Smoke Detector Applications and Testing Methods

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Introduction

- A hospital is like a city
  - Living areas
  - Machinery, high technology
  - Food prep/service
  - Retail, public spaces
  - Open spaces, parking
- Wide range of application challenges
- Similarity to other installations
Typical Applications

- Patient areas
- Living spaces
- Data rooms
- Kitchens, cafeterias
- Open spaces, atriums

Similar requirements to apartment buildings, hotels, offices, dormitories, and elderly care facilities
Patient Areas

- Fire detection requirements
  - Nuisance immunity
  - Addressability
  - Tamper resistance
  - Accessibility for testing and maintenance
Patient Areas

Multi-Criteria Detectors

- Combine multiple sensing technologies
- Quick response to real fires
- High level nuisance immunity

Ideal for areas where nuisance conditions are often present or mission critical activities are performed
Accurate Detection

Sensor elements work together to decide appropriate response
Similar Applications

- Frequent nuisance conditions
  - Dorm/hotel rooms (shower steam, cigarette smoke)
  - Industrial (welding)
  - Theaters (theater smoke)

- Zero tolerance for nuisance conditions
  - Finance
  - Data center
  - Medical facilities
Living Areas

Application requirements
- Accurate smoke detection
- Local annunciation of alarm
- General alarm annunciation

Similar to other living spaces such as hotels, dormitories, and apartment buildings
Living Areas

Sounder Base

- Provide local annunciation via direct connection to sensor head
- Eliminate additional devices and associated wiring, junction box, etc
- Smoke Alarm Application
1. Local event
   - Turn on local sounders
   - Volume = high
   - Tone = cont

2. General evac
   - Turn on all horns & strobes
   - Turn on all sounders
   - Volume = high
   - Tone = T3
   - Synchronize
Very Early Warning Detection
Data Rooms

Application Requirements

◦ High-value equipment and data protection through point location of alarm
◦ Detect smoke dispersed by high air velocity with high sensitivity and high airflow tolerant chamber design
◦ Open area and duct smoke detection

Other areas are data rooms for telecommunication centers or server farms for Internet companies.
Air Aspiration Approach

- Aspirated smoke detectors – air sampling
- One central detector – high sensitivity
- Air is sampled via pipes in protected area
  - air is filtered before reaching detector
High Sensitivity Laser Spot Detector

- Provides Very Early Warning Fire Protection as per NFPA 76

- Coverage:
  - 900 square feet “Standard Coverage”
  - 400 square feet coverage for “Mission–Critical” Environments
  - 200 square feet coverage for high air movement areas
A laserdiode is used to deliver ultra-high sensitivity
- 0.02% to 2.0% per foot
- 100 times more sensitive than a standard photoelectric smoke detector

Advanced algorithms eliminate most false and nuisance alarms
Data Rooms

Laser Duct Smoke Detector

- Ideal where high air velocity / high air changes per hour exist
- May be mounted directly to machinery and air handling equipment
Mounted Within Server Cabinet
Air Return Layout

Spot Type Detectors

Aspiration Sampling Pipe
Air Return Layout

Spot Laser Smoke Detectors

High-Sensitivity Duct Detector with up to 12’ Sampling Tube
**Open Spaces**

- **Application requirements**
  - Provide proper protection for large, open areas
  - Provide coverage at an affordable cost
  - Eliminate the interference or unsightliness of spot detection in open spaces

**Areas include atriums, churches, airports, gymnasiums, auditoriums, theaters, and malls**
Ceiling height affects

- **Accessibility** for maintenance and testing.
- **Stratification** – when smoke reaches the same temperature of the surrounding air, it stops rising.
- **Dissipation** – The higher the ceiling, the more smoke can dissipate by the time it reaches the detector.
Beam Type smoke detectors are a versatile and cost-effective solution for open area environments.

- Keep clear of reflective ceilings (12”–18”) but also other structural or mechanical obstructions.
- Consider the effects of incident light from skylights or overhead windows, especially as seasons change.
Smoke from the fire in the protected area diffuses the intensity of the reflected beam at the receiver.
Practical locations for Beam use?

- Areas with high ceilings
  - atriums, churches
- Large, open areas
  - warehouses, garages
- Mount detector on stable mounting surface
Annual Inspections

- Each detector shall be:
  - Visual inspected for cleanliness
  - Tested for operation with smoke or simulated smoke
Each detector shall be:
- Tested to ensure that it is operating within the rated sensitivity

Sensitivity may measured with
- Manufacturers recommended test equipment
- Directly from control units capable of providing that data through software
- Third party calibrated equipment
Duct Detectors should be located in a straight area between 6 and 10 duct widths from any return openings, sharp turns or connections in the duct.

Detectors may be mounted on inlet or outlet ducts, depending on the monitoring purpose or code requirement.

When the duct detector's Alarm or Supervisory LED is not visible to responding personnel, a remote alarm or supervisory indication shall be provided.
AIR DUCT TYPE SMOKE DETECTORS

- Where air duct type smoke detectors cannot be installed in the main supply duct, they shall be installed in each of the branch lines as close as practical to the supply fan downstream of the mixing box, filters and fan.
- Figure 24
Where air duct type smoke detectors cannot be installed in the main supply duct, they shall be installed in each of the branch lines as close as practical to the supply fan downstream of the mixing box, filters and fan.

- Figure 24
5.4.4 Air Duct Smoke Detectors

- Inspected and tested to confirm operability
- Rated for the air duct size and installed correctly for the air duct system
- The positive air flow and/or differential pressure at the sampling tubes is within the manufacturer’s specified limits
5.4.4 Air Duct Smoke Detectors

- The positive air flow and/or differential pressure at the sampling tubes is within the manufacturer’s specified limits.
Thank You!

Questions?