

Linear Heat Detection by



Agenda



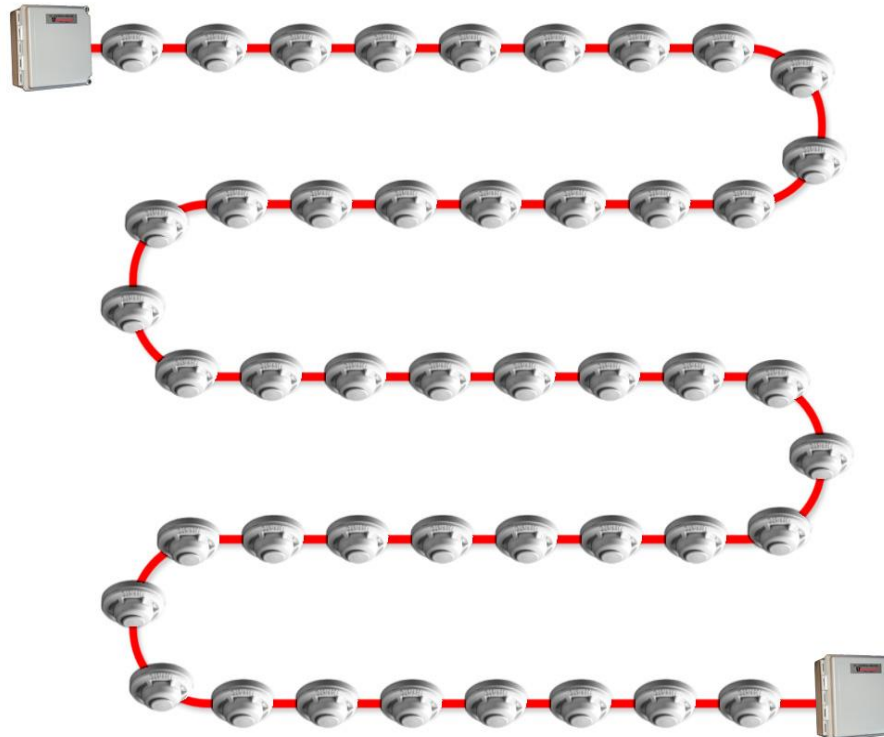
- 1 Analog and Digital Linear Heat Detectors
- 2 Fiber Optic and Thermocouple Linear Heat Detectors
- 3 Applications
- 4 Q&A Wrap up



Digital Linear Heat Detector was invented and patented in Pembroke, MA by Gerald Holmes of The Protectowire Company in 1938. Protectowire is both UL Listed and FM Approved for the past 70 years.

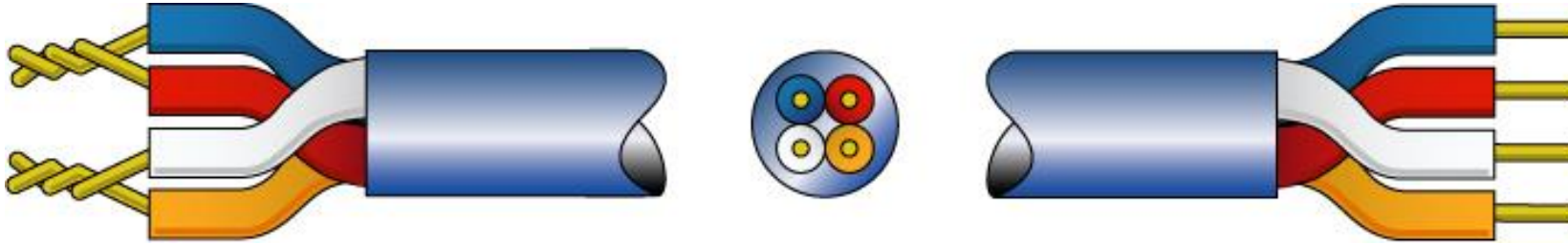
What is a Linear Heat Detector?

- LHD is a continuous heat detector capable of detecting heat anywhere along its length and often described as a continuous chain of individual spot heat detectors.
- The sensor cable is comprised of either two or four conductors, all individually insulated by heat sensitive polymers.



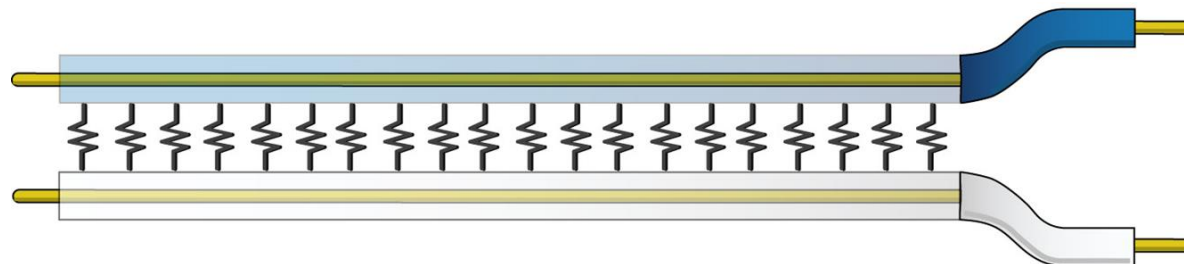
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Analog Linear Heat Detection

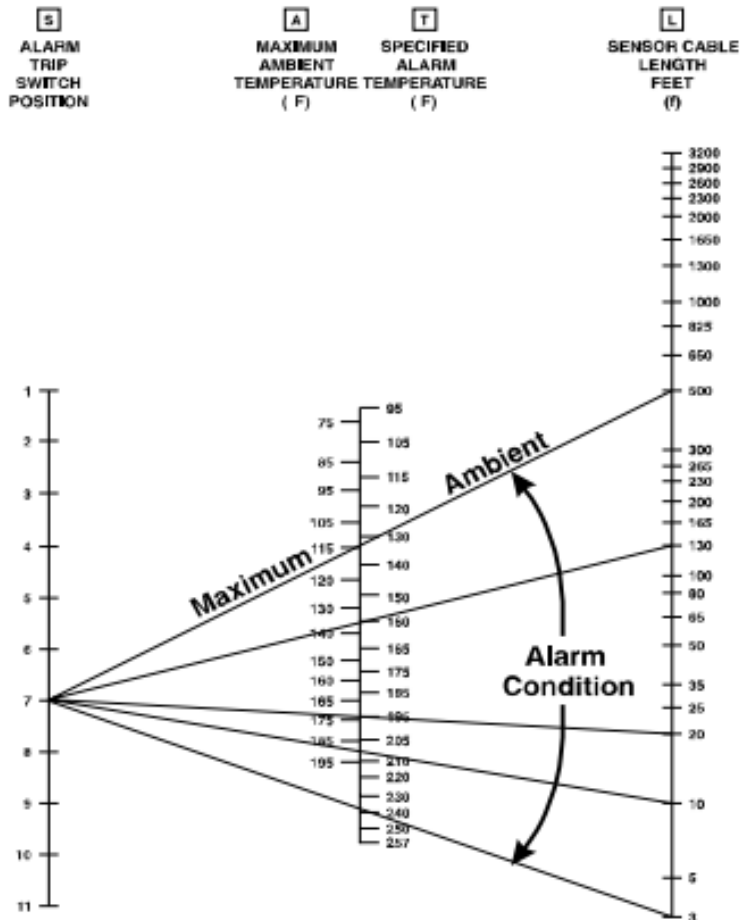


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- This type of detector is traditionally comprised of (2) wires coated in a negative temperature coefficient designed to detect temperature change and (2) supervisory wires to monitor the loop.
- As the negative temperature coefficient polymer coated around the conductor heats up, the resistance then decreases to allow more current flow.
 - The interface module monitors the circuit for a change in resistance. A large enough decrease in resistance causes the module to indicate an alarm.



Analog Linear Heat Detection



- Slight ambient temperature changes can have the same effect as large localized temperature changes.
- For example the following conditions would all trigger an alarm condition on a detector with a maximum ambient temperature of 115°F:
 - 500 feet of detector at 135 °F
 - 130 feet of detector at 160 °F
 - 20 feet of detector at 195 °F
 - 10 feet of detector at 210 °F
 - 3 feet of detector at 240 °F

Analog Linear Heat Detection



- Proprietary interface units are compatible with any FACP
- Interface units are available in (2) wire or (4) wire configurations
- Requires calibration if/when ambient temperature changes
- Technology does not allow for alarm point location
- Product is considered restorable up to 250 °F
- Length per zone: up to 500 feet
- Difficult to splice

