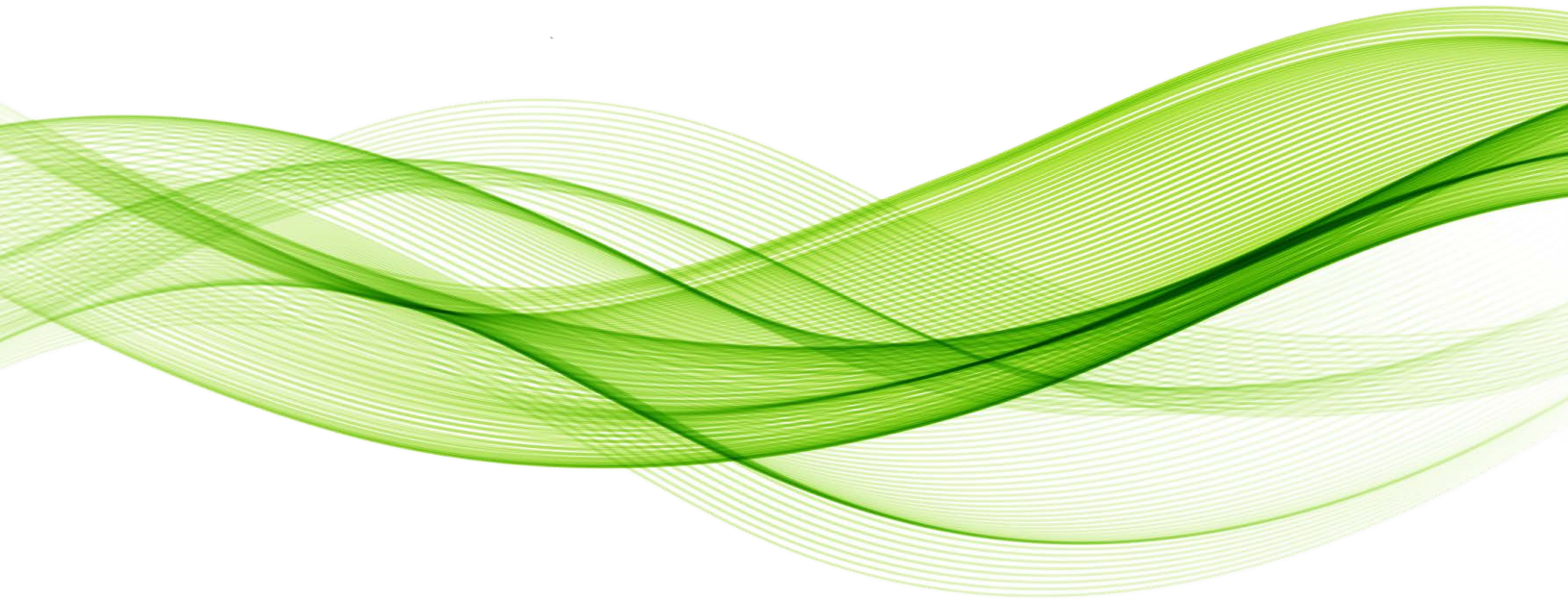
Air Sampling Smoke Detection and Linear Heat Detection Handbook

An Introduction

Volume 2

By: Ron Robertson



Better "Safe"..... Than Sorry

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A special thanks to:
Robert Robertson
Scot Robertson
Alex Helms
Jim Lloyd
Agustin Castineda
Michael Calvert

Dedicated to:
My children Robert, Scot, and Kady
whose love, patience, and understanding helped make
this book possible.

Preface

Like many industries, the fire detection market can be quite complicated because of the wide variety of technologies, applications and jargon. Documents and meetings can be filled with hazard names, codes, and insiders language that is not always easy for the technical sales professional to decipher.

This handbook was written as a result of the lack of in depth education materials available for specialty detection technologies. Inside this handbook is a compilation of information in two sections that introduce the reader to air sampling smoke detection and linear heat detection technologies, equipment, hazards and basic installation practices.

This handbook is perfect for the newer technical sales people, as well as the seasoned professionals. After spending most of my working life in the fire sector, even I come across things I don't recognize from time to time.

We hope you find this handbook useful in learning more about both these technologies and how they are used in various applications.

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An Introduction

Better "Safe"..... Than Sorry

Introduction

Definition of an Air Sampling Smoke Detection System

This handbook is a guide that introduces the reader to Air Sampling Smoke Detection Systems and shows examples of some types of systems for your reference. Please refer to all local and national codes for further details and instructions.

Inside The Technology

Air sampling smoke detectors come in Standard, Early and Very Early Warning sensitivities and provide an 'active' detection system that sample air from a given area or fire zone to detect the presence of combustion particles instead of waiting for smoke to rise to it, as in the case of conventional spot detectors.

Combustion particles are transported to the detector via an integral aspirator that continuously draws air from a network of supervised sampling pipes each containing small holes more commonly known as sampling points. Having identified an increase in airborne combustion particle levels this information is presented as a number of staged alarms via the detector display and outputs.

Cirrus HYBRID

The *Next Generation* in Early Warning Smoke and Fire Detection

CirrusCCD
Very Early Fire

ProPointPlus
Early Smoke

CirrusHybrid
Very Early Fire and Smoke

Typically, over the years early warning smoke detection was done by optical laser based systems that detect the earliest signs of smoke, or CCD detection that could detect the earliest signs before smoke. Now the CirrusHybrid Detector can combine both into a single detector that can see each individually, or combine their detection abilities into a single "Smart Signal" that allows you to make better decisions.

Applications

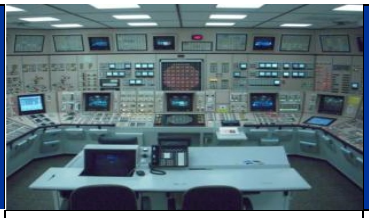
Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Applications

Air sampling smoke detection systems can provide critical time needed to investigate alarms preventing injury, property damage or business disruption for all applications. It is important that the system be designed based on the type of application and all applicable codes. There are five basic application types. Open area (traditional ceiling detection), High Airflow (air ducts and high velocity applications), Localized (rooms and equipment inside other rooms), In-Cabinet (sampling the air inside cabinets and enclosures) and duct detection. Ducts are located in almost every application therefore it is not referenced in the following application lists.

Below is a list of typical applications types and how the area should be classified for the design.

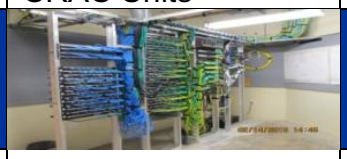
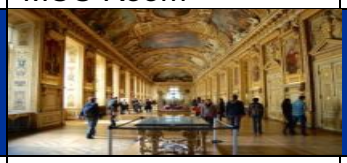
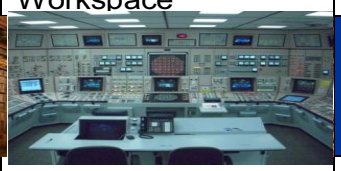
Note: Some applications can be protected by multiple options.

Control Rooms & Switch Gear		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	In-Cabinet Detection				●
	Return Air Monitoring		●		
	Room/Area Detection	●			
	Underfloor & Above Ceiling	●			
Power Plants		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Electric Vault			●	
	Switching Vault			●	
	Data & Telecom	●			
	Switch Gear & Cabinets				●
	Control Rooms	●			
Lithium Ion Battery Storage		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Storage Container	●			
	Battery Rack			●	
	Grid Storage	●			

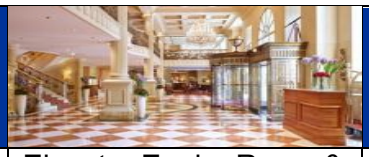
Applications

Hospital & Healthcare		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Operating Room	●			
	MRI Facility			●	
	IT & Data Center	●			●
	Elevator Equip Rm	●			
Correctional Facility		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Cell Monitoring			●	
	Control Room	●			
	Guard Station	●			
	Record Storage	●			
Cold Storage Facility		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Freezer Preaction System	●			
	Business Office	●			
	Electric Room	●			
	Record Storage	●			
Clean Room (Space Program)		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Return Air Monitoring		●		
	Mechanical Chase	●			
	Electrical Chase			●	
	Process/Production	●			

Applications

IT & Computer Room		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Equipment Area	●			
	Server Enclosure			●	
	Underfloor & Above Ceiling	●			
	CRAC Units		●		
Telecommunication		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Switch Room	●			
	HVAC Ducts		●		
	Battery Room	●			
	MCC Room	●			
Museum		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	High Ceiling Areas	●			
	Artifact Storage			●	
	Special Exhibit Space			●	
	Restoration Workspace	●			
Nuclear		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Critical Areas	●	●	●	●
	Simulators	●		●	
	Switch Gear				●
	Fire Watch			●	

Applications

Hotels		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Elevator Equip. Room & Elevator Shaft			●	
	Data/Telecom Room	●			
	Conference Room	●			
	Electric Room	●			
High Rise Building		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Elevator Equipment Rm	●			
	Server/Data Room	●			
	MDF & IDF Network Room	●			
	Elevator Shaft			●	
Airports & Support Facilites		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Air Traffic Control Ctr	●			
	Flight Training Simulator			●	
	Return Air Monitoring		●		
	Data & Telephone Equipment Rooms	●			
Schools & Universities		Open Area Detection	High Airflow	Localized Detection	In-Cabinet
	Library	●			
	Data Center & Teaching Lab	●			
	Gymnasium	●			
	Record/Archive Storage	●			

Lithium-Ion Detection

Lithium-Ion Battery Fire Detection Concerns

Lithium ion or Li-ion battery storage systems are being built all over the globe. With the rise of renewable energy generation, the power has to be stored. The most efficient way to store that power currently is through the use of Li-ion batteries. These batteries store energy efficiently and densely allowing for a lot of energy to be stored in a small foot print. These batteries; however, have a mode of failure that results in a very difficult fire for responders to handle.

When the batteries start failing they generate heat. At a certain point these batteries reach a heat threshold called “thermal run away” where the battery heat and subsequent fire become self-propagating. The only way to stop this propagation is to return the battery to a temperature below the thermal run away point. This problem is exacerbated by the dense packaging of these batteries. Once one battery reaches this point it can cause the adjacent batteries to heat to a point where they too reach thermal run away.

Once these batteries reach this point, all you can do is contain the fire and wait for them to cool below the thermal run away point. This means detecting the fire BEFORE thermal run away is key.

Thermal Runaway

The Hybrid uses a cloud chamber to detect fires at the earliest signs, well before smoke. The cloud chamber takes microscopic combustion particles released when materials thermally break down and produces a cloud around only those particles to see the fire.

A number of tests have been performed on cloud chamber detection and the Hybrid proving the sensitivity of the detection technology. Specifically in regards to Li-ion detection, as the batteries are heating up they release the combustion particles the cloud chamber detects.

Because of this, testing on the Hybrid has shown the capability to detect the Li-ion battery fire minutes before the batteries reach thermal run away allowing for the equipment to be turned off and cooled down. This has been proven further by cloud chamber detecting and preventing 5 fires in large building-scale battery storage systems.

System Design

While design is dependent upon the final design of the application, most systems are designed following NFPA 72 guidelines and install the detection on the ceiling of the area. With smaller “shipping container” style storage systems there is a high number of air changes per minute, the installation of the air sampling directly in front of the return air puts the sample points right in line of where the smoke/gases will travel.

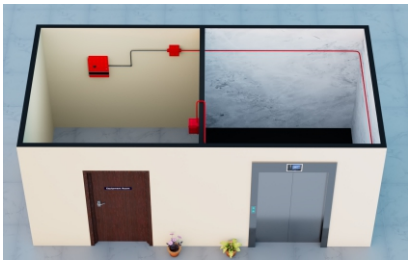
Through testing, and based on design, there are also benefits to installing the sample points close to the floor throughout the container, as the molecular weight of the chemical compounds could pull the original gases down. Putting detection at the floor and ceiling can result in quicker detection depending on application and design.

