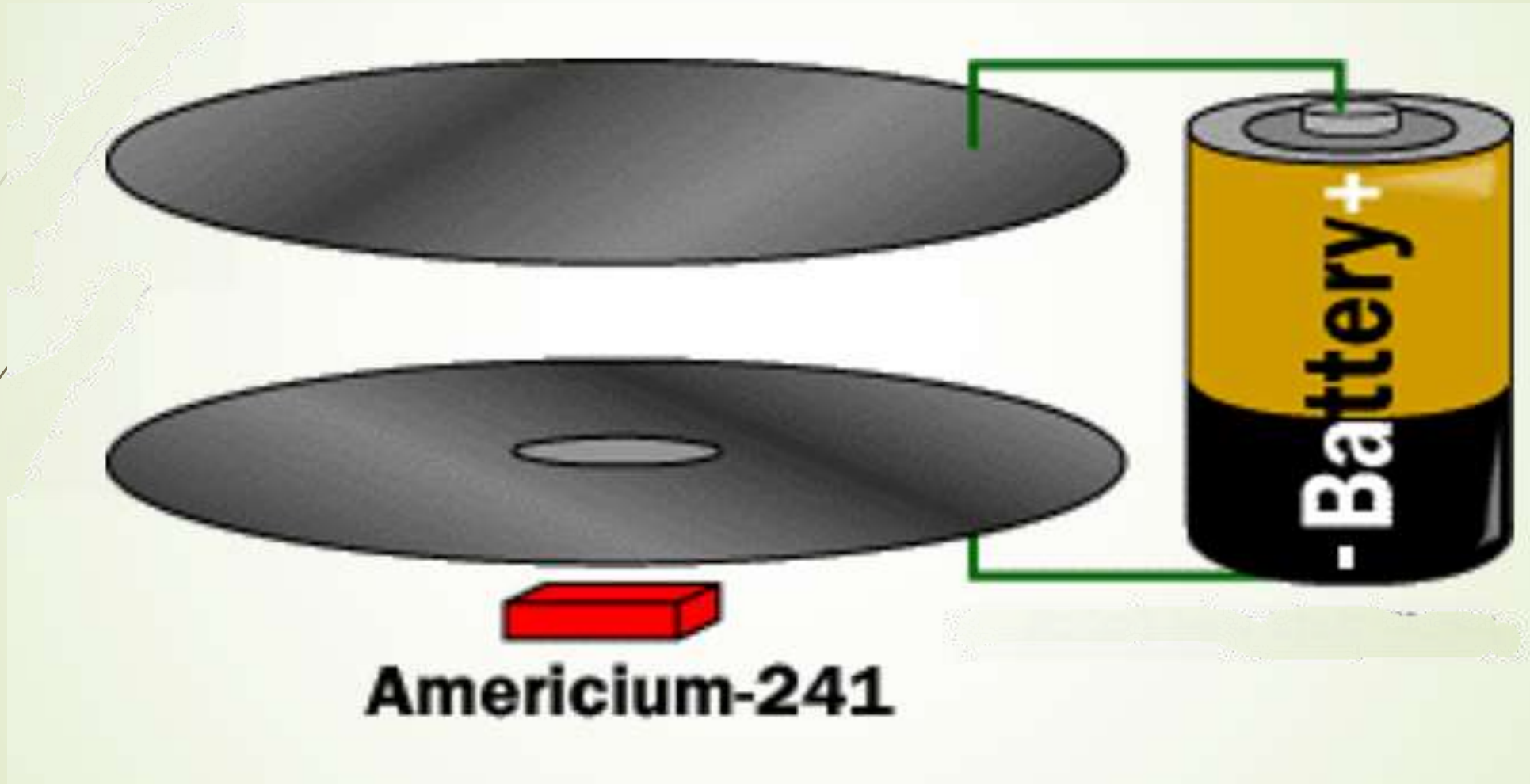
- The ionization smoke detector is widely used. Its capability to detect smoke originating from fire is best utilized for clean-burning fires that produce small particles during combustion.
- The ionization smoke detector consists of an alpha particle producing a radioactive source (americium-241), a smoke chamber, and charged detector plates.
- The alpha source causes the air within the smoke chamber to become ionized and conductive



IONIZATION SMOKE DETECTOR

- As smoke particles enter the smoke chamber, the smoke particles attach themselves to the ionized air molecules and the air in the chamber becomes less conductive
 - When the air conductivity within the chamber drops below a predetermined level, the alarm is triggered
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IONIZATION SMOKE DETECTOR





