Linear Heat Detectors in Cable Tray Applications

Application Guide

Kidde Fire Systems

INTRODUCTION

Fires in Cables and Cable Trays are generally caused by overheating due to electrical faults, welding, etc. Factors such as the presence of coal dust (especially in coal-fired power plants), oil spills or oil soaked rags accentuate the problem. When the cable starts to burn, it has the opportunity to ignite adjacent cables on the tray. Within a relatively short period of time, the fire can spread to the adjacent cables, ultimately destroying the cable tray, its support structure, and potentially the entire cable vault.

One of the keys to preventing such catastrophic fires lies in early detection of the overheat condition. A fast acting and reliable detection system can be achieved with the detector mounted in close proximity of the cable tray or preferably, in physical contact with it. The ability to be placed in physical contact with the cable tray being protected makes Linear Heat Detection (LHD) more responsive than traditional point-type ceiling-mounted detectors. Its inherent flexibility makes it possible for the Linear Heat Detection sensor to be attached to the cable tray support structure.

Kidde provides two choices of Linear Heat Detectors: (a) Shorting type LHS™ Linear Heat Sensor Cable (LHS) and (b) Integrating type AlarmLine™.

LHS is a fixed temperature sensor whose special insulation melts at its specific alarm temperature and allows its two conductors to short together and create an alarm condition at the fire control panel.

AlarmLine is an integrating type system that consists of the AlarmLine sensor cable and an Interface module. The cable is constructed with a negative temperature coefficient material, where a change in temperature results in an exponential decrease in resistance of the sensor. The interface module interprets this resistance change and provides an output to a control panel once the field programmable alarm set point is exceeded. AlarmLine is typically used when features such as programmable alarm threshold, pre-alarm, short-circuit trouble discrimination and ability to reset after overheat condition are required.

LHD OPERATION

As the cable or cable tray overheats beyond the alarm temperature of the LHD sensor used, it generates an alarm condition at the Fire Alarm Control Panel. The Fire Alarm Control Panel then activates the appropriate Suppression System to extinguish or suppress the fire.

LOCATING LHD IN CABLE TRAYS

It is recommended that the LHD be installed in a serpentine manner across the cable tray and supported on alternating sides as shown in Figure 1.
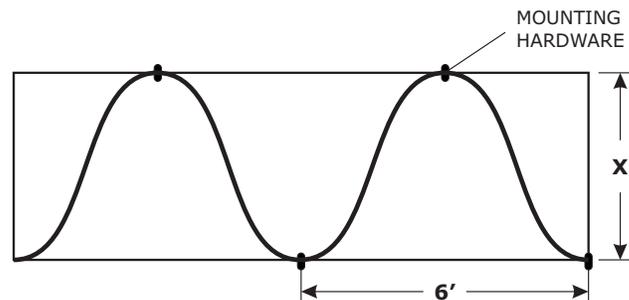

Figure 1. Layout for Cable Tray

The length of LHD required for a tray of known width can be estimated using the following table:

Table 1. LHD Cable Length Estimating Chart

Cable Tray Width (ft/m)	Multiplier x Cable Tray Length
4.0 (1.25)	1.75
3.0 (1.00)	1.50
2.0 (0.60)	1.25
1.5 (0.50)	1.15

For multi-tiered cable trays, it is further recommended that, as a minimum, the LHD be placed on the top and bottom tray and on alternate trays in between, as shown in Figure 2. For enhanced sensitivity, the LHD can be placed on every tray in the tier.
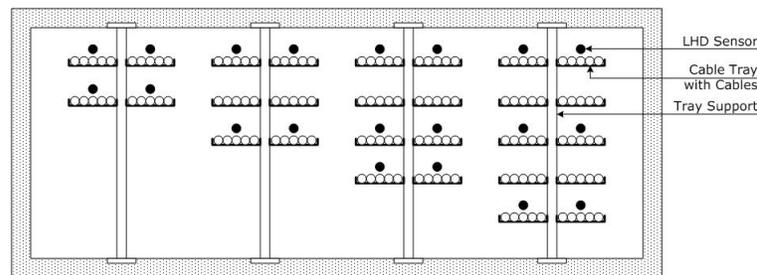

Figure 2. Typical Arrangement for Multi-Tiered Cable Trays

The cable vault should be segmented into a number of detection zones, each with its required length of LHD. The number of zones can be determined based on the length of the cable vault, the number of cable trays, the number of tiers in each cable tray and the length of LHD required to accommodate crossovers and termination.