Elevator Fire Detection

Linear Heat Detection for Elevators

Elevators are a common application that are in need of fire detection. NFPA72's section on elevator recall mention both smoke and heat detection as acceptable forms of detection depending on the requirements of the individual shaft.

Linear heat detection is a common form of heat detection for these applications. The wire is easy to run inside the hoistway at each level and in the pit at the base of the elevator. When installing the linear heat detection, the cable needs to be appropriate alarm temperature and installed withing 2ft of the sprinkler head. The cable is then ran to an equipment room outside the hoistway ending with a test switch.



Air Sampling Fire Detection

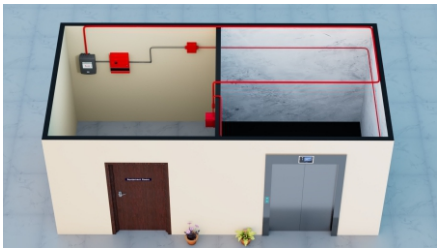
Air sampling smoke detection is another common form of smoke detection for these applications. For most hoistways, the detector would be installed in an equipment room at the top of the shaft where the pipe penetrates into the shaft.

The pipe then rings the hoistway locating several sample points inside, before penetrating back out of the hoistway and back into the equipment room where the pipe run ends with a test point. The exhaust of the air sampling smoke detector is then ran back into the hoistway

Modern System Design

With the adoptions of NFPA72 2019, these initiating devices now have a new requirement of being maintained and serviced outside the shaft. Both Linear heat detection and air sampling smoke detection easily achieve this requirement. For linear heat detection, the detection zone starts at the monitor module, or Box if Leader Cable is used, running into the shaft before returning out of the shaft to a test switch to be used for the NFP required annual testing of the A system.

Air sampling detection is similar as the detector is installed in the equipment room at the top of the hoistway, the pipe is ran into and back of out of shaft, then ending in a test point which is used for the NFPA required annual testing of the system. There is no need to enter the hoistway to commission, service, maintain, or test the system.



A number of states, and cities, including California, Colorado, and the city of Atlanta are going beyond the NFPA 72 2019 requirement and requiring both smoke detection and heat detection in their hoistways. These systems follow the same installation as shown in the example images, utilizing both initiating devices for detection inside the hoistway.

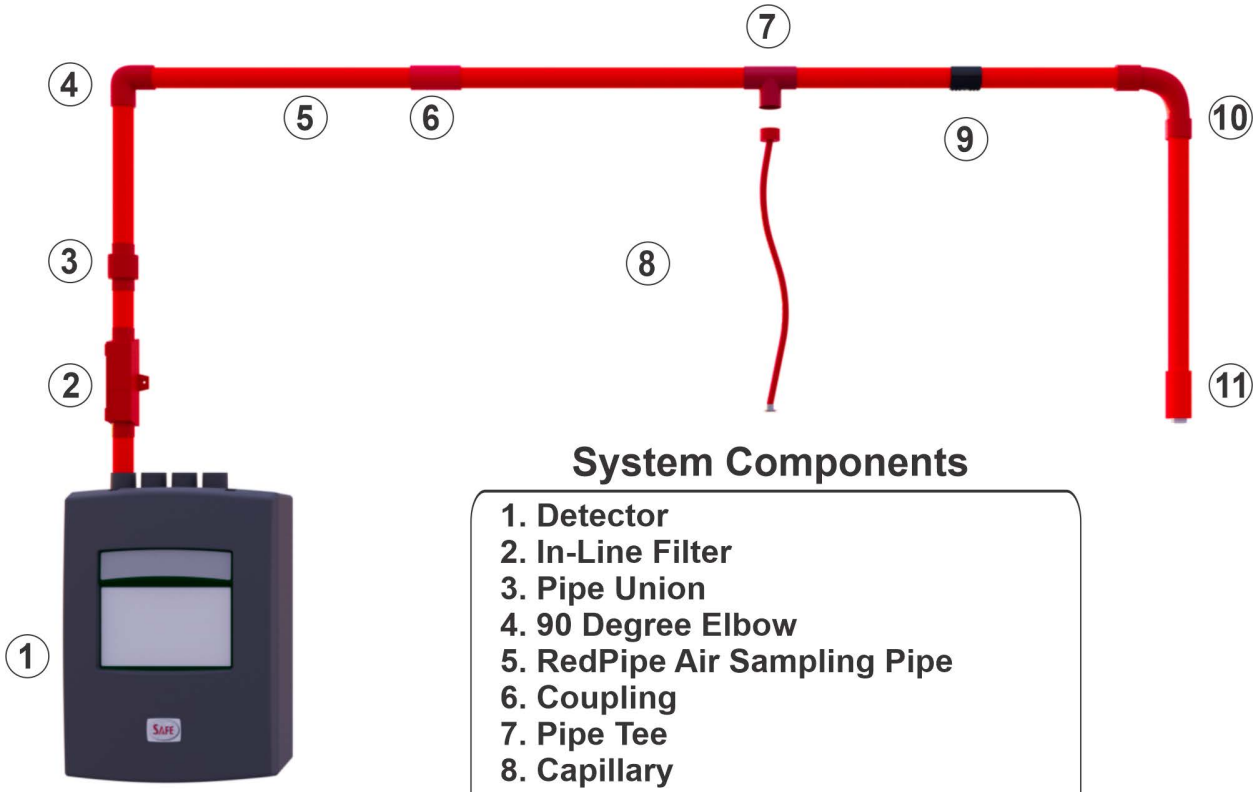
System Components

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

System Components

Air Sampling systems consist of a detector mounted on a wall or room in an adjacent room with a power supply and battery back up system usually mounted below or part of a fire alarm system that provides emergency power for 24 hours in case of a power outage.

The detector has a built in aspirator fan that draws air back through a supervised piping network from sample holes placed where spot detectors are usually located. The detector then analyzes the air sample for the earliest signs of smoke or fire and sends a signal to the building fire alarm panel. This type of detection is called active detection, where the detector actively draws air to the detector instead waiting for smoke to rise as is typically how spot detectors operate.



Typical Air Sampling Smoke Detection System

Cirrus HYBRID

The *Next Generation* in Early Warning Smoke and Fire Detection

CirrusHybrid
Very Early
Fire and Smoke

- **The First and Only Dual Technology "Combined Fire & Smoke" air sampling Detector**
- **The largest sensitivity range of any air sampling detector 0%obs/m - 20%obs/m**
- **HYBRID "Smart Signal" to verify alarms and discriminate false alarms**
- **7" full color multi-function touchscreen LCD Display**
- **Live Camera Stream from up to 6 IP color cameras**
- **Built-In Troubleshooting Videos**

ProPointPlus
Early Smoke

- **1 - 4 Individual detectors per aspirator(providing up to 4 separately identifiable areas)**
- **High performance optical 'Scatter Chamber Detectors' (SCD)**
- **Multiple language, multi-function LCD display**
- **Simple install and commission process generally without the need for a laptop connection**
- **Built-In algorithm to reduce unwanted alarms**
- **Airflow monitoring per pipe**

CirrusCCD
Very Early Fire

- **The only strictly 'Cloud Chamber' based Air Sampling Fire Detector available**
- **Resistant to unwanted alarms from dust, humidity & temperature changes**
- **Widest sensitivity range**
- **Full Airflow Monitoring**
- **7" full colour multi-function touch screen LCD display**
- **Live camera stream from up to 6 IP color cameras**

Power Supply Units (w/24 hour battery back up)

PRO UPS-24L

Battery backup

The UPS-24L Power Supply or Fire Alarm Power Supply provides supervised 24 VDC power and 24 hour battery backup for Hybrid Series detectors. The UPS-24L consists of an enclosure containing a power supply and charger PCB. The UPS-24L will hold a maximum of two 12v 18Ah, 26Ah, or 44Ah batteries.

Battery Calculation:

Below is an example of a Hybrid series battery calculation. Safe Fire detection offers this battery calculator free of charge, and it can be found in the Knowledge Library on www.safefiredetection.com

Battery Calculation for Cirrus Hybrid, CCD, or ProPointPlus Detector(s)

No. of units

1	Unit Type:	CirrusHYBRID/CCD		Quiscent Load:		Alarm load:	
	Select Number of SCDs:	2		745	mA	845	mA
	Select Blower Speed (%):	100				105.5	mA
	Select No. OP relays used in Alarm condition:	5					
2	Unit Type:	None		Quiscent Load:		Alarm load:	
	Select Number of SCDs:	1		0	mA	0	mA
	Select Blower Speed (%):	100				0	mA
	Select No. OP relays used in Alarm condition:	0					
3	Unit Type:	None		Quiscent Load:		Alarm load:	
	Select Number of SCDs:	1		0	mA	0	mA
	Select Blower Speed (%):	100				0	mA
	Select No. OP relays used in Alarm condition:	0					
4	Unit Type:	None		Quiscent Load:		Alarm load:	
	Select Number of SCDs:	1		0	mA	0	mA
	Select Blower Speed (%):	100				0	mA
	Select No. OP relays used in Alarm condition:	0					
5	Unit Type:	None		Quiscent Load:		Alarm load:	
	Select Number of SCDs:	1		0	mA	0	mA
	Select Blower Speed (%):	100				0	mA
	Select No. OP relays used in Alarm condition:	0					
	Other 24V loads	0	mA				

Key	
▼	*Select data from the drop down boxes*
	Fill in the data in the highlighted cells

Total mA	745	Total mA	950.5	
	X		X	
Standby Hours	24	Alarm Hours	0.5	
	=		=	
Standby Capacity	17880	Alarm Capacity	503.765	← NOTE: The calculation inculdes a derating factor of 1.06 as detailed in FIA Guide for Power Supplies
		Total Capacity = Standby + Alarm	18383.765	
		Divide by 1000	20.48	includes 2.1A for power supply board
		Battery Safety Factor	x 1.25	
		Battery Back Up Required	25.60	Amp/Hr
		Estimated charger size to be able to recharge the above batteries within the 24 hour time required by BS5839	2.44	Amps

RedPipe

7.5' Pipe Lengths Can Be Shipped Overnight

RedPipe is the ONLY UL listed fire resistant 3/4" CPVC pipe, approved specifically for use with <u>any</u> UL Approved air sampling smoke detector

UL Approved For Plenum Spaces

NFPA PRINTING ON PIPE

Printed in Both English and Spanish

7.5'(2.3m) OR 15ft(4.5m) Lengths

7.5' Length 3/4" CPVC
Part #: RP5209

15' Length 3/4" CPVC
Part #: RP5209-15

Pipe Kit 3/4" CPVC
Covers a 50'x50' Area
Part #: RP5240

PIPE FITTINGS

3/4" 90° Radius Bend
Part #: RP5215X 10/pk

3/4" Low Profile 90° Radius Bend
Part #: RP5230X 10/pk

3/4" 90° Elbow
Part #: RP5202X 10/pk

3/4"45° Elbow
Part #: RP5203X 10/pk

PIPE FITTINGS

3/4" Coupling
Part #: RP5206X 10/pk

3/4" Union
Part #: RP5208

3/4" Tee
Part #: RP5204X 10/pk

3/4" End Cap
Part #:RP5205X 10/pk

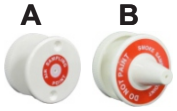
TEST POINT

Standard

Calibrated

Test Points
A Part #: RP5226
B Part #: RP5242

CAPILLARY



Air Sample Points
A Part #: RP5216
B Part #: RP5222
C Part #: RP5223

Quick Disconnect ½" tubing
Part #: RP5225
Note: 2 Required for each Capillary Drop

½ Capillary Tubing
Part #: RP5227 50ft.
Part #: RP5229 100ft.