IONIZATION SMOKE DETECTOR

► Advantages of Ionization Smoke Detectors

- Detects invisible products of combustion. It can detect fires that are in the incipient stage or detect other aerosol-type smoke products
- Quick acting -- Provides for earlier detection than other types of smoke detectors or thermal detectors

► Disadvantages of Ionization Smoke Detectors

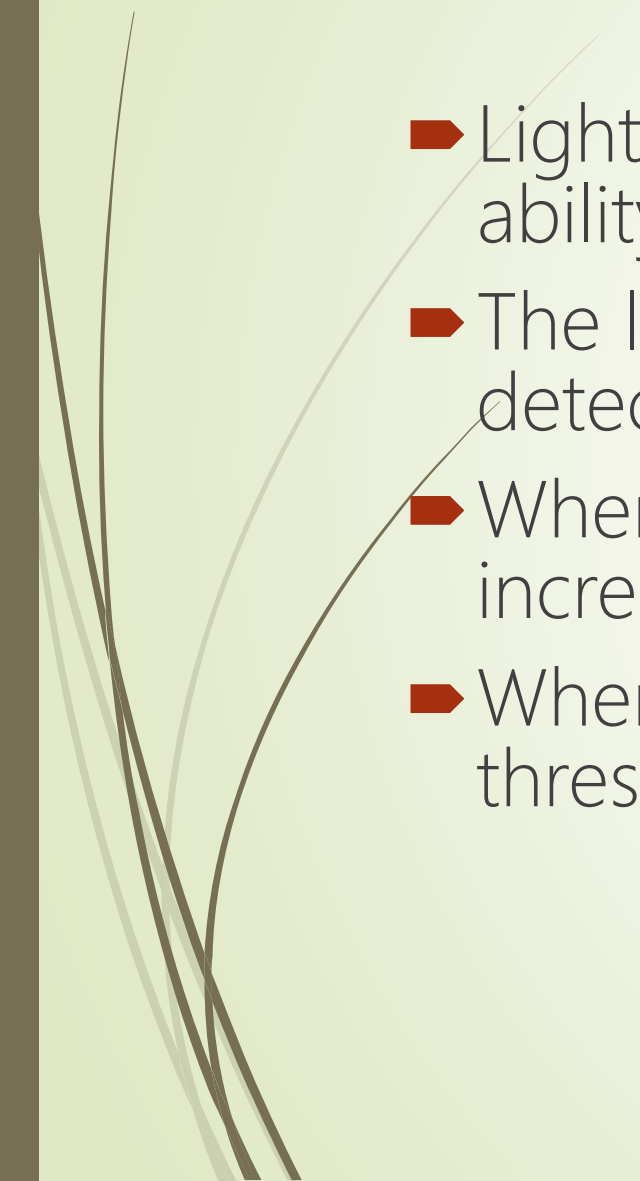
- May provide false detection if used where volatile solvents, conductive material dusts, or high humidity are present
- Detects the presence of smoke only, not toxicity
- Has a potential for high false alarm rate