CONVENTIONAL LHD SYSTEM

A Conventional LHD System may be employed for systems where a small- to medium-sized cable gallery is being protected. The Kidde AEGIS™ Panel is recommended for systems requiring Notification, Suppression control, Annunciation and auxiliary functions such as breaker tripping, emergency power, HVAC control, etc. A Conventional Linear Heat Detection System using the AEGIS may consist of:

*   Kidde AEGIS FACP:
    *   Microprocessor based conventional Fire Alarm-Suppression control panel with 3 detection, 1 manual release, 1 abort and 2 supervisory inputs and 3 notification, 2 agent release and 4 relay outputs
*   LHD zones:
    *   Up to 3 detection circuits each with a maximum of 860 feet (262 m) directly wired LHS, OR
    *   Up to 3 detection circuits each with a number of 4-Wire AlarmLine Modules (limited only by wiring resistance and source of 24 VDC for the module), each 4-Wire module with a maximum of 3,280 feet (1,000 m) AlarmLine
*   Other Input Devices:
    *   Conventional smoke detectors, water-flow switches, manual releases, etc., as required.

INTELLIGENT LHD SYSTEM

An Intelligent LHD System is recommended for multi-zone applications where fire zone location requires zone output control for Notification, Suppression control, Annunciation and auxiliary functions such as breaker tripping, emergency power, HVAC control, etc. *It is the preferred design method over traditional multi-zone conventional, hard-wired linear heat detection and provides the added benefit of zone output control, text location indicator and installation cost savings.* An Intelligent Linear Heat Detection System using the ARIES-based FACP may consist of:

* ARIES™ or ARIES NET*Link*™ FACP:
    * Microprocessor based intelligent Fire Alarm-Suppression control panel with:
        * 1 Signaling Line Circuit (255 addresses) for ARIES
        * Up to 8 Signaling Line Circuits (2,040 addresses) for ARIES NET*Link*
* Addressable LHD zones:
    * SmartOne Addressable Input Modules (AI) each with a maximum of 860 feet (250 m) directly wired LHS Series cable, or
    * SmartOne Addressable AlarmLine Module (AAM) each with a maximum of 3,280 feet (1,000 m) directly wired AlarmLine cable
* Other Input Devices:
    * SmartOne smoke detectors, water-flow switches, manual releases, etc., as required.
* Other Output Devices:
    * SmartOne Addressable Output Modules (AO), Remote Release Modules (RRM), Addressable Signal Modules (ASM), etc., as required.

Zoning is simple and easy with the Kidde Intelligent Linear Heat Detection System. Each LHD zone is created with an Addressable Input Module (AI) interfaced with up to 860 feet of directly wired LHS Sensor cable OR an Addressable AlarmLine Module (AAM) each with a maximum of 3,280 feet (1,000 m) AlarmLine. Up to 255 addressable devices (any mix including addressable LHD zones, Smoke Detectors, Manual Pull Stations, Waterflow switches, etc.) can be connected to each Signaling Line Circuit.

ADDITIONAL INFORMATION

Additional information on all the Linear Heat Detection System components mentioned in this guide can be found at www.kiddefiresystems.com

* LHS™ Sensor Cable (Data Sheet # K-73-201)
* AEGIS™ Conventional Fire Alarm-Suppression Control Panel (Data Sheet # K-84-100)
* ARIES™ Intelligent Fire Alarm-Suppression Control Panel (Data Sheet # K-77-157)
* ARIES NET*Link*™ Intelligent Fire Alarm-Suppression Control Panel (Data Sheet # K-76-800)