Quick Disconnect 3/8" tubing
Part #: RP5223

3/8" Capillary Tubing
Part #: RP5219 50ft.
Part #: RP5239 100ft.

RedPipe Kit

AIR SAMPLING SMOKE DETECTION PIPE

EVERYTHING YOU NEED IN A SINGLE BOX

PN#RP5240

No More Pipe Take-offs

Simply Divide your total sq. ft by 2,500 Equals the number of kits you need

---

New Sample Hole Markers (SHMs)

Now easily identify the sample hole size from the floor without having to use a ladder. The SHM color indicates the Sample Hole size determined by the computer flow calculations. Please refer to the data sheet for Hole Size and Color Configurations.

5/64	3/32	7/64	1/8	9/64	5/32	11/64	3/16	13/64
RP5248	RP5249	RP5250	RP5251	RP5252	RP5253	RP5254	RP5255	RP5256

System Types

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Types of Air Sampling Smoke Detection Systems

It is generally accepted that there are five types of Air Sampling Detection System design.

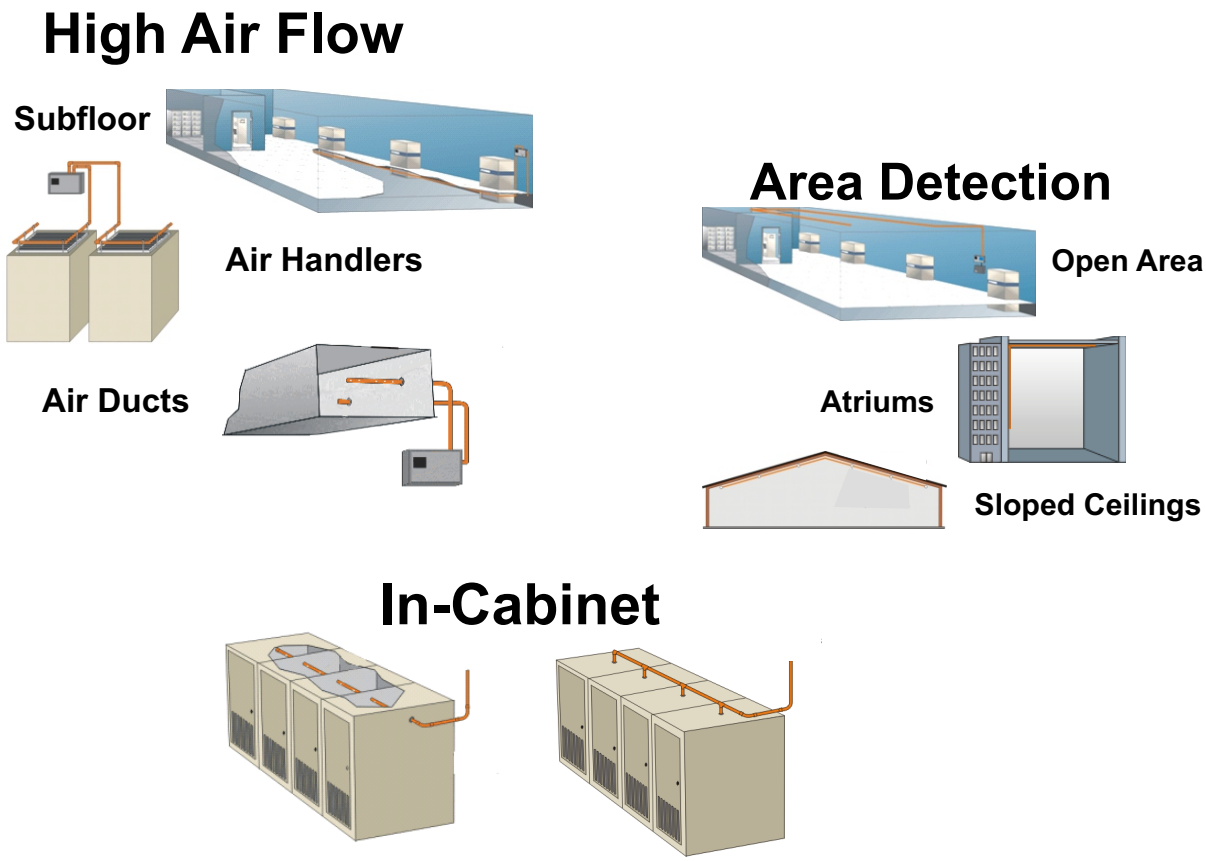
High Airflow Detection Sampling System
Definition:- A system utilising the airflow created by the air conditioning and ventilation system to carry the sampled air to the sampling points.

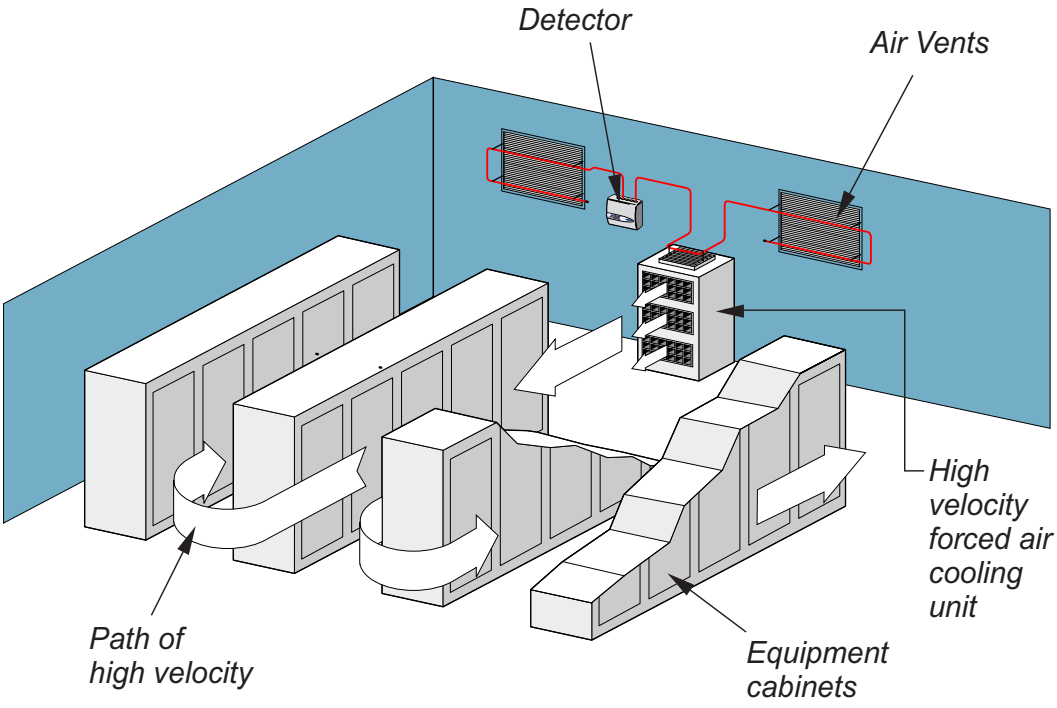
Area Wide Detection Sampling System
Definition:- A system where the air sampling points are sited and spaced as if they are point type smoke detectors.

Localized Detection Sampling System
Definition:- A system where the air sampling points are arranged and spaced to provide monitoring of specific pieces of equipment.

Duct Detection Sampling System
Definition:- A system where the air sampling is provided within the ducting of a ventilation system.

In-Cabinet Detection Sampling System
Definition:- A system where the air sampling is provided either directly inside or adjacent to a specific piece of electronic hardware or control equipment.



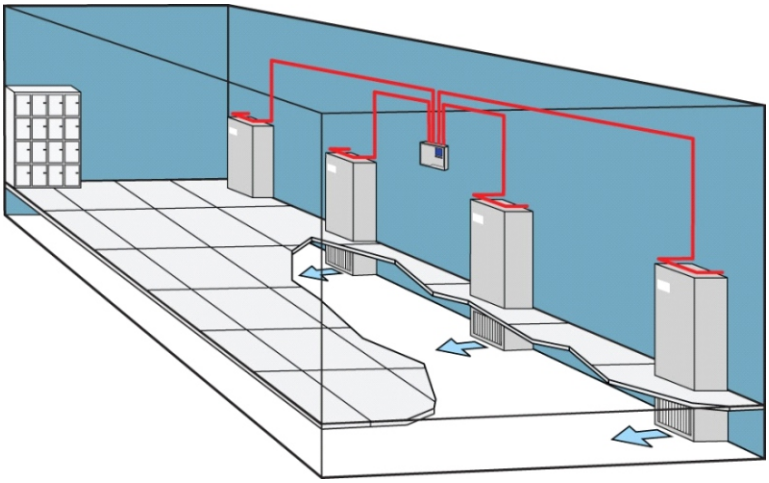


High Airflow Detection Sampling Systems

High Airflow Sampling Systems are designed to monitor the airflow movement within a room by strategically positioning the sampling pipe directly in the airflow. This type of detection is usually supplementary to other forms of detection, as it would have limited detection response when the forced airflow is not operational.

Due to the cumulative effect (air with combustion particles entering more that one sampling point) the sensitivity of such a system when monitoring a single point of extract or supply may be directly related as equal to the sensitivity of a central detector. Consultation should be sought with Safe Fire Detection or its nominated representative where detection is taken from multiple supply and extract points on the same detector.

Hybrid Series detectors can operate at very sensitive levels when used as a means of High Airflow Detection and as such are often used to ‘shut-down’ mechanical ventilation systems to enable ‘point type’ detectors to operate more efficiently.



(All sampling points located directly in the airflow of the room at the return air grille of each air handling unit)

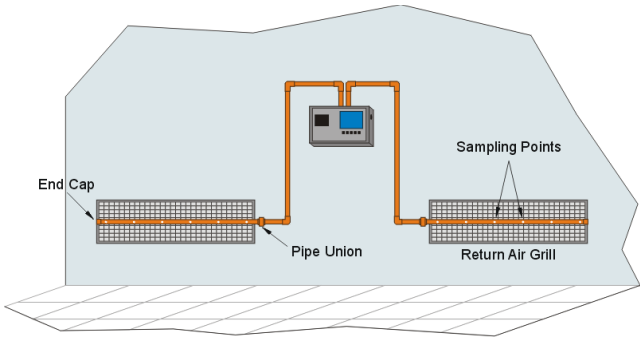
High Airflow System Examples

Air Handling Room Return Air Detection

The sampling pipe is routed across the return air grill with sampling holes facing outwards into the protected area.

Sampling holes must face into the air stream or towards the object tc being protected.

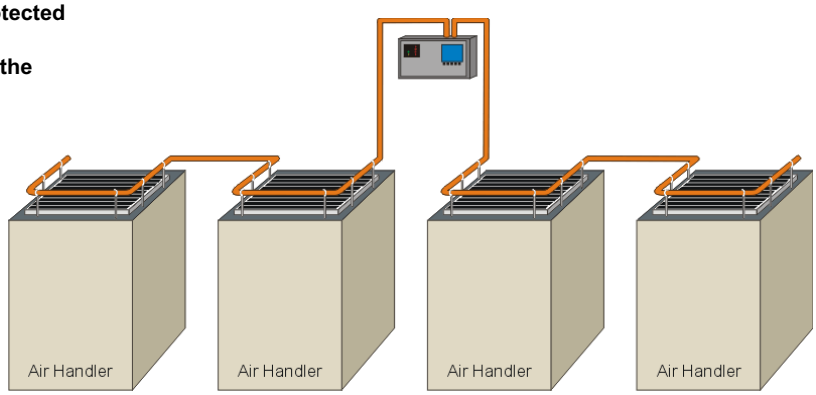
Unions are used to allow removal of air sampling pipe for return air filter changes or duct cleaning.



Sample holes should be positioned every 6” to 12” along the sample pipe crossing the grill to obtain a good cross sampling of air.

Air Handling HVAC / CRAC Unit Detection

Up to 4 air handlers may be protected from one unit.
Sample pipe may be mounted to the perimeter of the air handling unit.