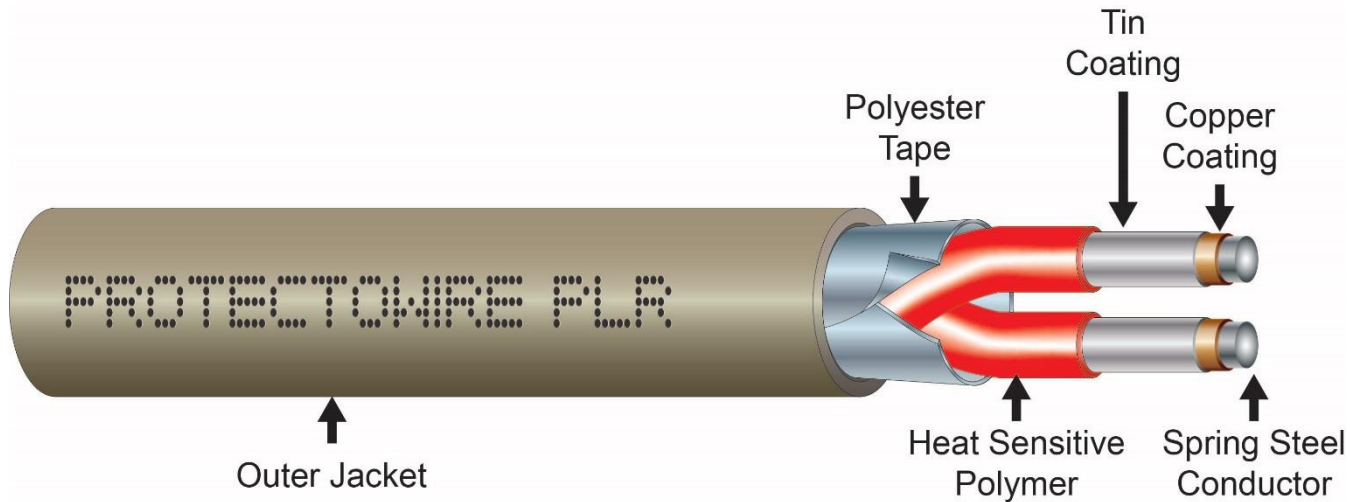
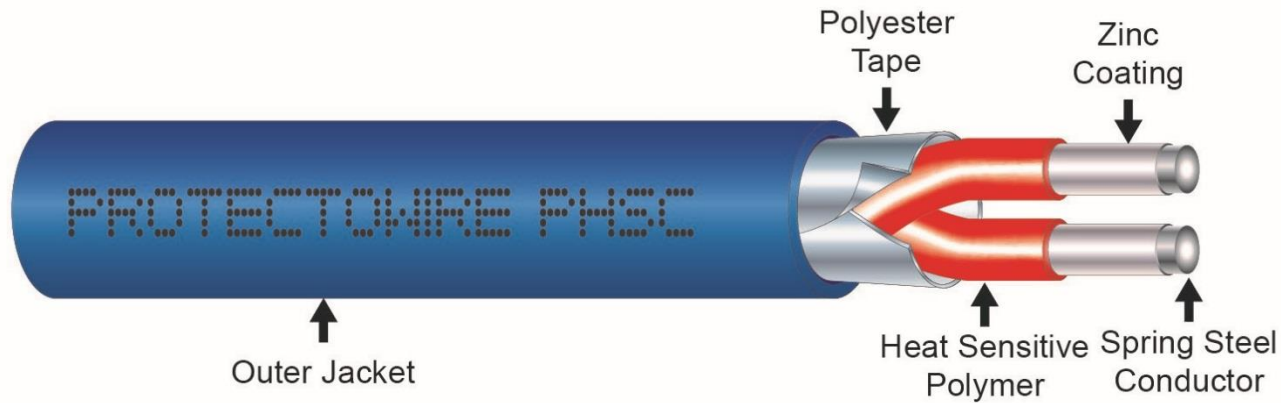


→ NFPA 2016 Section 14. Table 14.4.3.2 Test Methods

Initiating Devices – (d) Heat Detectors

Fixed-temperature, rate-of-rise, rate-of compensation, restorable line, spot type (excluding pneumatic tube type): Perform heat test with a heat source or in accordance with the manufacturer's published instructions. Assure that the test method for the installed equipment does not damage the nonrestorable fixed-temperature element of a combination rate-of-rise / fixed-temperature element detector.

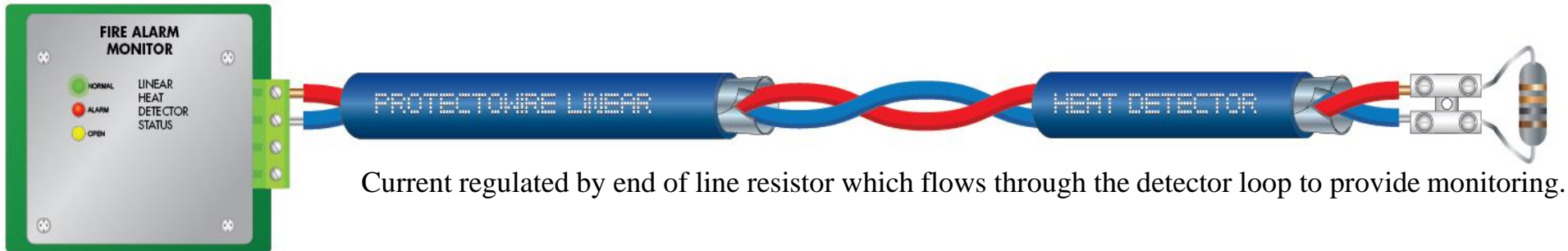
Digital Linear Heat Detection



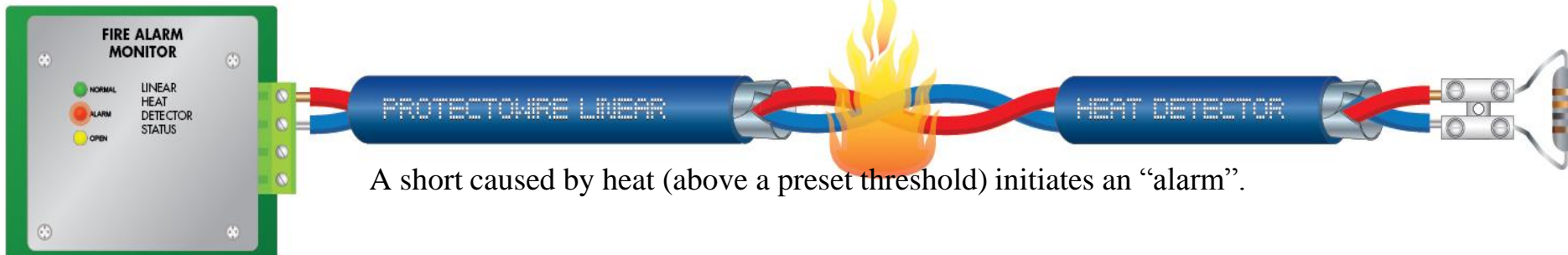
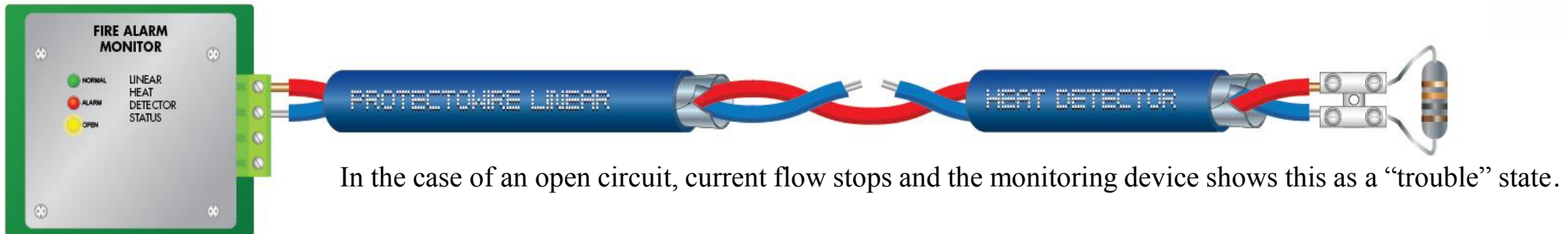
- Digital LHD is supervised by a conventional initiating device circuitry.

Digital Linear Heat Detector Operation

(Three conditions of digital linear heat detection)



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Digital Linear Heat Detection

- This technology does not require proprietary interface units
 - Detector is a contact device
- Calibration is not necessary for ambient temperature changes
- Alarm point location is possible
- Non restorable detector
- Length per zone: up to 10,000 feet
- Easy to splice



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→ NFPA 2016 Section 14. Table 14.4.3.2 Test Methods

Initiating Devices – (d) Heat Detectors

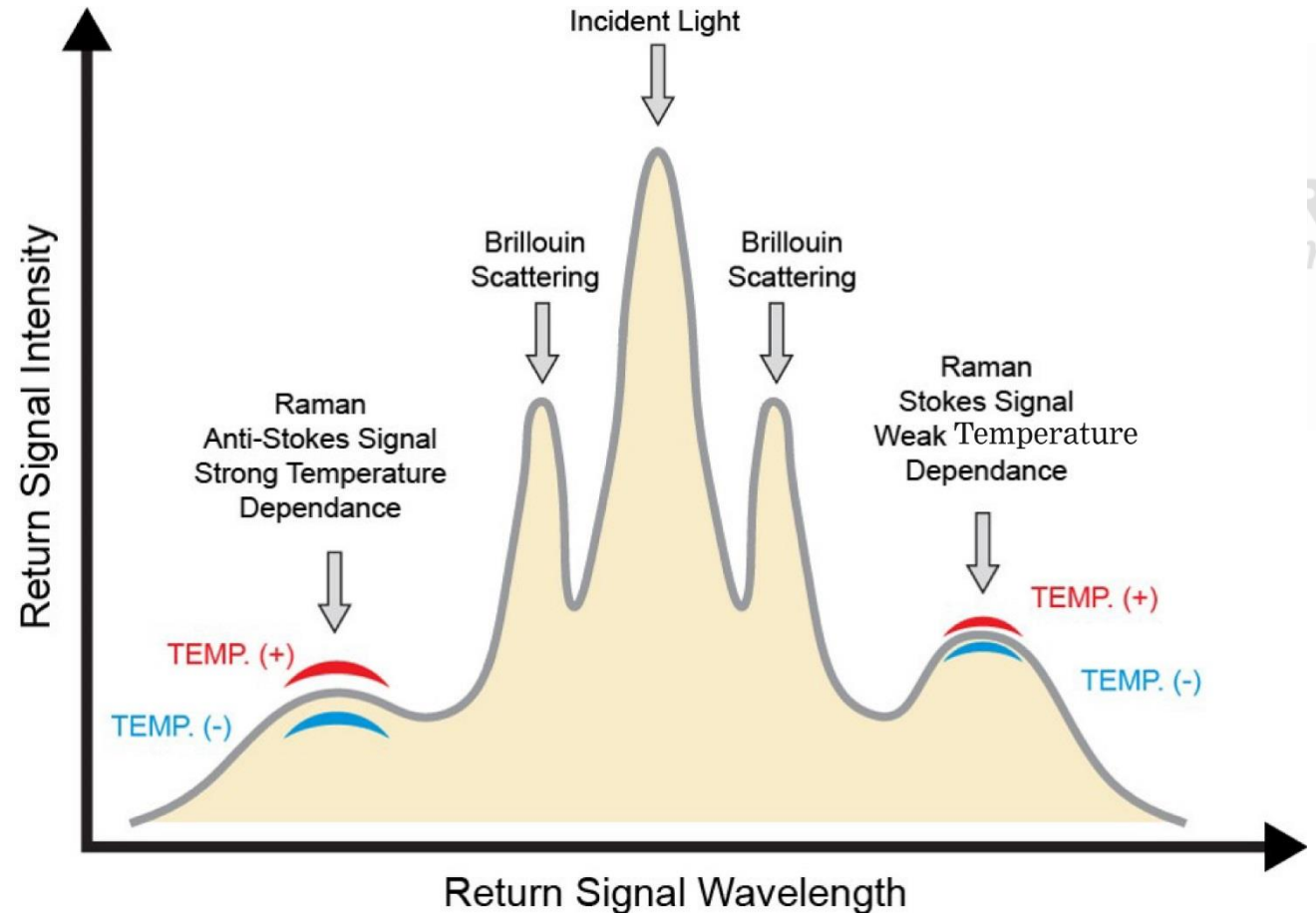
Fixed-Temperature, Non-restorable Line Type: Do not perform heat test. Test functionality mechanically and electrically. Measure and record loop resistance. Investigate changes from acceptance test.