PHOTOELECTRIC SMOKE DETECTOR

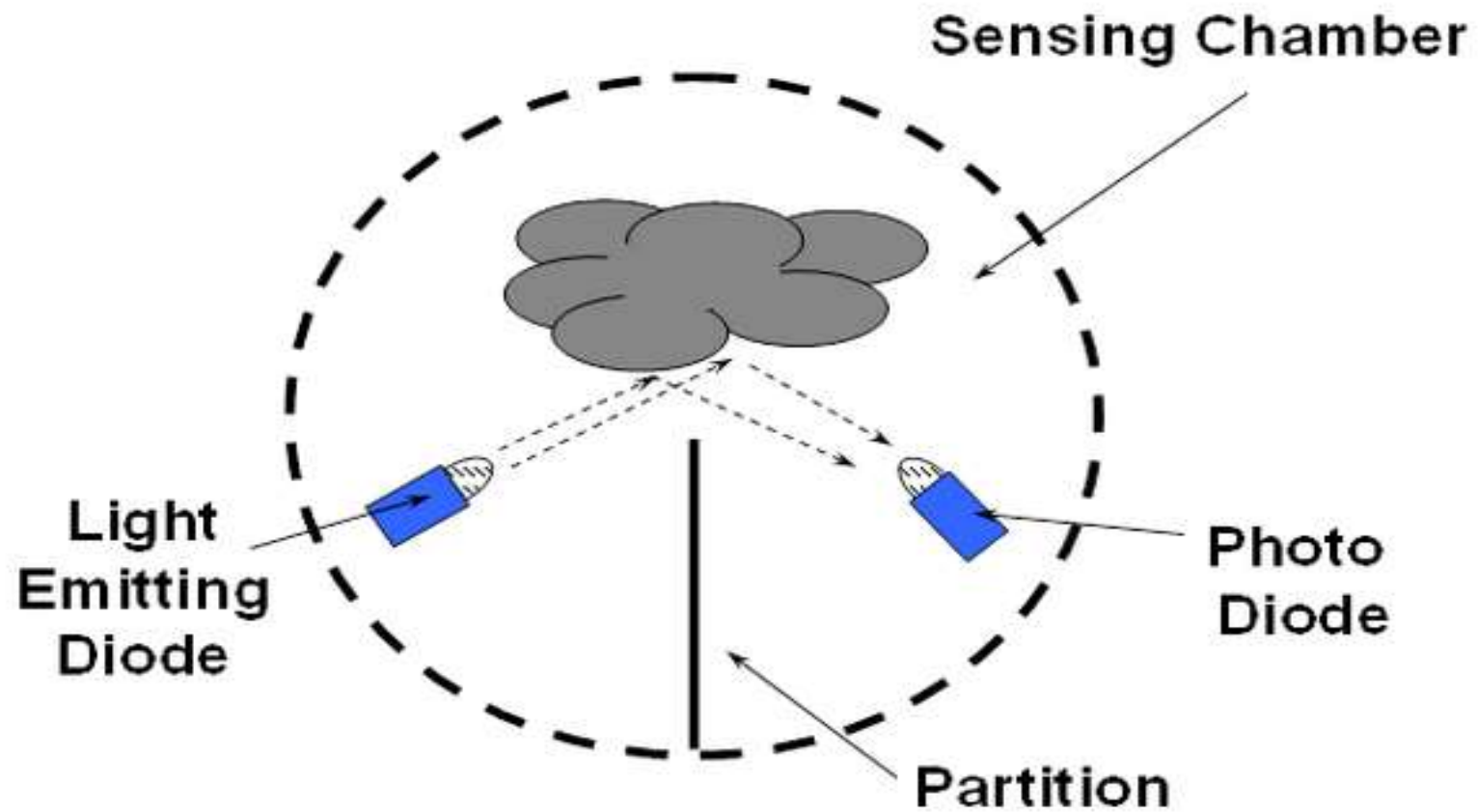
- The photoelectric type detector utilizes light as a detection mechanism.
- A **photoelectric**, or **optical**, **smoke detector** contains a source of infrared, visible, or ultraviolet light, a lens, and a photoelectric receiver (typically a photodiode).
- There are two types of photoelectric smoke detectors:
 - Light sensing(scattering)
 - Light obscuring(blocking)



LIGHT SCATTERING SMOKE DETECTOR

- Light scattering smoke detector depend on the ability of small airborne particles to scatter light.
 - The light emitted from the light source is not detected by the photo sensor.
 - When smoke particles enter in the chamber increases, more light is scattered toward the sensor.
 - When the concentration of particles reach the threshold, an alarm sound is produced.
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LIGHT SCATTERING SMOKE DETECTOR





LIGHT SCATTERING SMOKE DETECTOR

► Advantages of Light Scattering Photoelectric Smoke Detectors


- Sensitive to visual particles of smoke
- Detects smoldering low heat fires
- Provide early warning