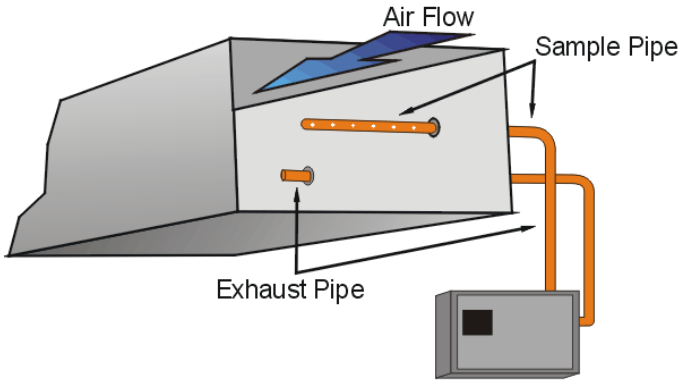


Air Handling Air Duct Detection

Sampling return or supply air from a duct can be done with a probe extending into the duct.

A sealing grommet must be used to seal the duct preventing outside air from entering or exiting the duct.

The detector exhaust must be piped back into the duct downstream from the sample pipe.



Area Wide Detection Sampling Systems

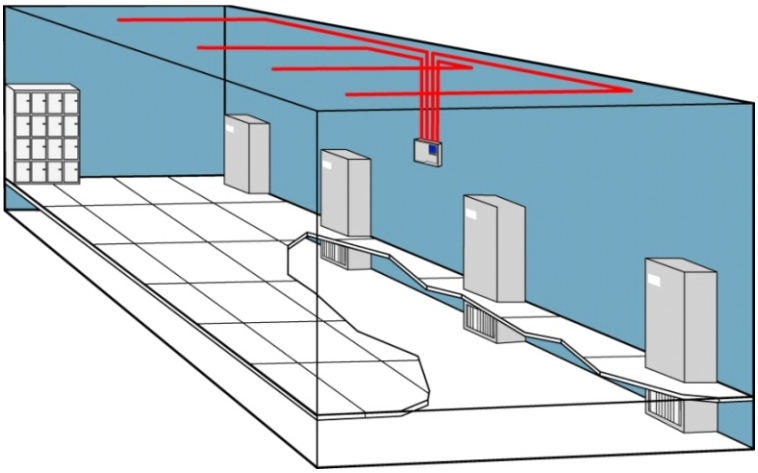
Area Sampling Systems are arranged such that the air sampling points are sited and spaced as if they are ‘spot type’ smoke detectors inline with local standards and codes.

This design concept may offer an extremely good alternative to ‘spot type’ detectors or ‘beam’ detectors when installed in high ceiling applications. For these high ceiling applications it may be necessary to install some vertical or multi-level sampling points as some smouldering fires produce little heat energy to carry particles to the high ceiling detection points.

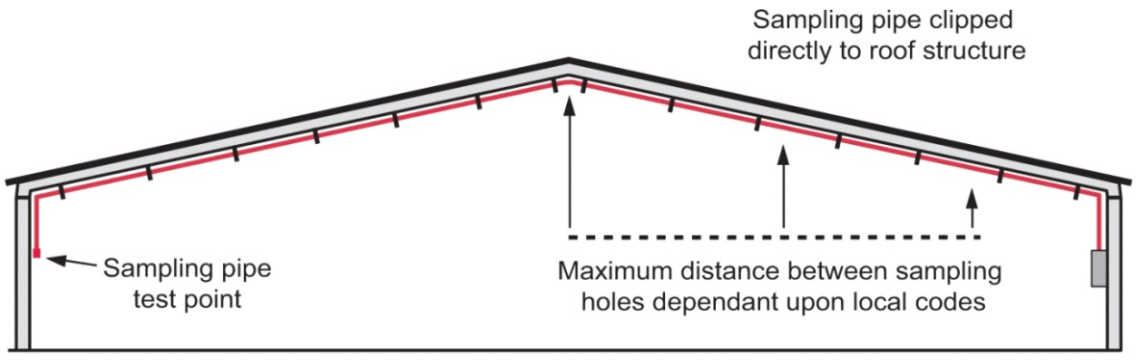
Care should be taken with this design option to ensure that ceiling ‘apex’ areas, voids and compartments are covered correctly.

Where access for maintenance of ‘spot type’ detectors or ‘beam’ detectors may be either difficult or expensive, Area Sampling Systems can provide a logical and inexpensive design option. It is recommended that dedicated sampling pipe ‘test points’ are installed in accessible locations to enable the integrity of the entire sampling pipe array to be confirmed during maintenance visits.

It is possible to improve an air sampling detection system that would comply with local standards but could also be improved by adding additional sampling holes drilled into the sampling pipe without any additional cost.

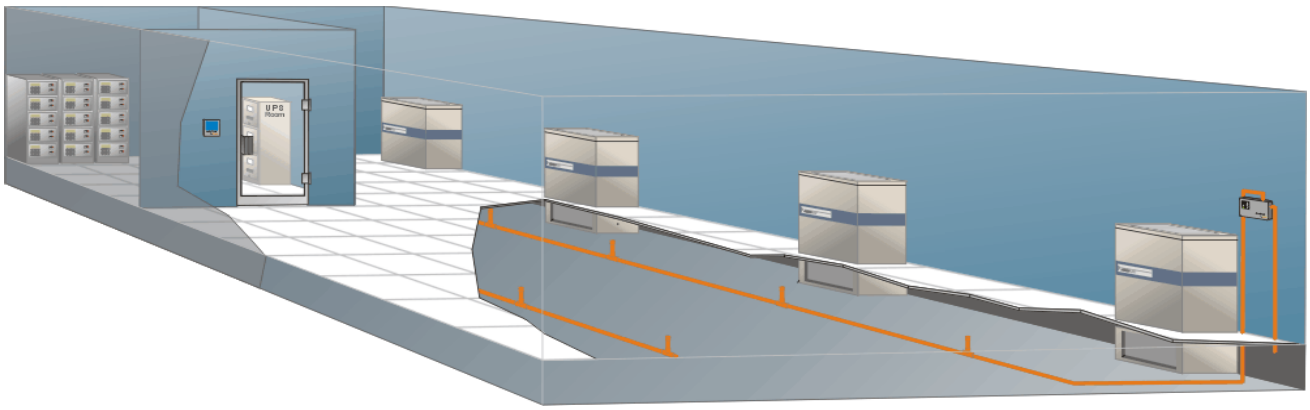


(All sampling points located in the position of ‘spot type’ smoke detectors)

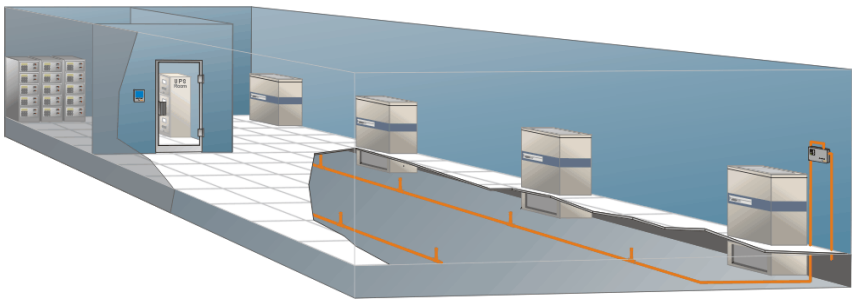


Area Detection Examples

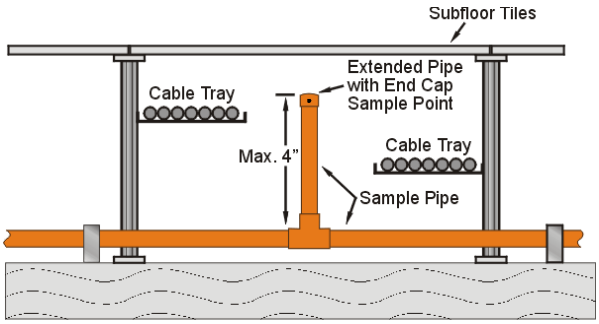
Air Sampling smoke detection systems must be dedicated to a common pressure area. Therefore, you cannot mix sampling from both above and below the subfloor areas on the same unit. For these type areas, the units must be located into the same pressure area that is being sampled. Or if the detector is located in an adjacent room, the exhaust of the unit must be piped back into the same room that is being sampled.



Subfloor detection may mirror ceiling mounted area detection but must be done with a separate unit to avoid pressure differential issues. Always be sure the exhaust is piped back to the area being sampled.



To prevent subfloor cabling from blocking the sample points, pipe extensions should be used with sample points drilled on the sides to help prevent dust loading.



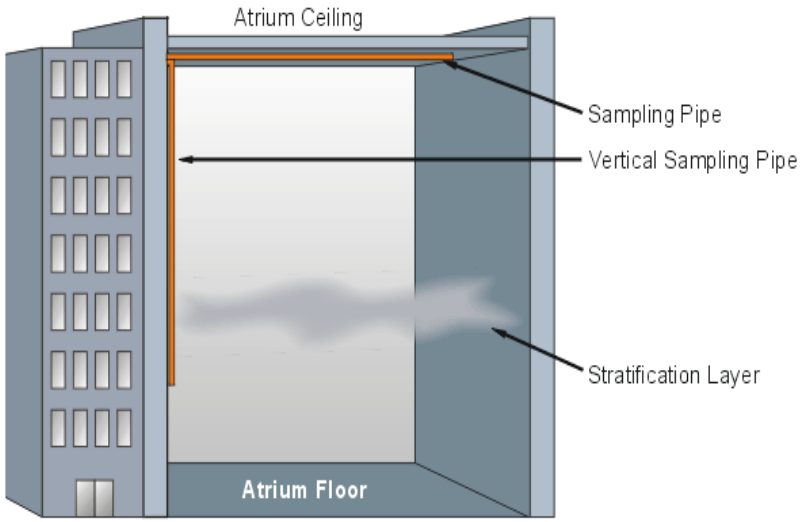
Area Detection Examples - High Ceilings

Same Spacing as open area detection.

Stratification - Cooling and layering of smoke.

Because of smoke stratification layers, some detection systems (consult manufacturer) utilize a vertical sampling pipe in application with ceiling heights over 30 feet.

Note:
The Hybrid detector is the best choice for high ceiling applications as it can detect up to 125' without the need of multi-layer detection sampling pipes.



Area Detection Sloped Ceilings

NFPA 72 defines a sloped ceiling as a ceiling "having a slope of more than 1 in 8.

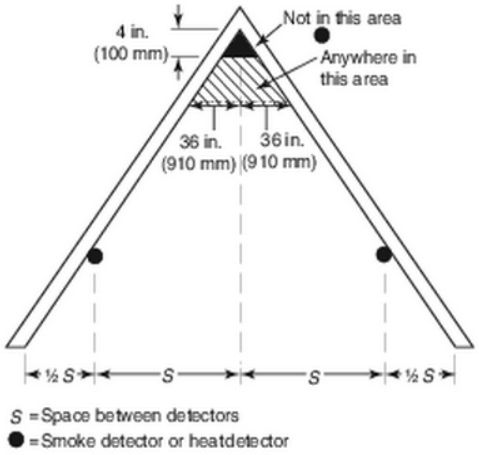
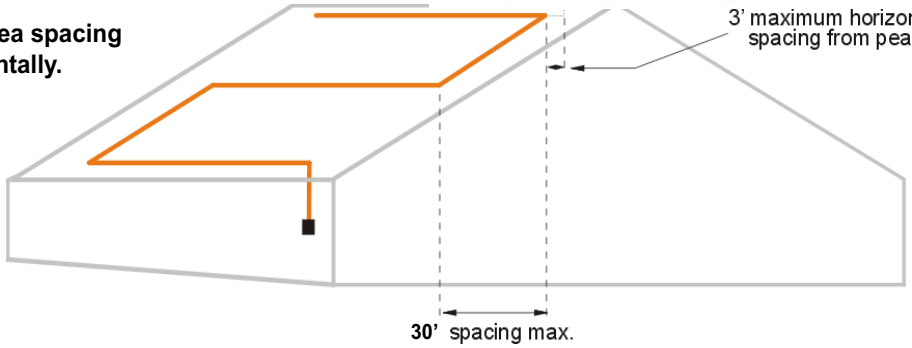


FIGURE A.17.6.3.4(a) Smoke or Heat Detector Spacing Layout, Sloped Ceilings (Peaked Type).