Fiber Optic Linear Heat Detector



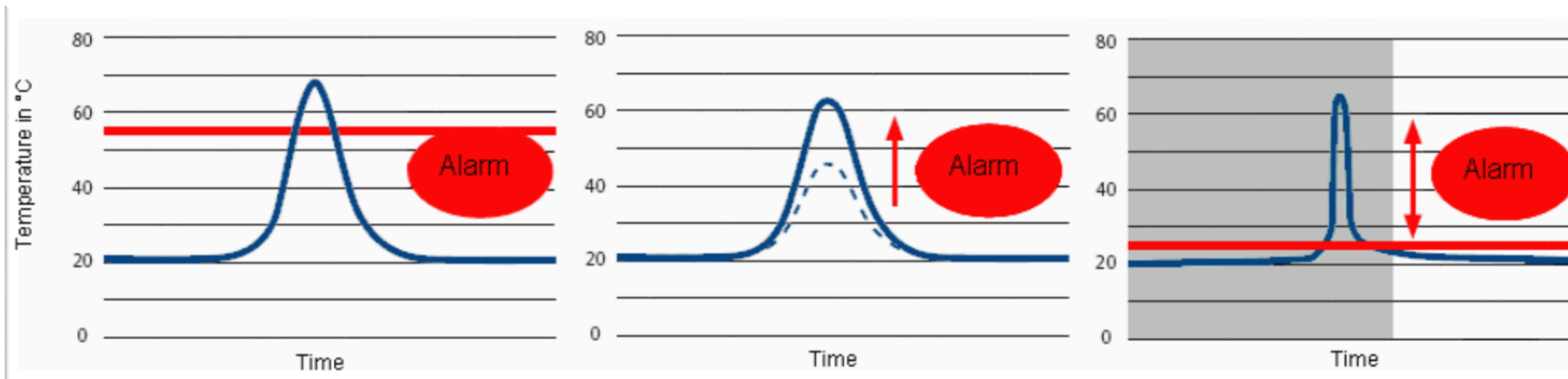
Fiber Optic Linear Heat Detector

- A unique programmable linear heat detection system
- Immune to EMI and RFI
- Functions on the principals of back scattered light from a laser beam pulse sent down the fiber cable
- The fiber controller calculates the temperature using the ratio between the stoke and anti-stokes frequency bands
 - Stokes – temperature independent
 - Anti-Stokes – temperature dependent
- Capable of detecting changes as small as one degrees Celsius per minute (~ 2 °F).



Fiber Optic Linear Heat Detector

- Technology allows for multiple partitions within a single channel
- Different alarm criteria in the same or multiple partitions
- Range 1, 2, 4, 6, 8, 10 km per channel
- Number of measurement channels: 1, 2 or 4 (up to 10, 8, 6 km/channel respectfully)
- Spatial resolution: 1M – 5M adjustable



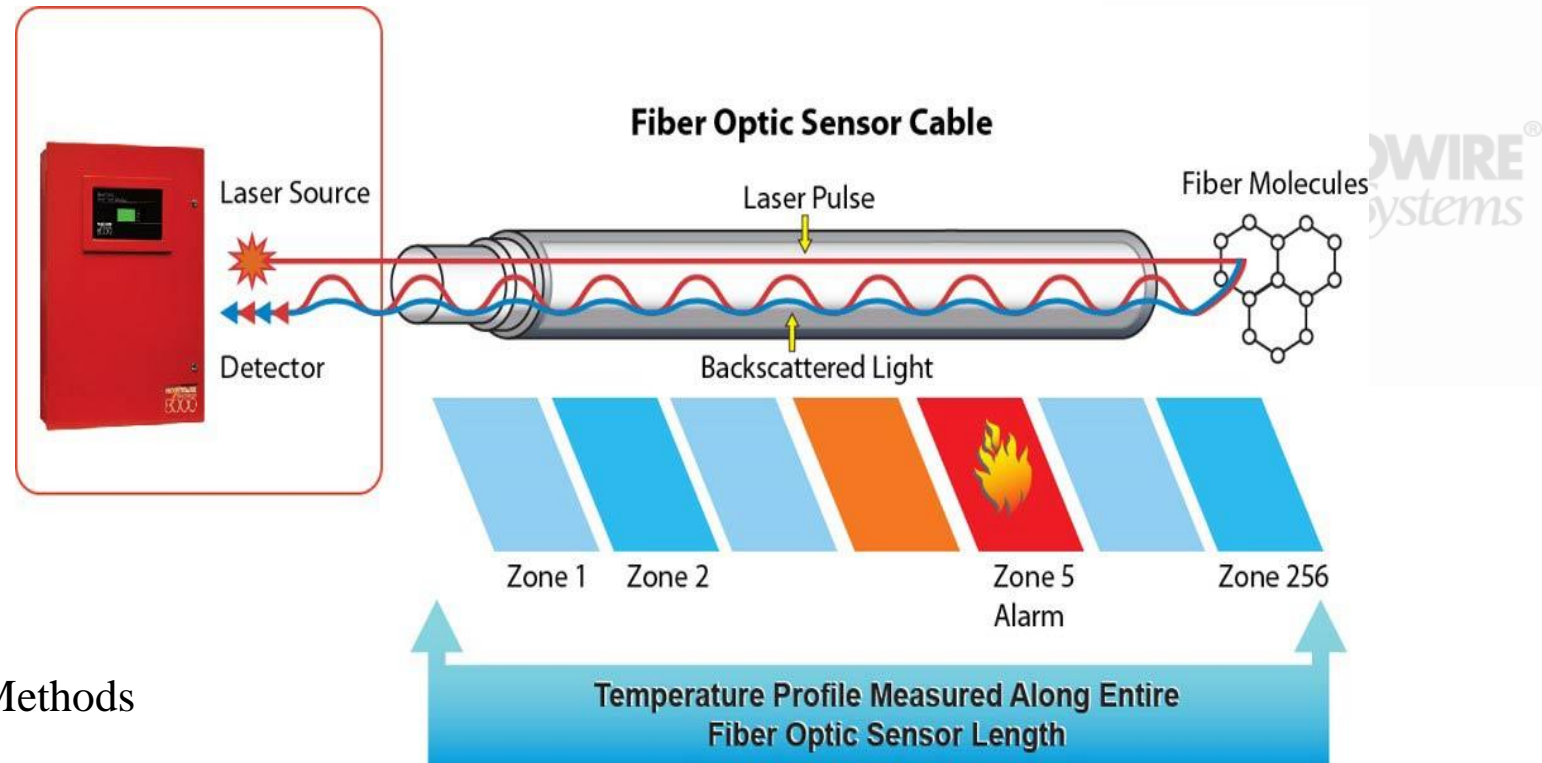
Exceeding maximum
temperature

Exceeding defined rate-of-
rise

Deviance from zone
average
(adaptive maximum)

Fiber Optic Linear Heat Detector

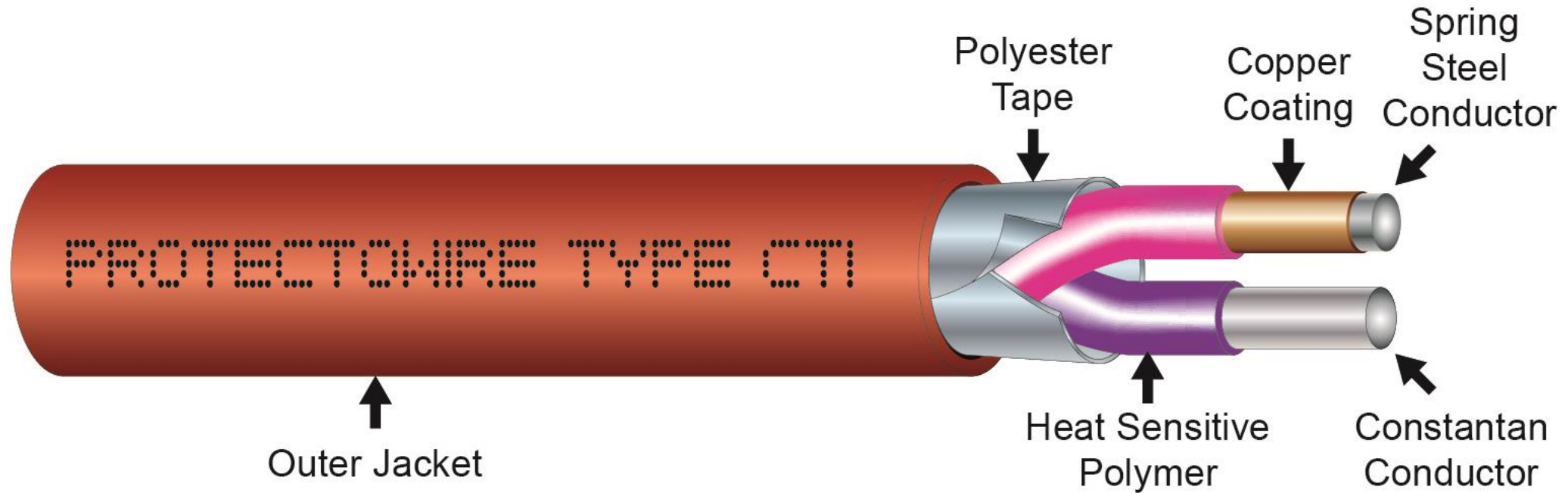
- Fiber controllers are (4) wire devices compatible with any FACP
- Extensive calibration is required during installation and setup
- Alarm point location is possible
- Restorable up to 235 °F
- Length per channel: up to 32,808 feet (10km)
- Fusion splicing only – minimize line loss