ORDERING INFORMATION

ALARMLINE™ LINEAR HEAT DETECTOR – SENSOR CABLES	
73-117068-X13	AlarmLine Sensor - Standard (X = 0 for 656 ft, 200 m roll & = 1 for 3280 ft, 1,000 m roll)
73-117068-X16	AlarmLine Sensor - Nylon Coated (X = 0 for 656 ft, 200 m roll & = 1 for 3280 ft, 1,000 m roll)
73-117068-X19	AlarmLine Sensor - Bronze Braided (X = 0 for 656 ft, 200 m roll & = 1 for 3280 ft, 1,000 m roll)
73-117068-041	AlarmLine Sensor Heat Pad
ALARMLINE™ LINEAR HEAT DETECTOR – INTERFACE MODULES	
73-100001-003	Addressable AlarmLine Module (AAM)
73-100003-001	NEMA 4 Enclosure for Addressable AlarmLine Module
73-117068-046	Conventional 4-Wire AlarmLine Interface Module with Relay and Enclosure
LHS™ LINEAR HEAT SENSOR CABLE	
73-515502-001	LHS-155°F (68°C) Alarm temperature. Indoor/Outdoor, PVC, 656 ft (200m) Roll
73-515510-001	LHS-155°F (68°C) Alarm temperature. Indoor/Outdoor, PVC, 3280 ft (1000m) Roll
73-519002-001	LHS-190°F (88°C) Alarm temperature. Indoor/Outdoor, PVC, 656 ft (200m) Roll
73-519010-001	LHS-190°F (88°C) Alarm temperature. Indoor/Outdoor, PVC, 3280 ft (1000m) Roll
73-522002-001	LHS-220°F (105°C) Alarm temperature. Indoor/Outdoor, PVC, 656 ft (200m) Roll
73-519010-001	LHS-220°F (105°C) Alarm temperature. Indoor/Outdoor, PVC, 3280 ft (1000m) Roll
73-535602-001	LHS-356°F (180°C) Alarm temperature. Indoor/Outdoor, PVC, 656 ft (200m) Roll
73-535610-001	LHS-356°F (180°C) Alarm temperature. Indoor/Outdoor, PVC, 3280 ft (1000m) Roll
INTRINSIC SAFETY EQUIPMENT	
73-117068-201	Intrinsic Safety Barrier for Intelligent LHS Systems (need one per zone) Compatible with Addressable Input (AI) Module
73-117068-031	Intrinsic Safety Barrier for AlarmLine LHD (need two per zone) Compatible with Conventional Interface and Addressable Module (AAM)
73-117068-032	Weather-Tight Enclosure for up to 2 Intrinsic Safety Barriers
73-117068-033	Weather-tight Enclosure for up to 5 Intrinsic Safety Barriers
73-117068-034	Weather-tight Enclosure for up to 12 Intrinsic Safety Barriers
73-117068-035	Weather-tight Enclosure for up to 24 Intrinsic Safety Barriers

MOUNTING ACCESSORIES	
73-117068-020	Nylon Cable Tie . Used with Nylon Cable Clamp. Supports sensor from pipe up to 8 in. diameter (100/pkg)
73-117068-022	Master Clamp Used with Cable Clamp. Supports sensor from beam flanges up to 1/2 in. thick (100/pkg)
73-117068-023	Flange Clip Used with Cable Clamp. Supports sensor from material up to 3/16 in. thick (100/pkg)
73-117068-024	Flange Clip Used with Cable Clamp. Supports sensor from material from 3/16 in. to 1/4 in. thick (100/pkg)
73-117068-025	Nylon Cable Clamp Used with Master Clamp, Flange Clips or Cable Tie (100/pkg)
73-117068-026	Weather-tight Connector Used for sensor penetration of enclosure for Standard sensor
73-117068-027	Weather-tight Connector Used for sensor penetration of enclosure for Metal braided or Nylon coated sensor
73-117068-028	AlarmLine In-line Sensor Splices (4 per splice, 10/pkg)
73-117068-029	AlarmLine In-line Sensor Splice Crimping Tool
73-117068-030	AlarmLine Sensor Termination Kit (1 kit terminates 10 zones, 10/pkg)

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