Uses standard area spacing measured horizontally.



Please see NFPA 72 for more details regarding sloped and domed ceilings.

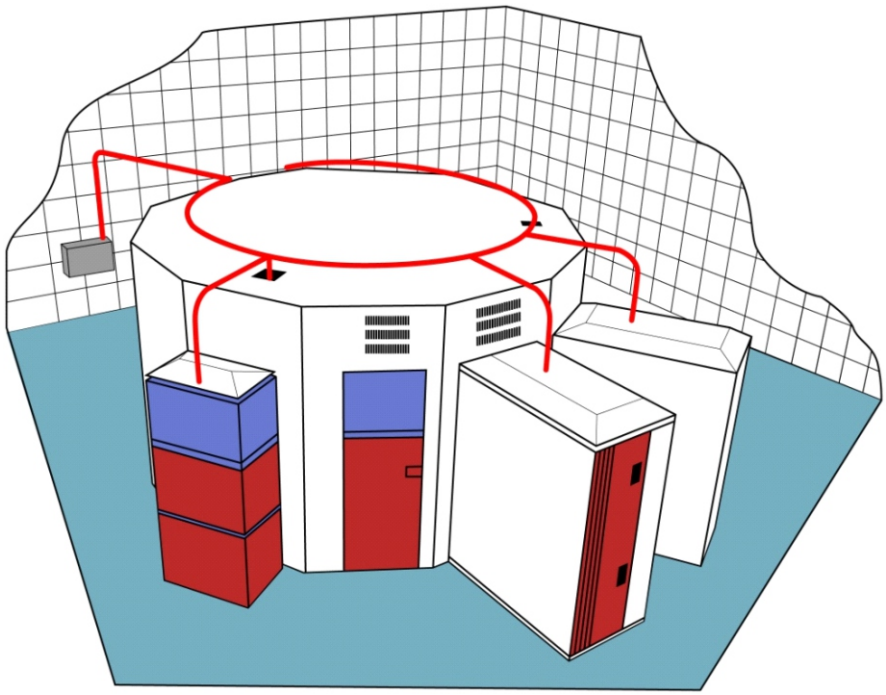
Localized Detection System Design Examples

For localized sampling the pipe network and sampling points are arranged to monitor specific pieces of equipment in an open area.

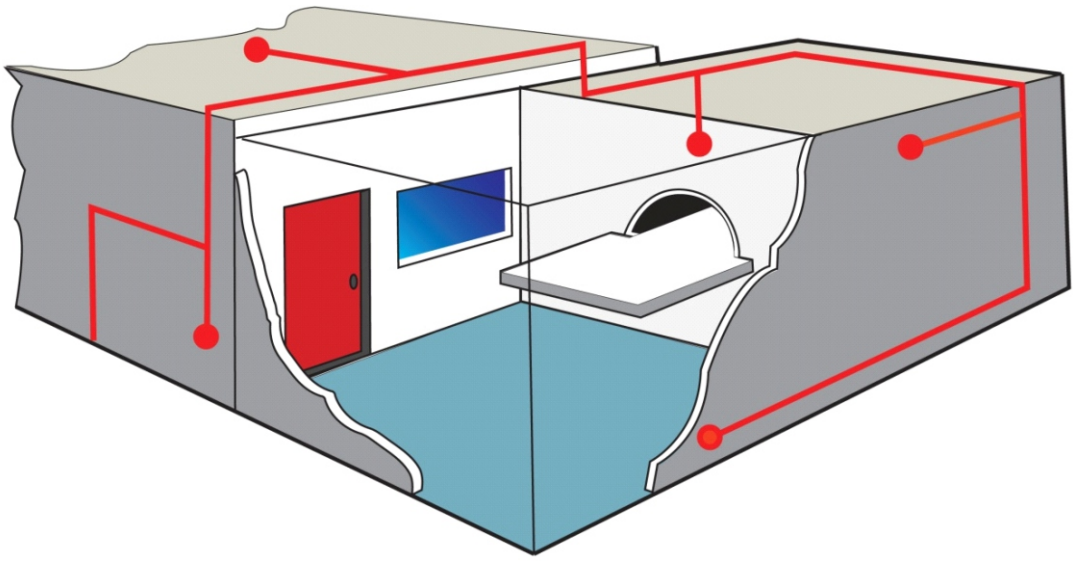
This method of detection is usually established following some type of test simulation to best recreate, where possible the actual application. The sensitivity of such a system is generally dependent upon the application and environment of the specific piece of equipment.

Consideration must also be given by the end user to ensure that any future changes to the equipment do not have a detrimental effect on the installed detection system.

Data Storage Carousel



MRI Scanner



Duct Detection Sampling System Design

Hybrid Series Air Sampling Detectors may be used for duct sampling dependent upon the risk and application.

Duct detection systems are comprised of the air sampling detector mounted locally to or onto the protected duct. An ‘air inlet’ sampling pipe probe is installed into the ducting to carry the sampled air to the detector and an ‘exhaust’ sampling pipe probe is installed into the ducting to return the sampled air to the duct.

It is strongly recommended that Duct Sampling Systems are installed in straight lengths of ducting at a distance of 6 x the diameter of the duct downstream of any bends, vents, tee’s or branches etc. For this reason Duct Sampling is not recommended for flexible ducts due to the turbulence of air usually found within this type of ducting.

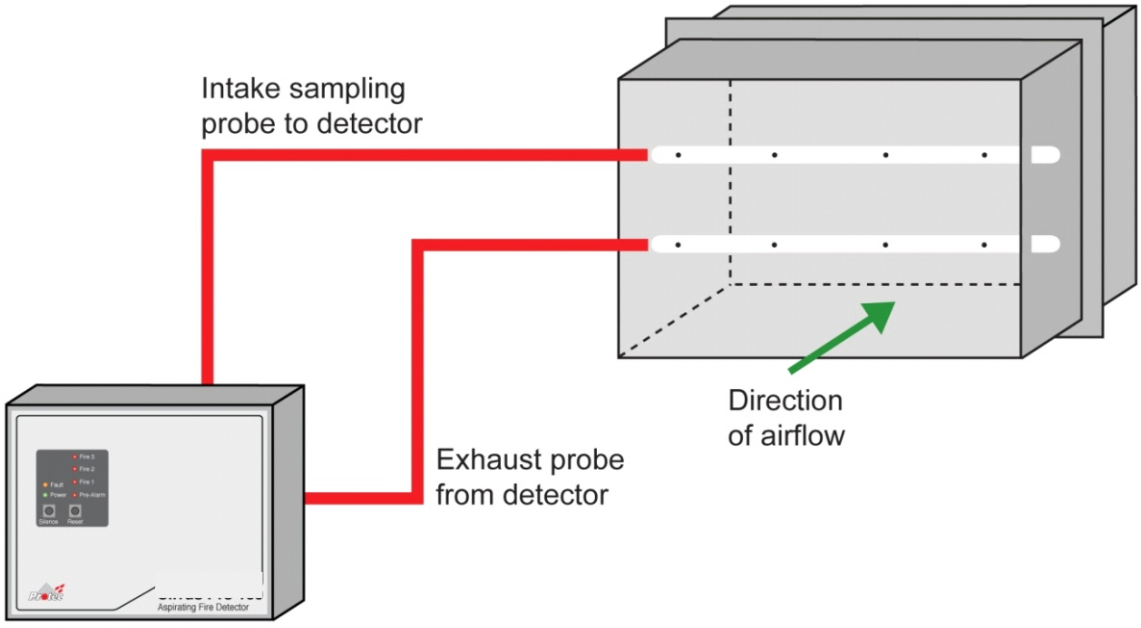
For small ducts up to 3ft wide the ‘air inlet’ sampling pipe probe is mounted in the centre of the duct with sampling holes spaced approximately 8in. apart. The ‘exhaust’ sampling pipe probe should be mounted approximately 18in. downstream of the ‘air inlet’ probe and at a quarter of the height of the duct from the top or bottom of the duct with holes concentrated towards the middle of the duct.

For larger ducts 3ft – 6ft wide it is recommended that the ‘air inlet’ sampling pipe probe be branched outside the duct to create two individual probes. These should be mounted proportionally within the height of the duct with the ‘exhaust’ sampling pipe probe mounted centrally within the duct with 4 holes concentrated towards the middle of the duct.

The sizes of all sampling holes should be confirmed utilising the Hybrid Series ‘Pro Flow’ sampling pipe calculation program.

Sampling from multiple ducts is not recommended.

Sampling from ducting and ambient environments is not recommended on the same detector.



In-Cabinet Detection Sampling Design

In-Cabinet Detection sampling is where the air sampling is provided either directly inside or adjacent to electrical cabinets, racks, consoles, switchgear, cable trays or any other electrical equipment, electronic hardware or control equipment.

This monitoring technique may be used where the protection of specific pieces of equipment is critical to the continued operation of communications, control or production processes.

In cabinet detection systems should not be expected to provide detection outside of the protected cabinet/equipment. Room detection should be provided by other dedicated Hybrid Series aspirating detectors.

The designer should consider the quantity of cabinets protected. Too many on a zone may be too time consuming to determine which cabinet is in alarm.

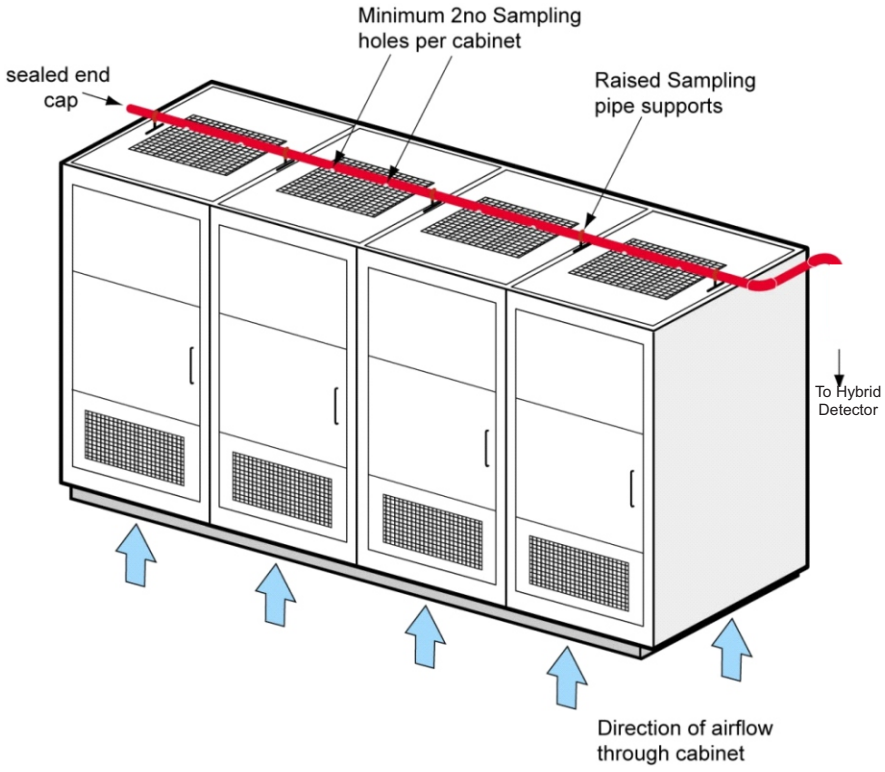
Consideration must also be given by the end user to ensure that any future changes to the equipment function or layout do not have a detrimental effect on the detection system.