→ NFPA 2016 Section 14. Table 14.4.3.2 Test Methods
Initiating Devices – (d) Heat Detectors

1. Fixed-temperature, rate-of-rise, rate-of compensation, restorable line, spot type (excluding pneumatic tube type)
2. Fixed-Temperature, Non-restorable Line Type

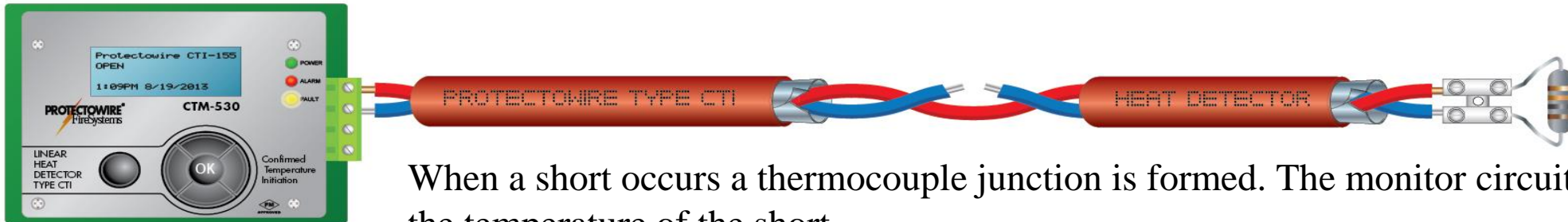
Digital Thermocouple Linear Heat Detector



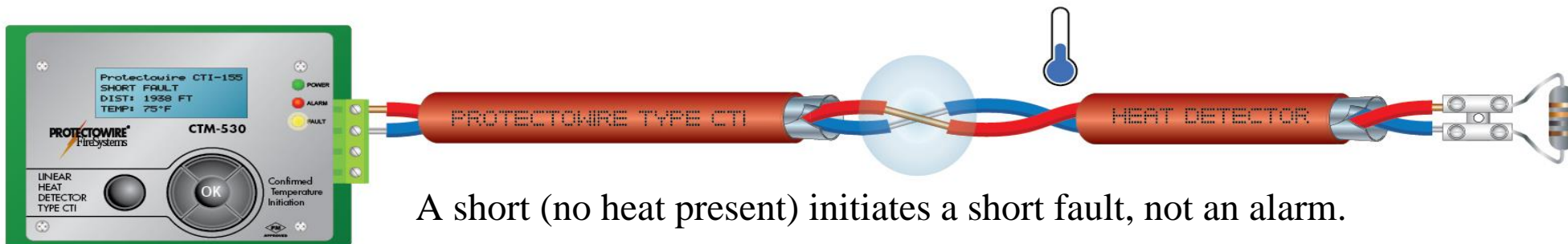
- The Digital Thermocouple Linear Heat Detector is constructed of a twisted pair of dissimilar metal spring conductors (copper coated and constantan) coated with a heat sensitive polymer designed to soften at a specific temperature.

Digital Thermocouple Linear Heat Detector

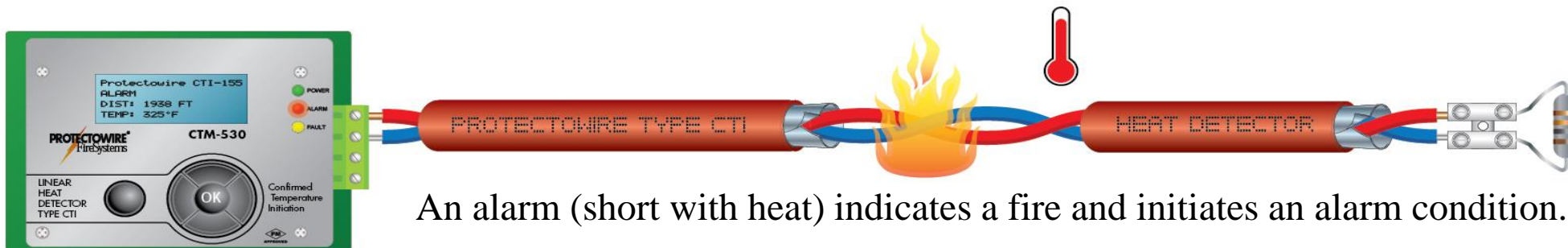
* Normal condition not shown (green LED).



When a short occurs a thermocouple junction is formed. The monitor circuit measures the temperature of the short.



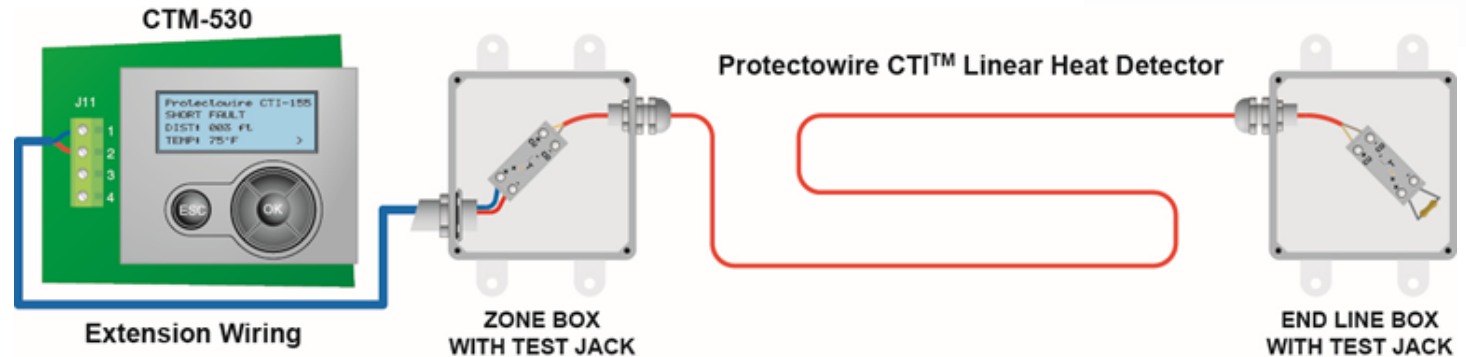
A short (no heat present) initiates a short fault, not an alarm.



An alarm (short with heat) indicates a fire and initiates an alarm condition.

Digital Thermocouple Linear Heat Detector

- Digital thermocouple technology offers short circuit discrimination
 - Mechanical damage (short at ambient temperature) = short fault/trouble
 - Heat actuation (detector reaches meets or exceeds fixed temperature) = alarm
- Module is 4-wire device compatible with any FACP
- Calibration is not necessary for ambient temperature changes
- Alarm point location and temperature confirmation are provided as standard features
- Non-restorable detector
- Lengths per zone: up to 4,000 feet (1200 m)
- Easy to splice



→ NFPA 2016 Section 14. Table 14.4.3.2 Test Methods

Initiating Devices – (d) Heat Detectors

Fixed-Temperature, Non-restorable Line Type: Do not perform heat test. Test functionality mechanically and electrically. Measure and record loop resistance. Investigate changes from acceptance test.

Questions to Ask When Applying LHD

- What type of application are you protecting?
 - Commercial
 - Industrial
- What environmental conditions are present?
 - Bases, acids, solvents, hydrocarbons, dust, oil, water
- Interior or exterior application?
- Is this a classified hazard?
- What will the maximum ambient temperature be?
 - Including seasonal temperature fluctuations



If answered YES, to one or more then LHD should be considered for your application.

Linear Heat Detectors

Conditions	*CTI	*CTI-X	PHSC-EPC	PHSC-XCR	PHSC-XLT	PLR-R	Fiber
Interior Application	✓	✓	✓	✓	✓	✓	✓
Exterior Application		✓		✓		✓	✓
UV Stabilized Outer Jacket	✓		✓			✓	✓
Naturally UV Resistant Outer Jacket		✓		✓			
Chemical Resistance	✓		✓		✓	✓	
High Chemical Resistance		✓		✓			✓
Abrasion / Vibration Resistance		✓		✓			✓
Cold / Refrigerated Storage	✓		✓		✓		
Requires Protectowire Interface Equipment	✓	✓					✓
Low Resistance LHD						✓	
Simple to Splice	✓	✓	✓	✓	✓	✓	
Fixed Temperature Detection	✓	✓	✓	✓	✓	✓	✓
Rate of Rise Detection							✓
Real time Temperature Monitoring							✓
Detection for a Suppression System	✓	✓	✓	✓	✓	✓	✓

* Thermocouple LHD is designed to discriminate between a short and an alarm.