► Disadvantages of Light Scattering Photoelectric Smoke Detectors

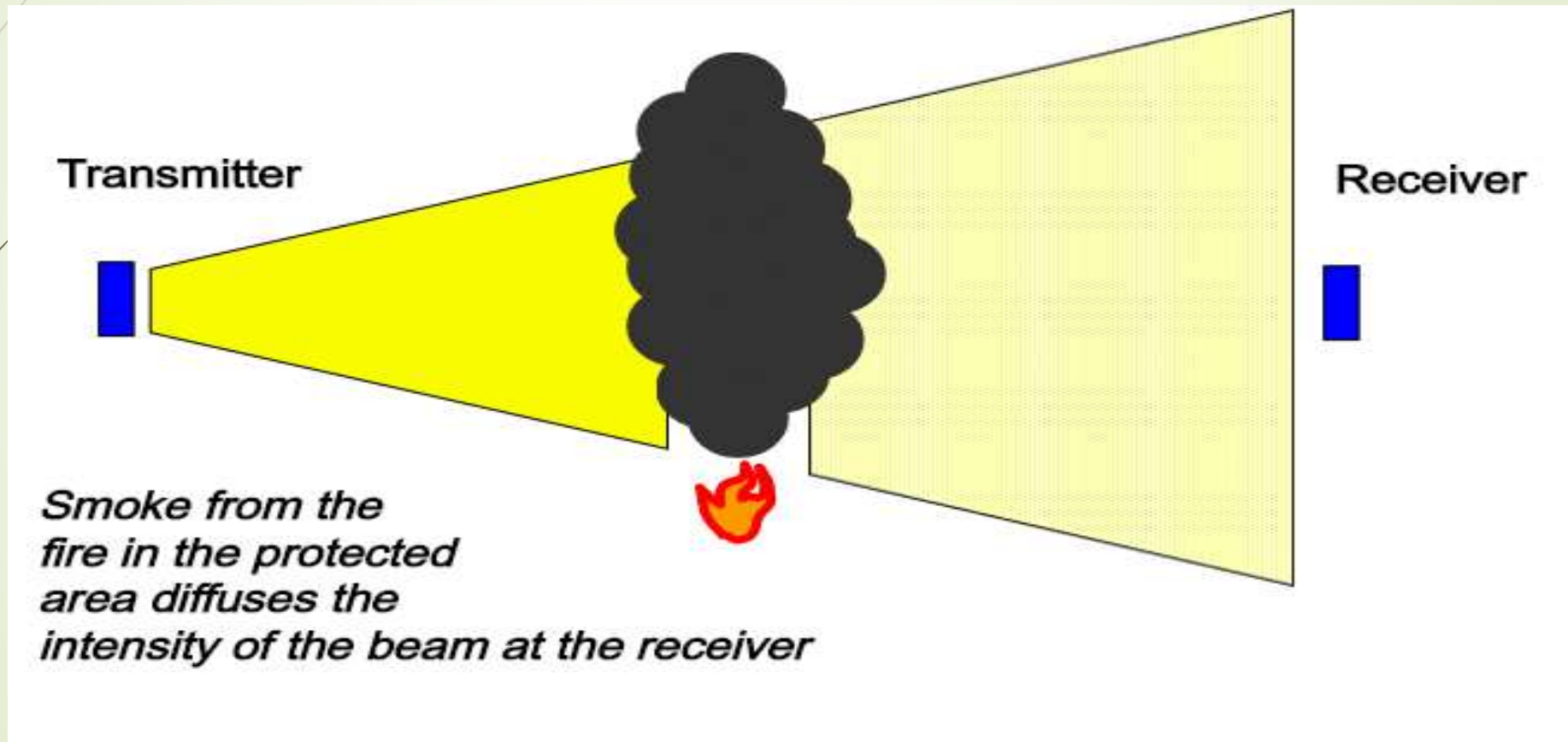
- Early contamination by dust causing reduced sensitivity
- Detects presence of smoke, not toxicity
- Must be cleaned on a regular basis
- Has a potential for high false alarm rate



LIGHT OBSCURING SMOKE DETECTOR (BEAM SMOKE DETECTOR)

- Beam smoke detectors are line-type photoelectric detectors consisting of a separate light source and photosensitive receiver. These devices are usually installed in large open areas where there is an unobstructed line of sight between the light source and the receiver and where the use of spot-type detectors would be economically unfeasible due to the number of detectors required.
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LIGHT OBSCURING SMOKE DETECTOR (BEAM SMOKE DETECTOR)





LIGHT OBSCURING SMOKE DETECTOR (BEAM SMOKE DETECTOR)

► Advantages of Beam Smoke Detectors

- Cover a large area economically
- Quick acting

► Disadvantages of Beam Smoke Detectors

- Unobstructed Loss between the light source and the receiver
- Correct alignment needs to be maintained
- Typical locations or hazards for beam detectors:
- High atriums
- Manufacturing spaces

WHICH IS BEST, IONIZATION OR PHOTOELECTRIC?

- According to a detailed study by the US National Institute of Standards and Technology: "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." Smoke detectors are trivially inexpensive compared to the cost of fire damage—and life, of course, is priceless. Although any smoke alarm is better than none, fit *both* types of detector if you possibly can.