Above cabinet sampling

Sampling pipes are placed directly above the equipment in the path of the airflow generated by the forced or natural ventilation.

Sampling pipes should be located in the centre of the exhaust air stream or directly above the equipment being protected. Sampling holes must face directly into the air stream or towards the equipment being protected. If there are multiple exhausts then sampling points must be located over each opening.

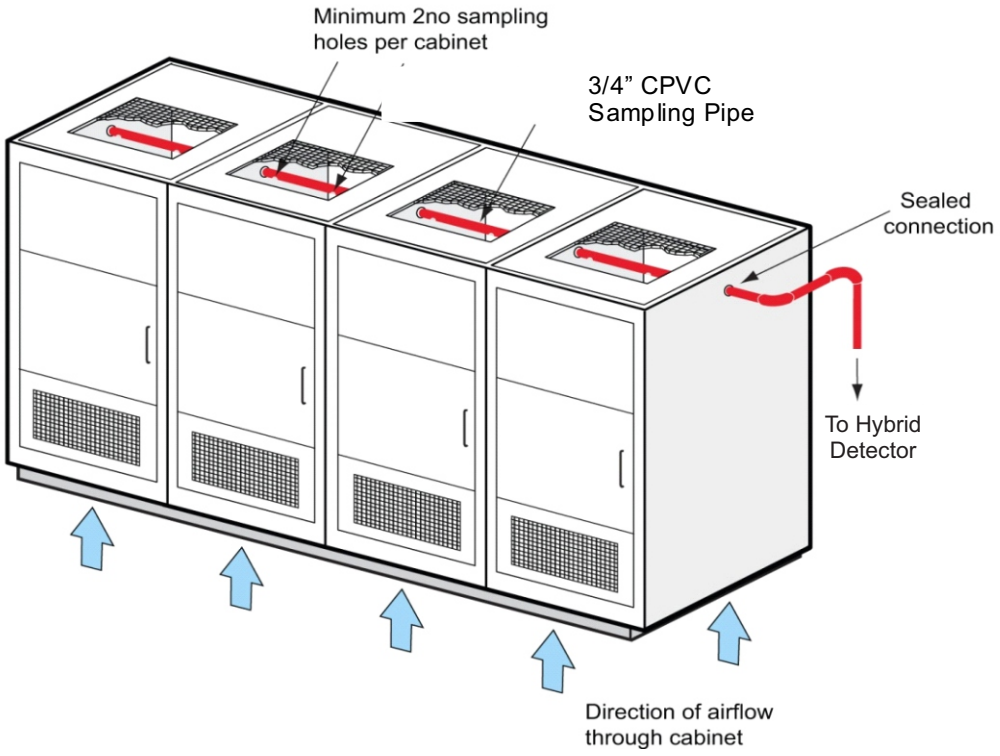
Where cabinet exhaust vents are large it may be necessary to use two or more sampling pipes to adequately detect all potential incidents. When possible a series of tests should be performed to verify the efficiency of the installation.



In-Cabinet Detection

This method of detection is often achieved using standard sampling pipe or 'Capillary Sampling Points' installed directly inside electrical cabinets. If detection is provided by utilising forced airflow through a cabinet then consideration should be given to the overall system detection capabilities should the forced airflow fail or be switched off.

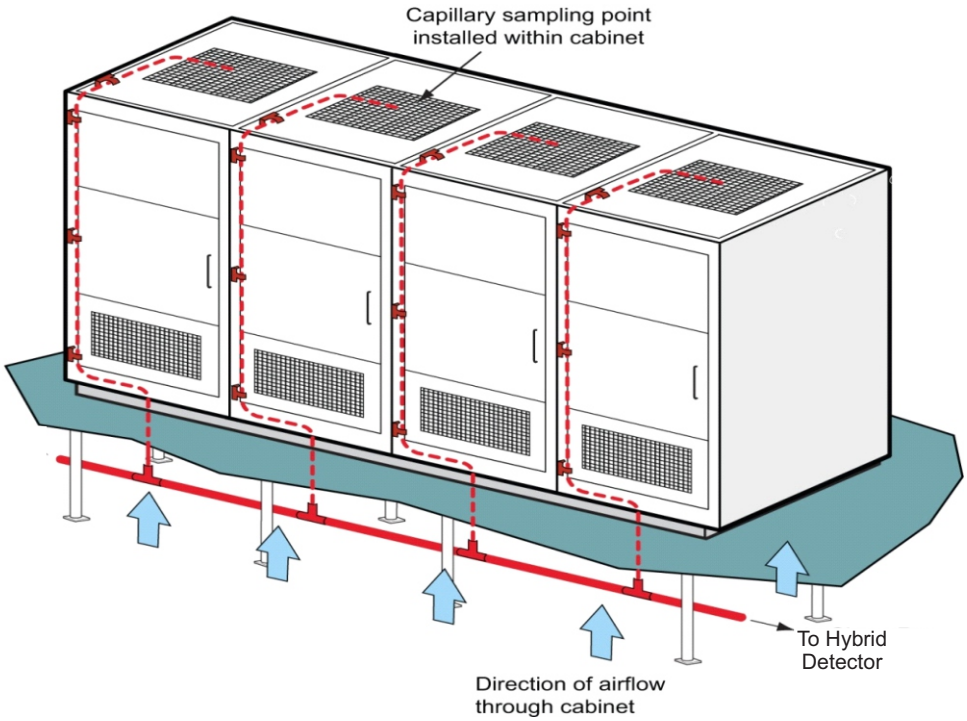
For safety reasons it is recommended that dedicated sampling pipe test points are installed in safe locations to enable the integrity of the entire sampling pipe array to be confirmed during maintenance visits without the need to power down electrical cabinets to gain access to the sampling points.



Inside cabinet with capillary sampling pipe

A more aesthetically pleasing installation may utilise the under floor void area for the main trunk pipe, with small bore capillaries installed to the optimum detection position.

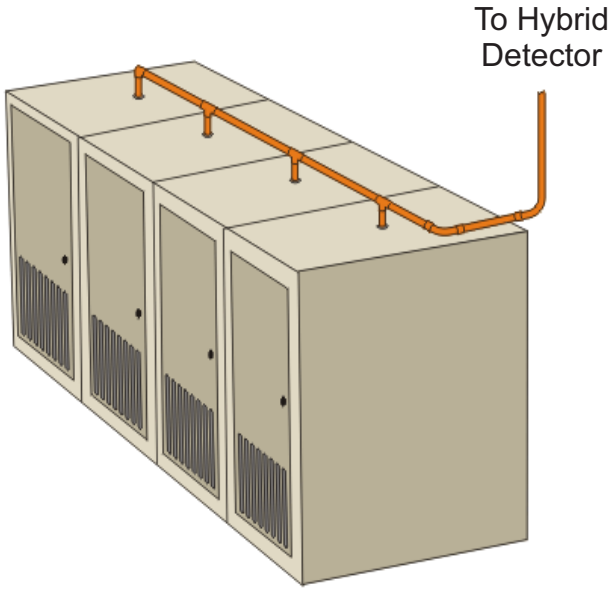
The capillary sampling pipe should be securely fixed inside the cabinets to prevent interference with the normal operation of the cabinet.



In-Cabinet System Examples

In-Cabinet Detection

Multiple cabinets may be protected by running a sample pipe above the cabinets with extensions protruding into the cabinet.

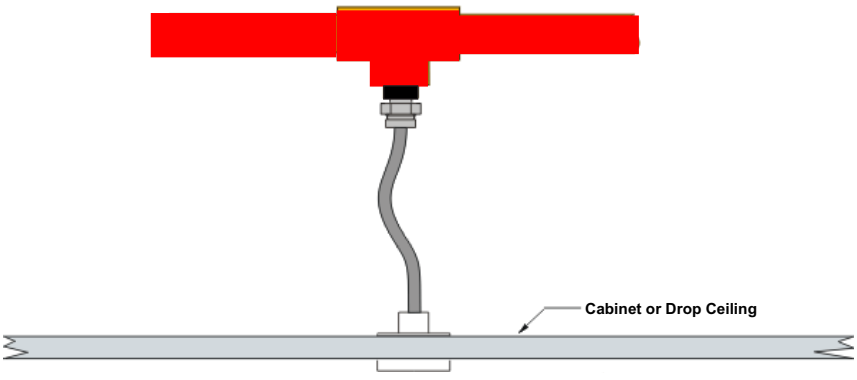


In-Cabinet Detection and Drop Ceilings

A sealing grommet can be used to prevent outside air from diluting the air sample.

A maximum 4” sample pipe is extended into the cabinet from the main pipe run.

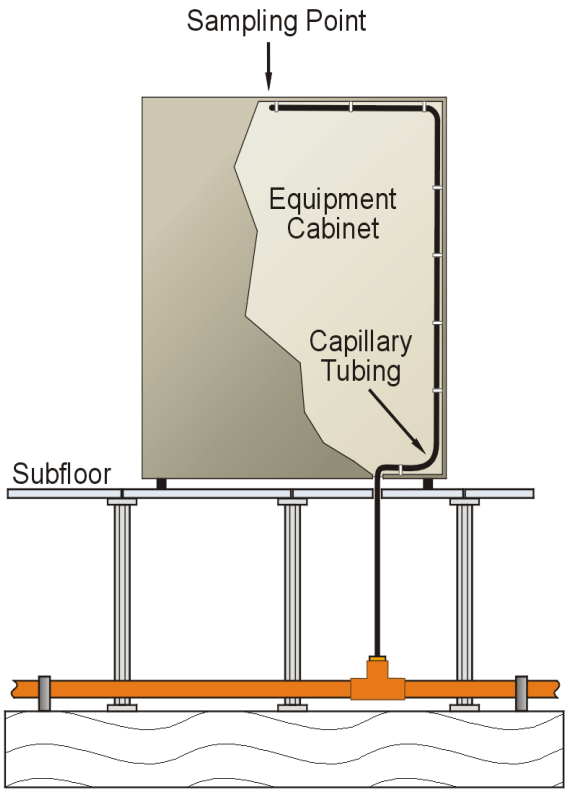
Flexible capillary drops may also be used for in-cabinet sampling.



In-Cabinet System Examples

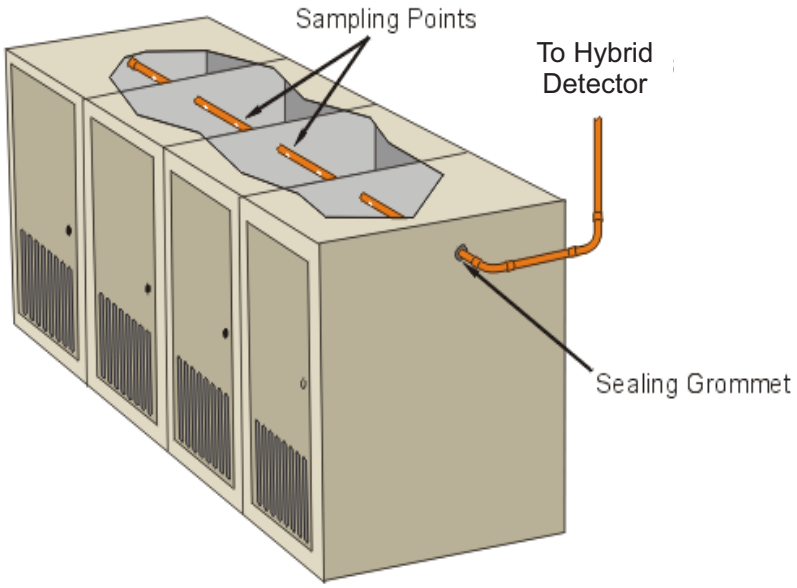
In-Cabinet detection may also be done from the subfloor space.