Applications

POWER



- Cooling Towers
- Cable Trays
- Conveyors
- Transformers
- Electrical Apparatus
- Solar Panels

WAREHOUSES



- Refrigerated Storage

PETRO CHEMICAL



- Fuel Storage
- Liquid Fuel Storage Tanks
- Wet Benches

SELF STORAGE



- Self Storage Facilities

NEW CONSTRUCTION/ RENOVATION



- Temporary Protection

ANIMAL HOUSING



- Barns and Stables

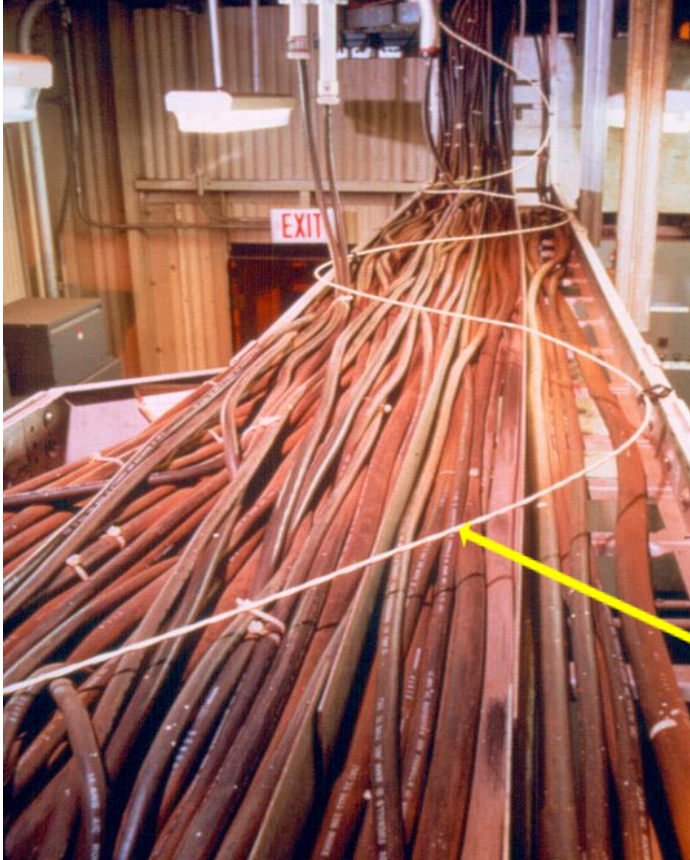
TRANSPORTATION



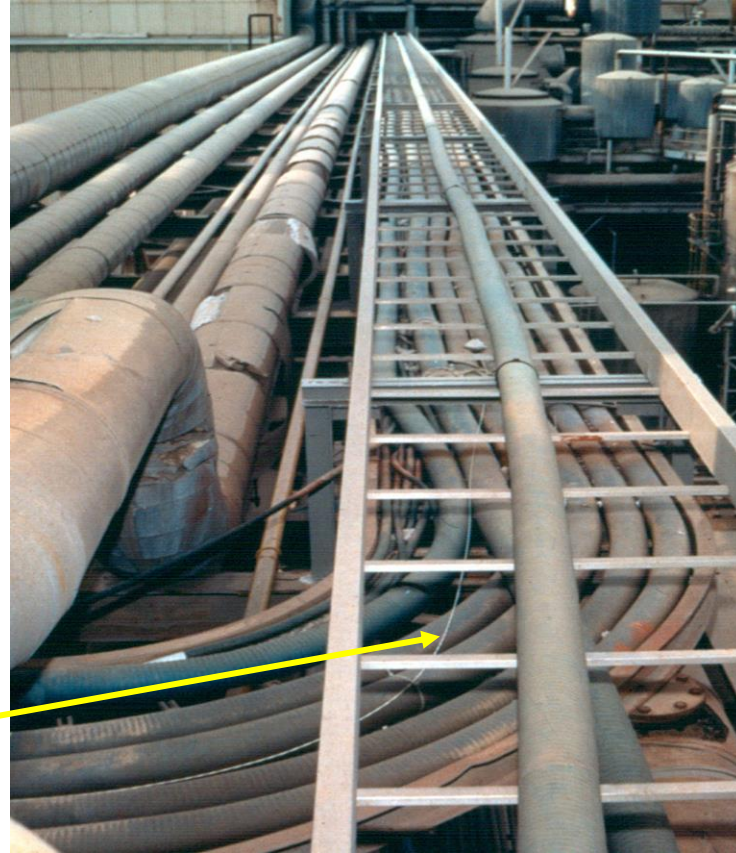
- Hangars & Terminals
- Tunnels
- Metro Systems
- Industrial Machinery
- Bridges
- Platforms
- Vehicle Systems

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Cable Trays



Linear Heat
Detector

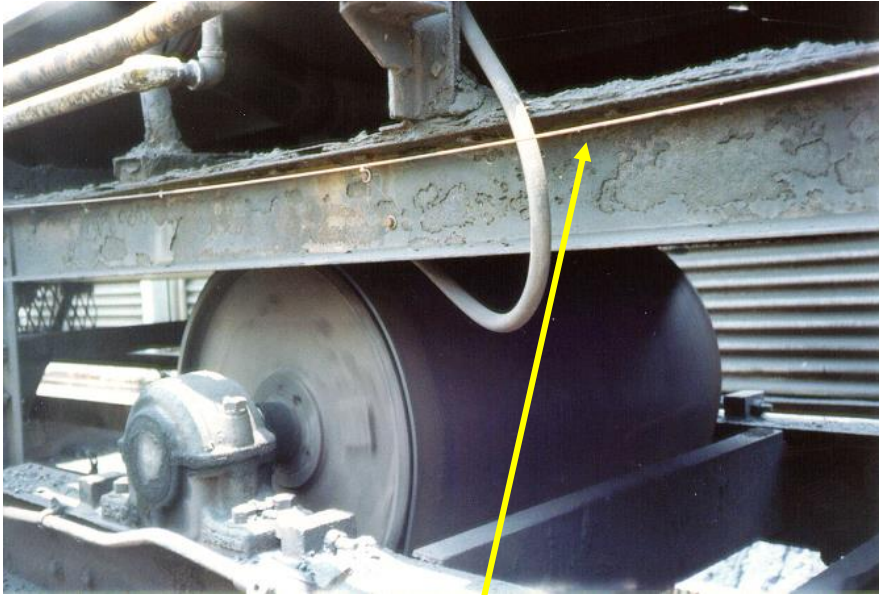


- Extended Runs
- Early overheating protection
- Transition from horizontal to vertical runs
- Provides coverage in limited access or restricted areas

- Proximity coverage
- Alarm point location



Conveyors



Linear Heat Detector

- Proximity location enables quick detection
 - Friction from belt slippage
 - Bearing failure
 - Maintenance work nearby - welding
- Robust detector, suitable for harsh elements



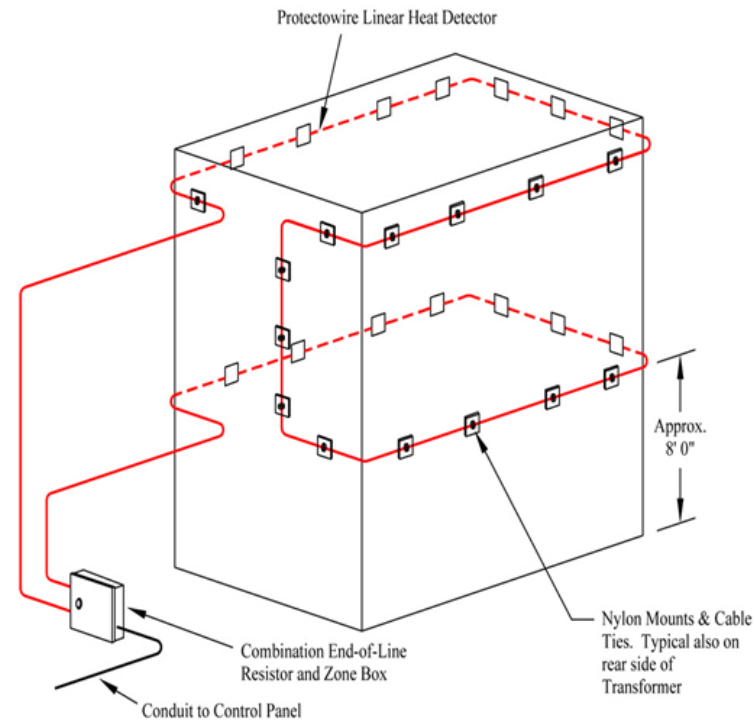
- Can be installed inside covered conveyors with messenger wire
- Detector can be used to activate deluge systems and equipment shutdowns

Transformers



Linear Heat Detector

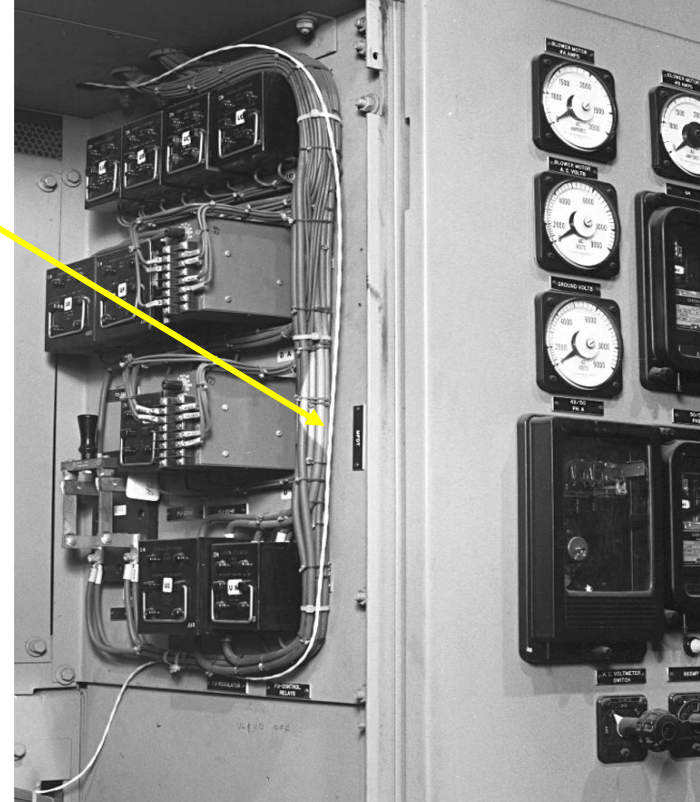
- Mounted directly to the deluge/sprinkler system
- Proximity detection
 - Easy installation & testing
- Multiple runs
 - Pre-alarm & alarm
- Weather resistant
- Detect overheating allowing for equipment shutdown