Be sure to securely fasten the capillary tubing to prevent it from interfering with any of the cabinet components.



In-Cabinet Detection

Multiple cabinets may also be protected by running a sample pipe through the cabinets with a sealing grommet where the sample pipe enters the cabinets.



System Design

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Pre-Design Considerations

Expectations of the completed aspirating detection system

Prior to the detection system design and in the absence of a specification the designer should consult with the client to confirm the expectations from the completed aspirating detection system. These consultations should include such things as the 'type' of detection system to be installed, the compliance with applicable local codes and standards, the 'realistic' sensitivity of the detector for the given application and a possible and suitable performance test for the completed installation.

Detector Sensitivity

The sensitivity of the required detection system is dependent upon a number of issues including the application of the detection system, the 'type' of aspirating detection system employed, the ambient background particle levels, local codes and performance test requirements.

Hybrid Series detectors have a huge sensitivity range. This enables the detectors to be installed in applications as diverse as a 'Cleanroom' requiring the very highest sensitivity available through to a *'dirty'* warehouse with diesel and other pollutants present.

The extent of this vast sensitivity range is that from a single Hybrid Series detector up to four alarms can be generated at different points along the fire growth curve as detailed in the example below.

Example: Computer Room Installation

Pre-alarm condition	-	May be given when the detector is operating at a very high sensitivity level. This condition would most likely initiate a visual check only of the protected space. It should be noted that there may not be any visible smoke present at this time. (0% obs/ft.)
Fire 1 condition	-	May be given when the fire condition is continuing to develop. This alarm level may 'shut-down' any forced ventilation to enable point detectors to be more efficient.
Fire 2 condition	-	May be given when the fire condition is continuing to further develop. This alarm could provide a signal to 'evacuate' the building to protect the lives of any personnel that may be affected by the condition.
Fire 3 condition	-	May be given when the fire condition is continuing to further develop to a flaming stage. This alarm level could provide a signal to release a 'fire suppression' system to extinguish the fire condition.

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Background Levels

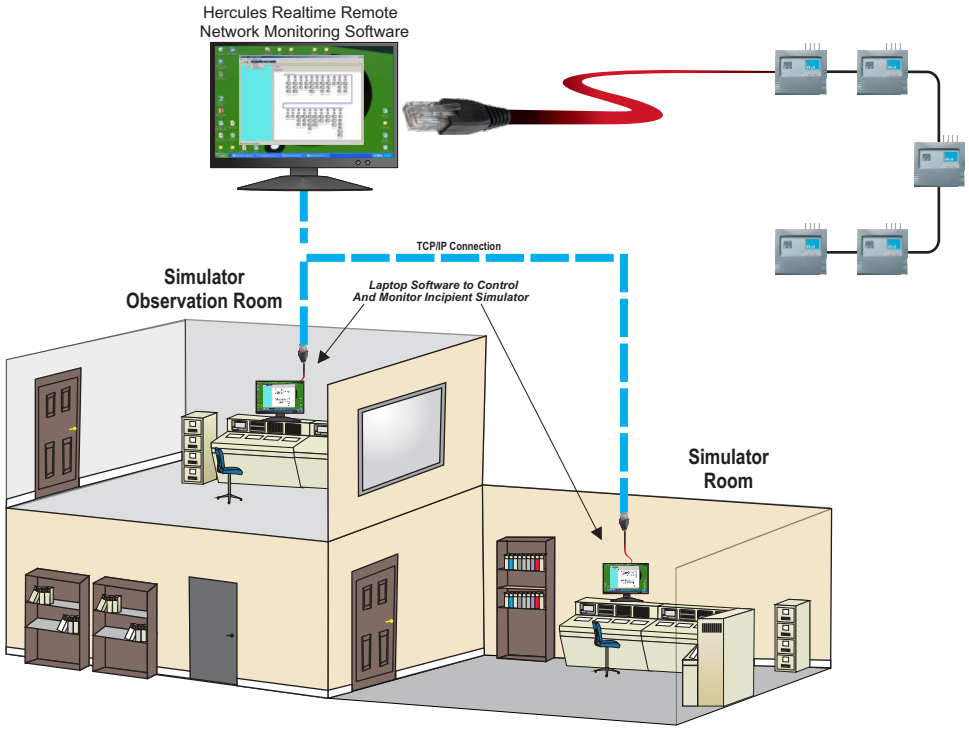
The actual sensitivity setting of the detector for each specific application is most affected by the ambient background particle level. This ambient particle level may be influenced by many sources including, the proximity to outside air, any production or manufacturing that may be carried out within the environment and the influence of forced air ventilation or air penetrating from adjoining areas.

This ambient background particle level may not be consistent throughout the period of a day, week other time span. With this in mind the sensitivity of Hybrid Series detectors can be configured to suit the variable background levels in a number of ways; including different time settings on up to three time zones during a 24 hour period and by each day of the week to allow for differences between working days nights. Consideration should be given to standard dirt and dust levels in the room and what precautions should be taken.

Required 'Performance Tests'

'Spot Type' detection systems utilize device area for location compliance coverage only. Air sampling detection systems should be designed to achieve an acceptable level of fire detection for the protected area and to take into consideration other aspects such as ventilation and forced or natural extraction points.

The designer should therefore confirm with the client at design stage the most suitable 'performance test' for the installed aspirating detection system as well as adhering to NFPA and local codes.



Area System Design

To estimate a project you must first layout the separate hazards or required zones as shown in Figure 8. Normally this is done by placing the sample heads within the hazard based on square footage of protection.

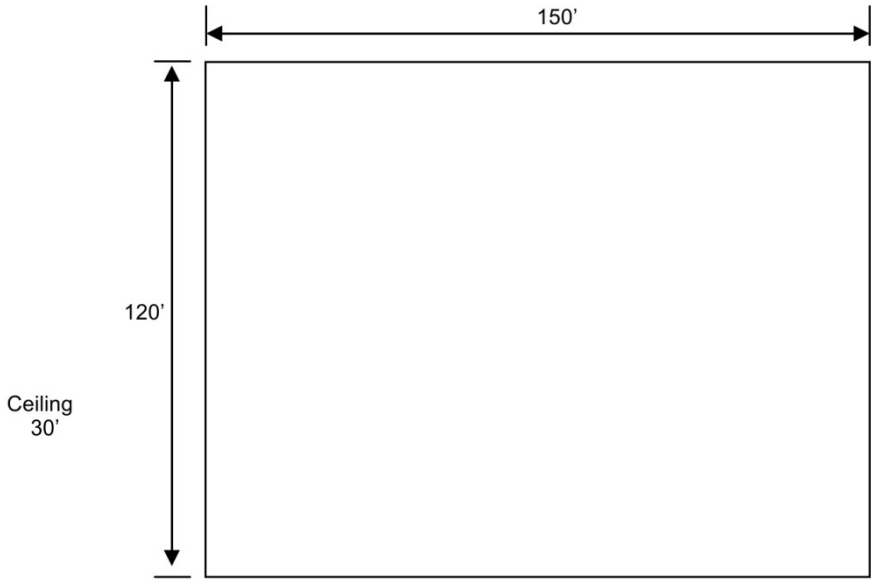


Figure 8

Sample Point Spacing:

Air sampling systems are estimated by using a 30' x 30' spacing grid, as shown in Figure 9, to determine the sample pipe run. Be sure to use a maximum of 15 feet spacing from any sidewall. This method of estimating a system will also help ensure your design meets NFPA 72 requirements.

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

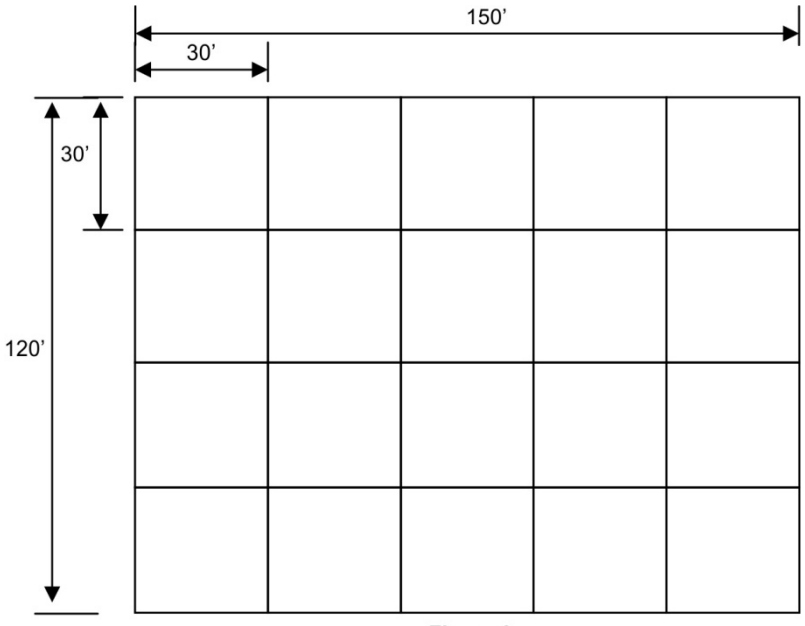


Figure 9

Configuring Sample Points by Detector:

Figure 10 below illustrates running the sample pipe to best fit the area. If using multiple sample pipes on the same detector as shown in Figure 11, they must be relatively similar in length to maintain airflow balance between sample pipes. All designs must have a flow calculation performed to ensure the system meets all NFPA 72 requirements.

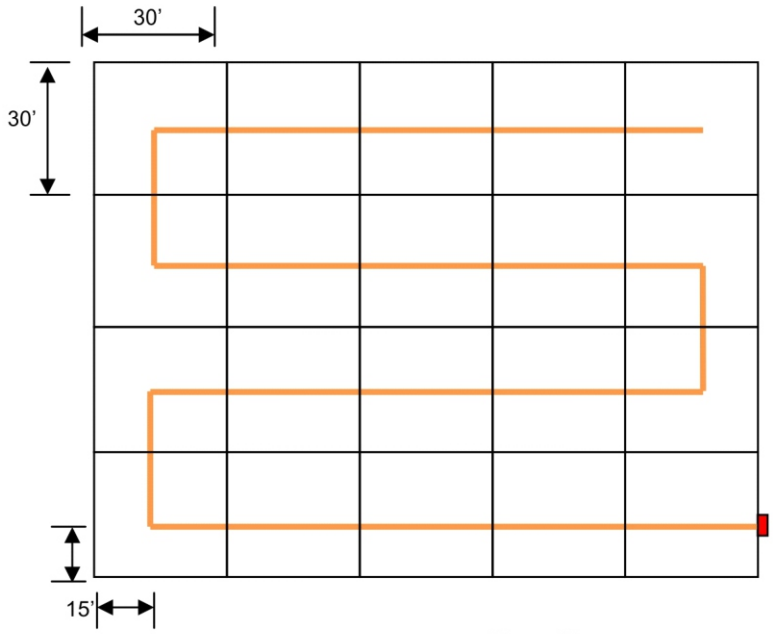
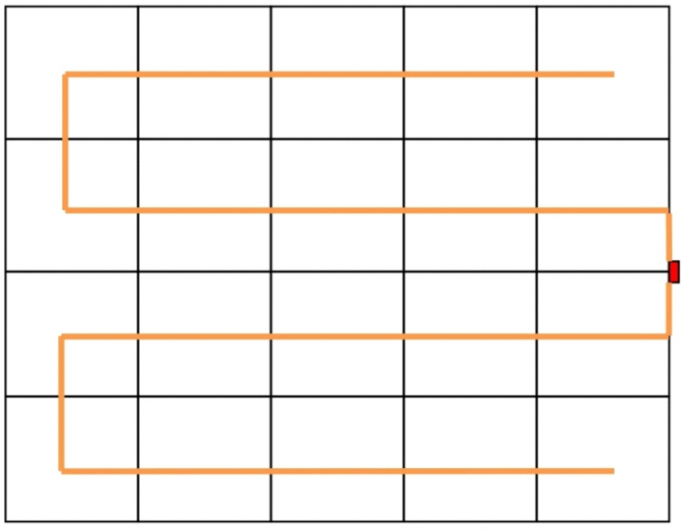


Figure 10

Figure 11 illustrates an alternate configuration using multiple sample pipes. For this example, this design is used to prevent exceeding the maximum pipe runs. This type of design will also decrease transport time compared to a single serpentine pipe run.