Electrical & Engine Compartments



Linear Heat
Detector

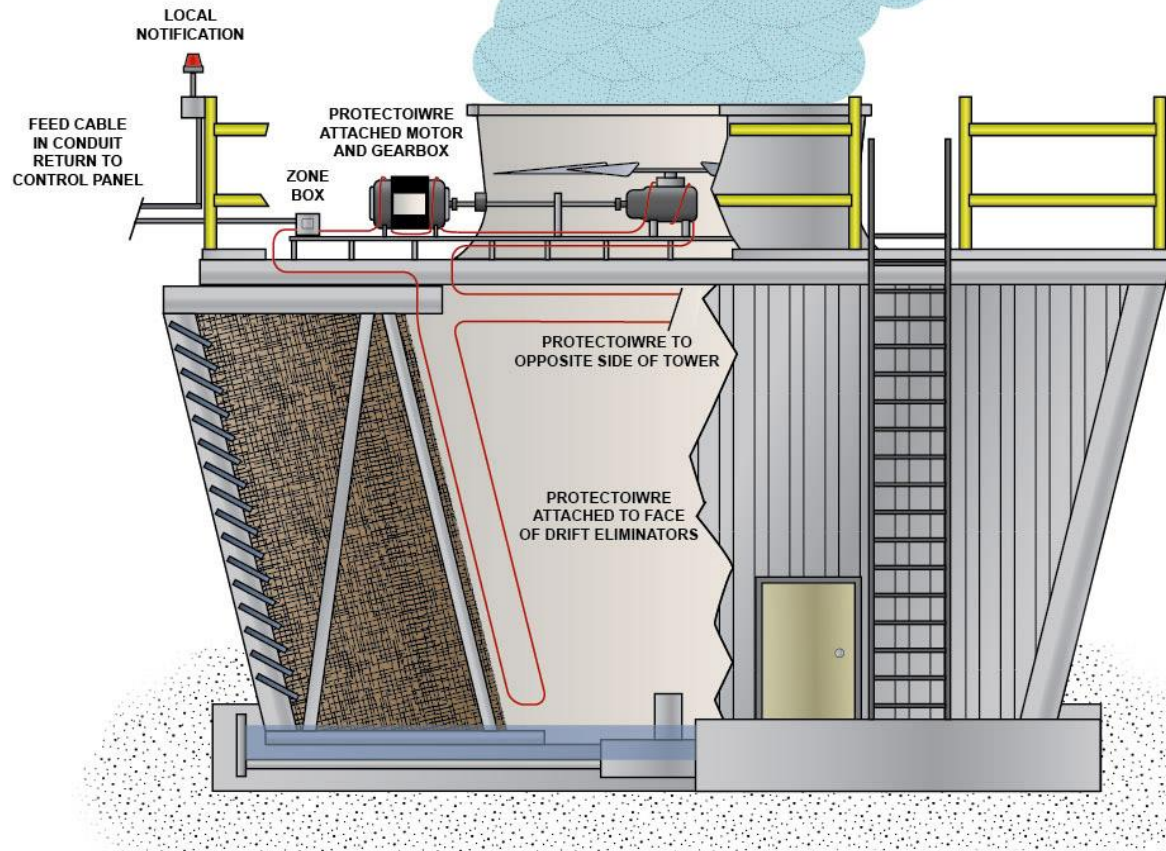


- Compatible with 12V vehicle systems
- LHD flexibility allows for proximity detection and installation versatility
- Low maintenance and rugged

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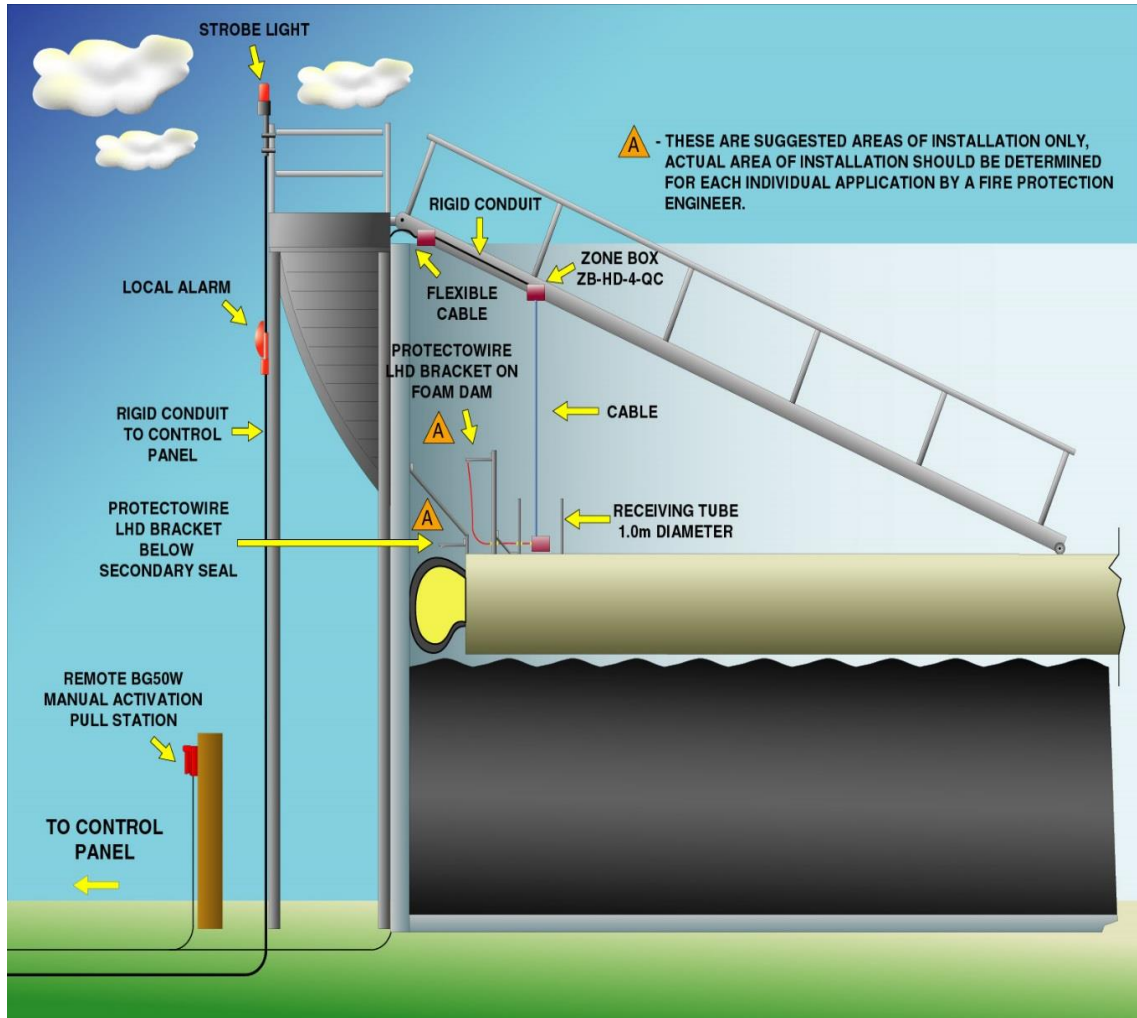
Cooling Towers

- Suitable for harsh environments
- Place detector around fan motor & wood fill
- Absolutely NO splices



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Floating and Fixed Roof Tank



- Simple – cost effective means of detection
- Intrinsically Safe installation
 - Hazardous/classified locations
 - Class B Configuration
- Reliable performance
- Stainless steel mounts suggested
- Retractable cable available supports LHD

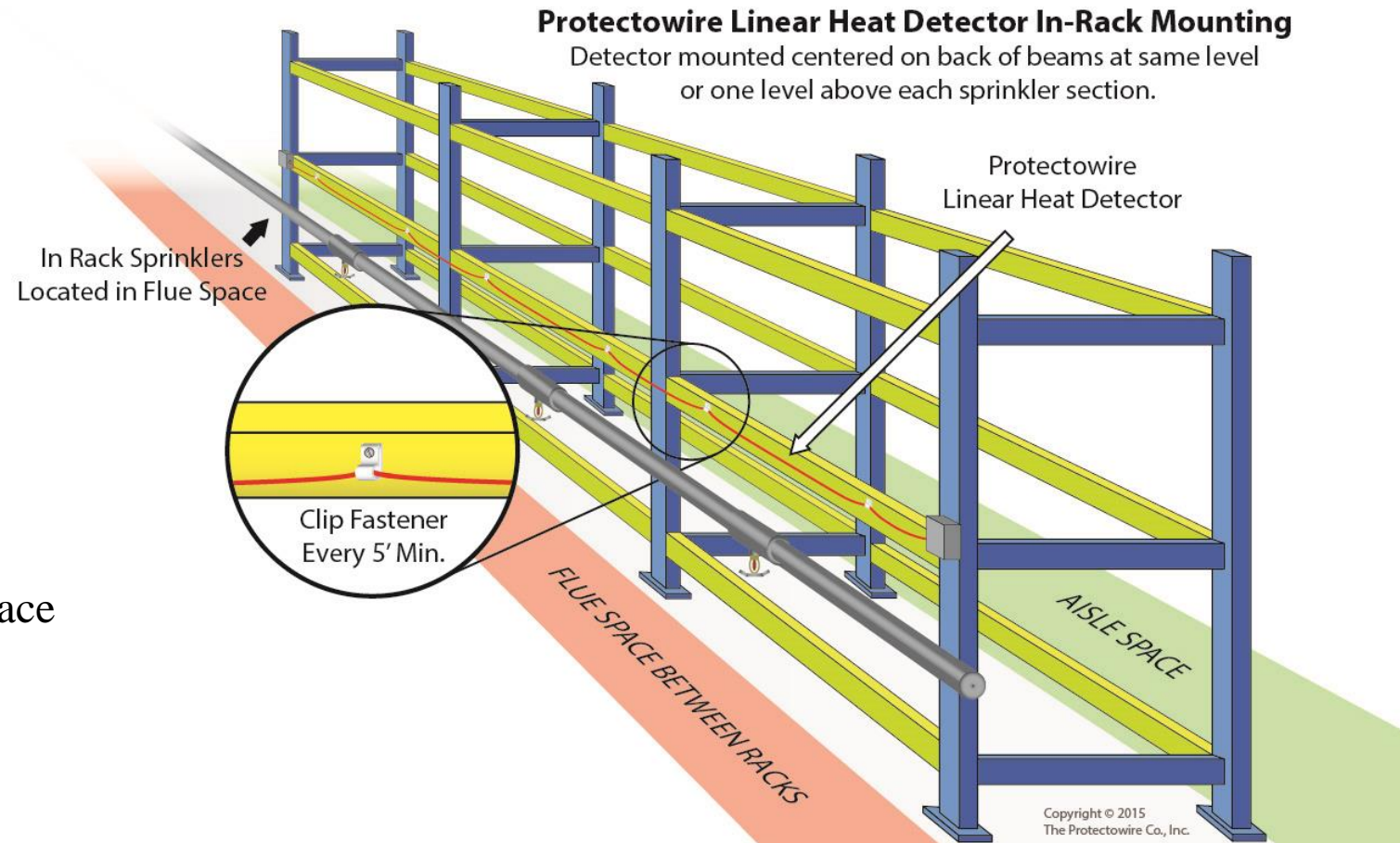
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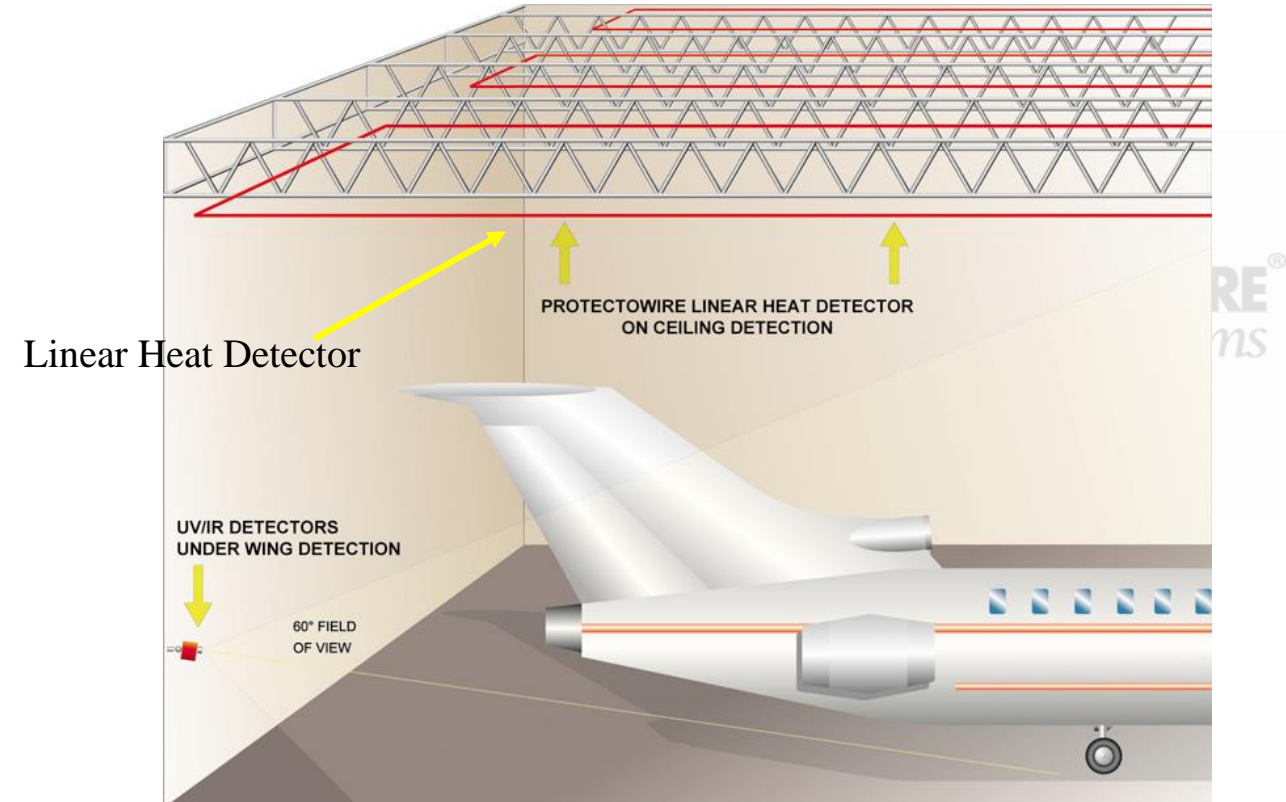
Refrigerated/Warehouse Storage



- Install detector on the load beam in the flue space
- Great application for thermocouple LHD
- NEVER mount to in-rack sprinkler pipes



Aircraft Hangars



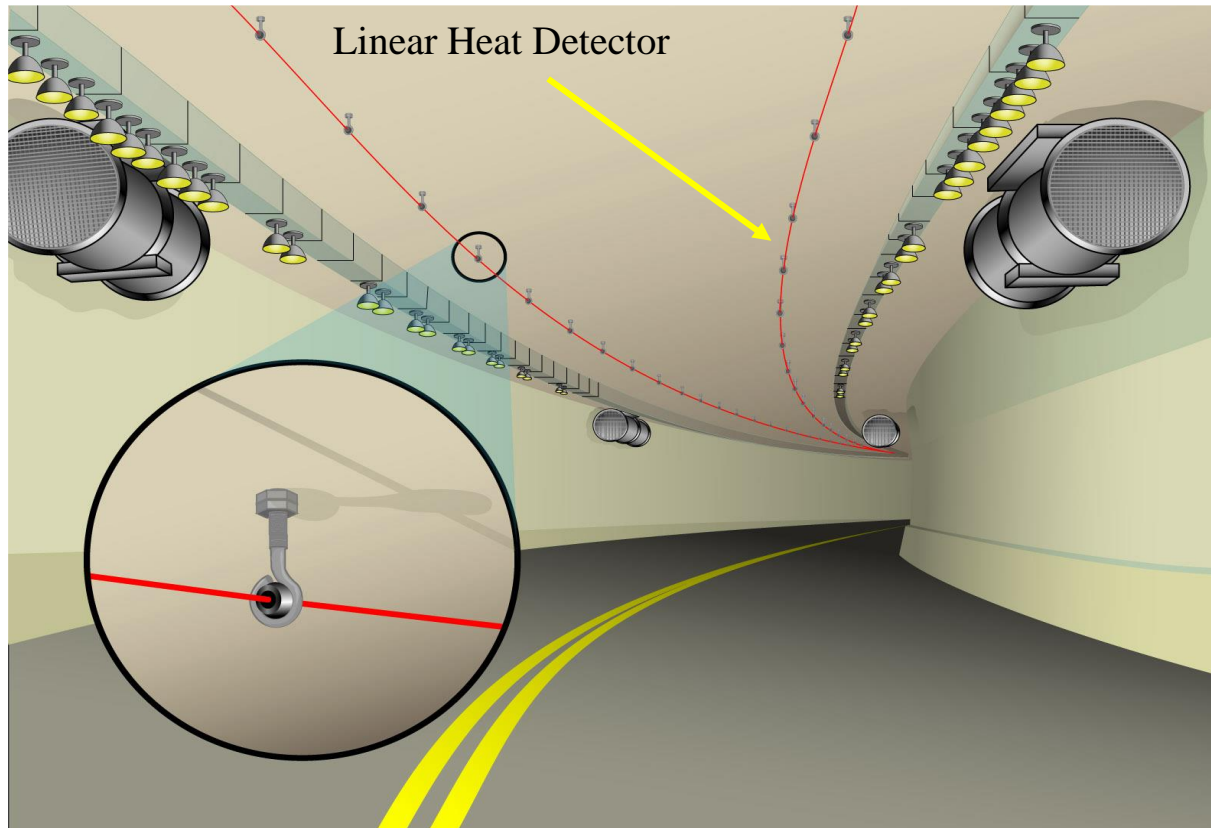
- Follow manufacturers listed spacing and NFPA requirements
- Bring the EOL junction box down to convenient level for easy testing or wire Class A
- LHD is easy to install and maintain
- Fixed temperature detector is immune to rapid temperature changes

Aircraft Hangar False Alarms



- Short circuit discrimination minimizes false activations

Tunnel Applications



- Perfectly suited for long runs of LHD
- Resistant to corrosive gases/exhausts
- Easy to install/maintain and test
- Potential application for messenger wire
- Alarm point location is required per NFPA 502

New Construction & Renovation



Linear Heat
Detector

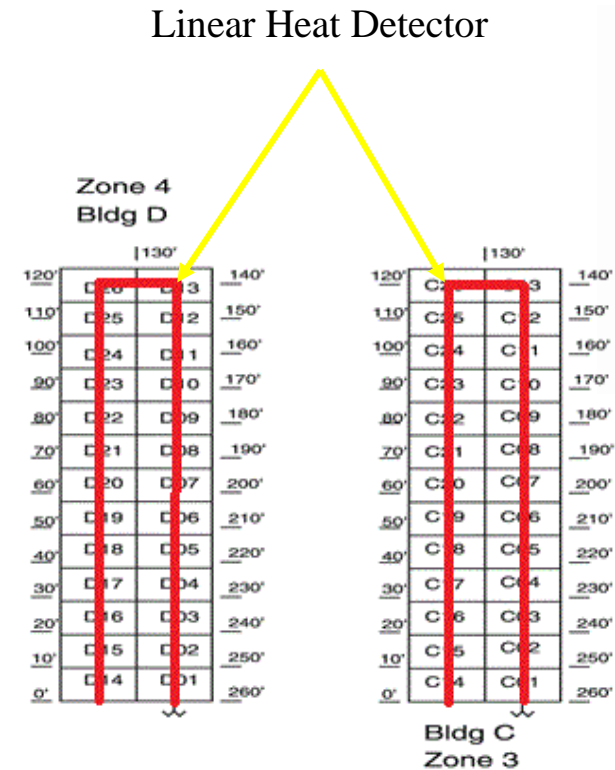


- Temporary protection
- Easy installation, cost effective solution
- Compatible with an existing FACP
- Thermocouple LHD ideal for construction zones

Self Storage Facilities

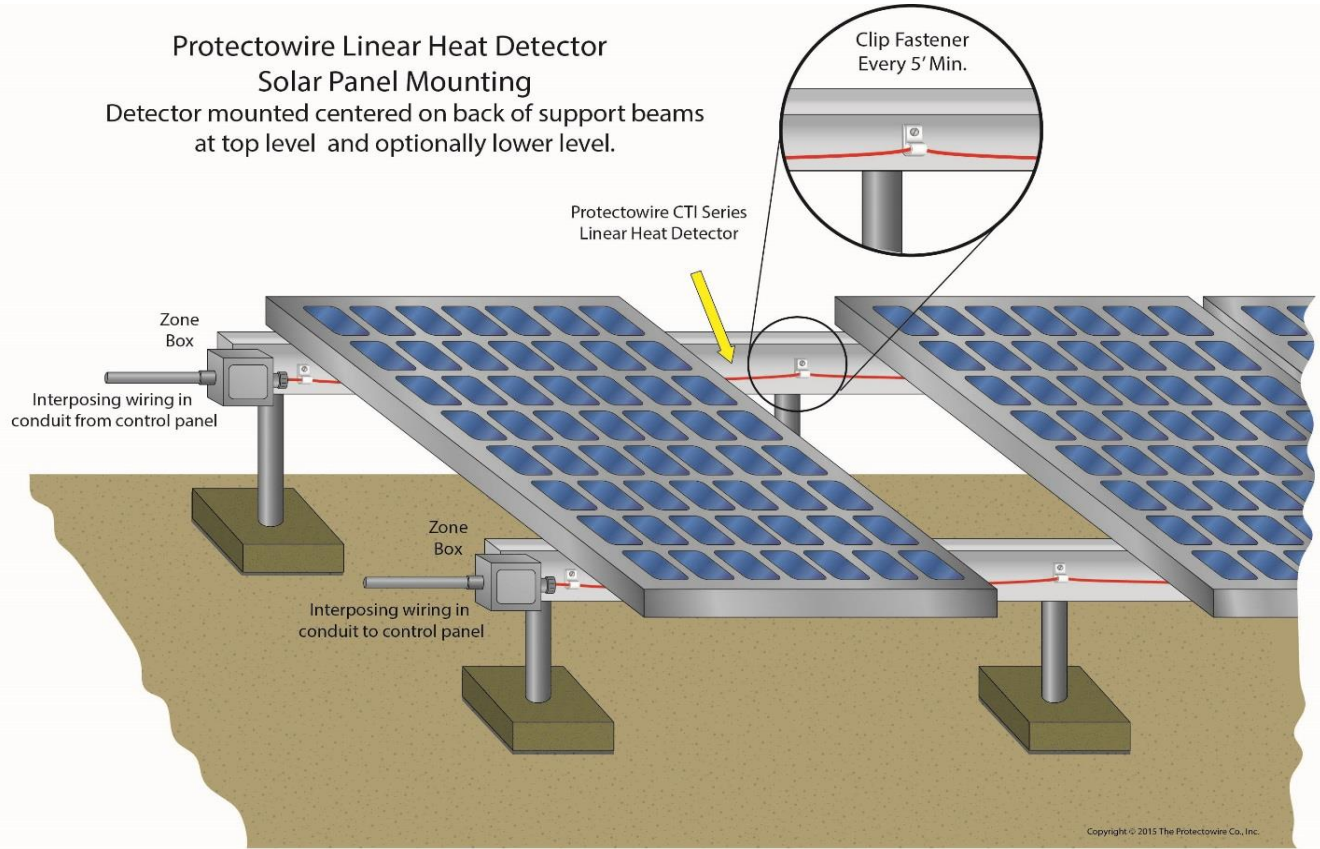


- Easy testing – no privacy invasion
- Continuous coverage
- Alarm point location allows for hot spot identification
- Low maintenance

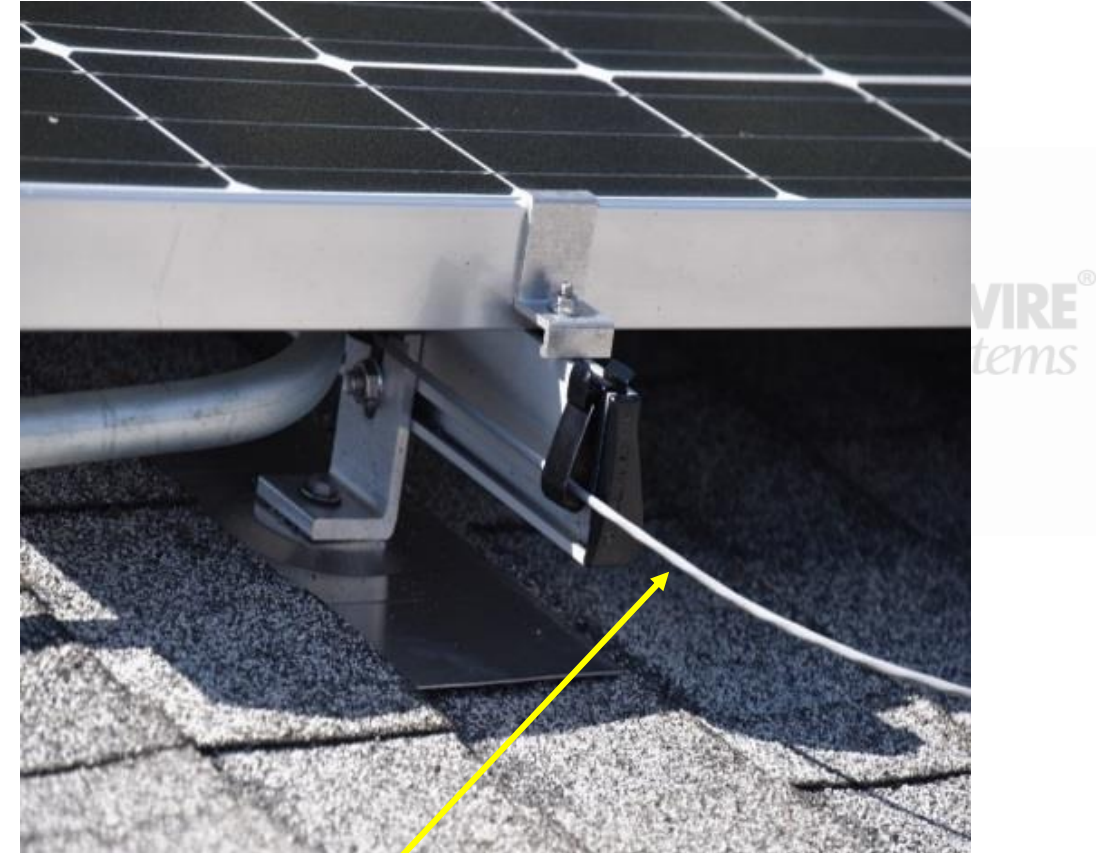


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Solar Panels



- Flexible proximity detection
- Zone mapping necessary
- Early detection
- Alarm point location
- Thermocouple LHD is recommended



Linear Heat
Detector

Property Protection - Fences



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- Outdoor non invasive protection
- Used for vineyards, farms, other types of property protection
- Simple testing and maintenance
- Extended coverage runs

Unique Applications – Inflatable Dome



- Owner switched to a fiber optic system as previous system was experiencing frequent lightning strikes

More Unique Applications

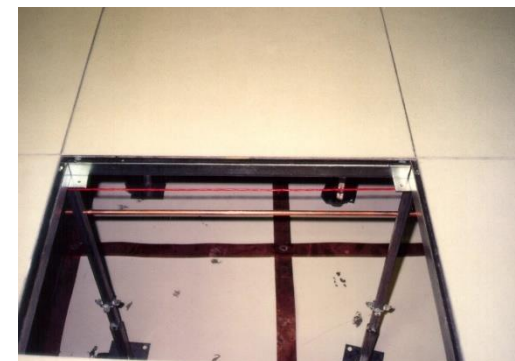
- Iconic towers
- Railroad trestles
- Subfloors
- Interstitial spaces
- Historic covered bridges
- Religious institutions
- Concealed spaces



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- Extended service life
- Ease of testing – hard to access installations
- Reliable performance
- Proximity detection





The first name in linear heat detection.

Please contact info@protectowire.com if you have any questions.