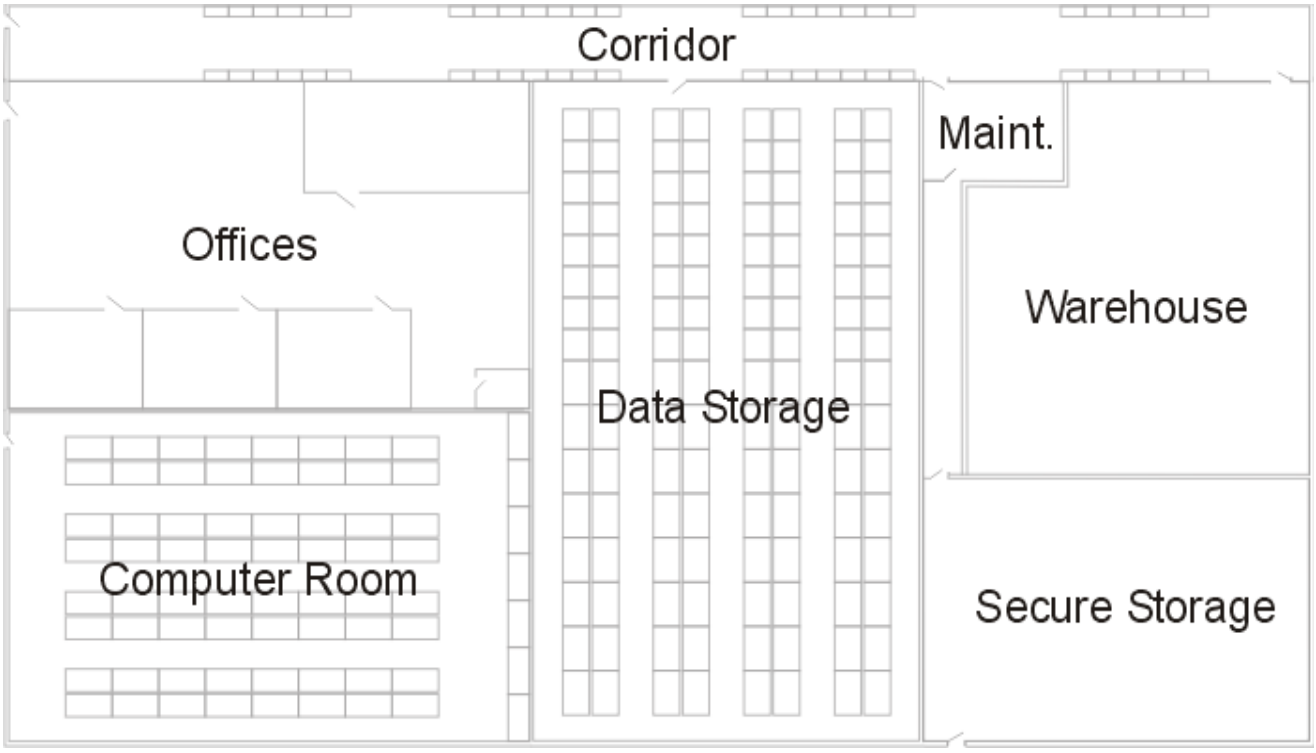
Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project



Total Pipe Run:
300 ft. each

Figure 11

Area Detection Design Example



Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Corridor:

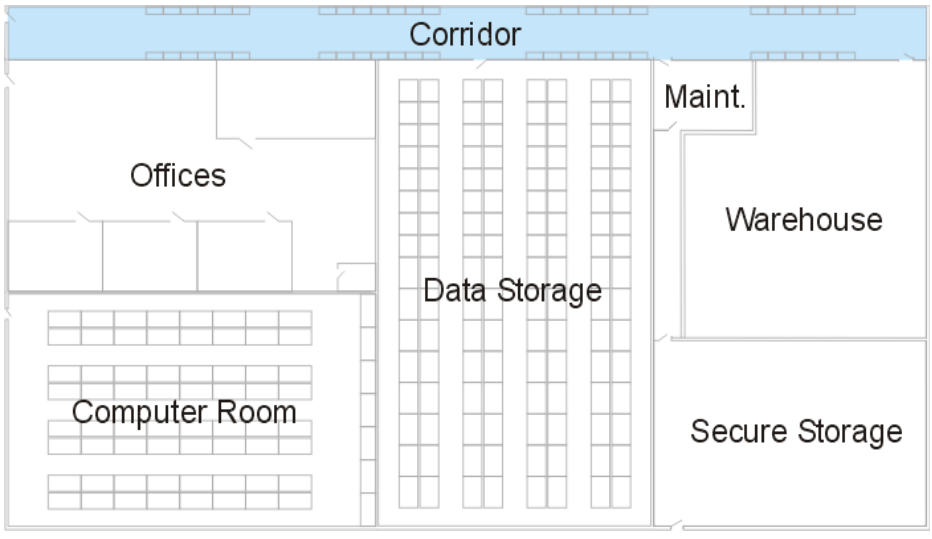
Dimensions: 200' x 15'

Ceiling Height: 20 feet

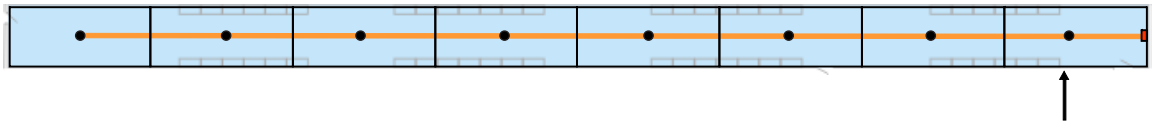
Spacing: 30' x 30'

Capillary Drops: No

Number of zones: 1



For optimal system performance, always place a sampling point in the path of moving air or at the return air grill.



1. Layout sample point spacing
2. Determine location of detector
3. Layout sampling pipe
4. Determine Unit –

An alternate configuration may use a "T" to divide the pipe run.

Even though the straight pipe passed the calculation, this alternate pipe configuration must still pass the flow calculation.

For optimal system performance, always try to place a sampling point in the path of moving air or at the return air grill.

The 3 separate offices, a conference room, and a utility closet which will also require detection

Offices:

Dimensions: 80' x 60'

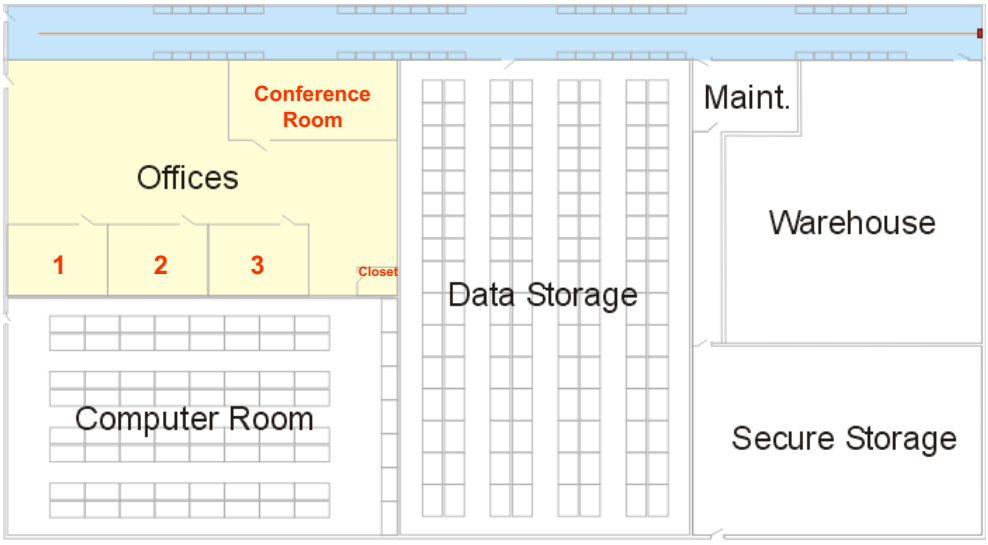
Ceiling Deck Height: 15 feet

Spacing: 30' x 30'

Capillary Drops: Yes

Drop Ceiling Height: 9 feet

Number of zones: 1



Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Area Detection

For optimal system performance, always try to place a sampling point in the path of moving air or at the return air grill.

Offices:

Dimensions: 80’ x 60’

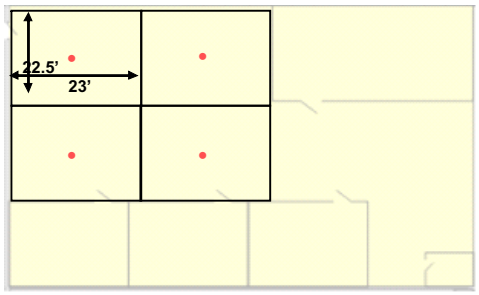
Ceiling Deck Height: 15 feet

Spacing: 30’ x 30’

Capillary Drops: Yes

Drop Ceiling Height: 9 feet

Number of zones: 1



• Sample Point

The area covered by each sample point is less than 30’ x 30’, and therefore within NFPA 72 spacing limits.

This space reduction can provide better detection than standard 30’ x 30’ spacing, while using the same amount of pipe.

30’ x 30’ spacing does not easily fit in this example. There are three options.

1. **Reposition spacing to fit the area**
2. **Use alternate spacing per NFPA 72 to calculate exact coverage area.**
3. **Reduce the coverage area of each sample point to fit into the room, and adjust the sample point spacing.**

Actual spacing for these four sample areas will be 23’ x 22.5’

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Offices:

Dimensions: 80’ x 60’

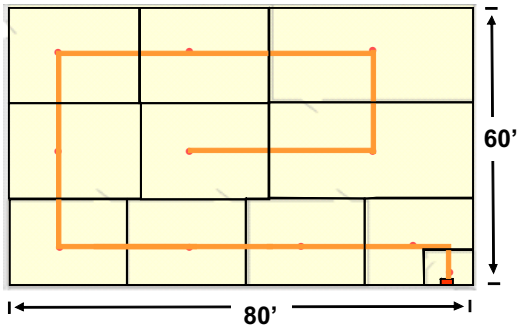
Ceiling Deck Height: 15 feet

Spacing: 30’ x 30’

Capillary Drops: Yes

Drop Ceiling Height: 9 feet

Number of zones: 1



1. **Determine location of detector**
2. **Layout sampling pipe**
3. **Determine total length of pipe**
   Length of Run 224.5’
   Drop from Ceiling 9’
   Total Length 233.5’
4. **Determine Unit –**

DESIGN WORKSHEET

DATE:_____ PAGE ____OF____

CUSTOMER:_____

ADDRESS:_____

CITY:_____STATE:_____ZIP:_____

PHONE:_____CONTACT:_____

HAZARD:_____

CEILING HEIGHT:_____

WIDTH
_____

LENGTH
_____

scale____:____

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Air Sampling
Pipe Flow
Calculation Program

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

ProFlow Sampling Pipe Calculation Program

The design of any Hybrid Series Air Sampling Detection System should be confirmed by producing a sampling pipe calculation. This section is a representation of how flow calculations are done and not actual training.

'ProFlow' is a 'Windows' based software program that allows the designer to enter the site specific information and then to automatically check a range of possible Hybrid Series detectors, sampling pipe sizes, sampling pipe lengths, quantity and size of sample holes or capillary sampling point configurations.

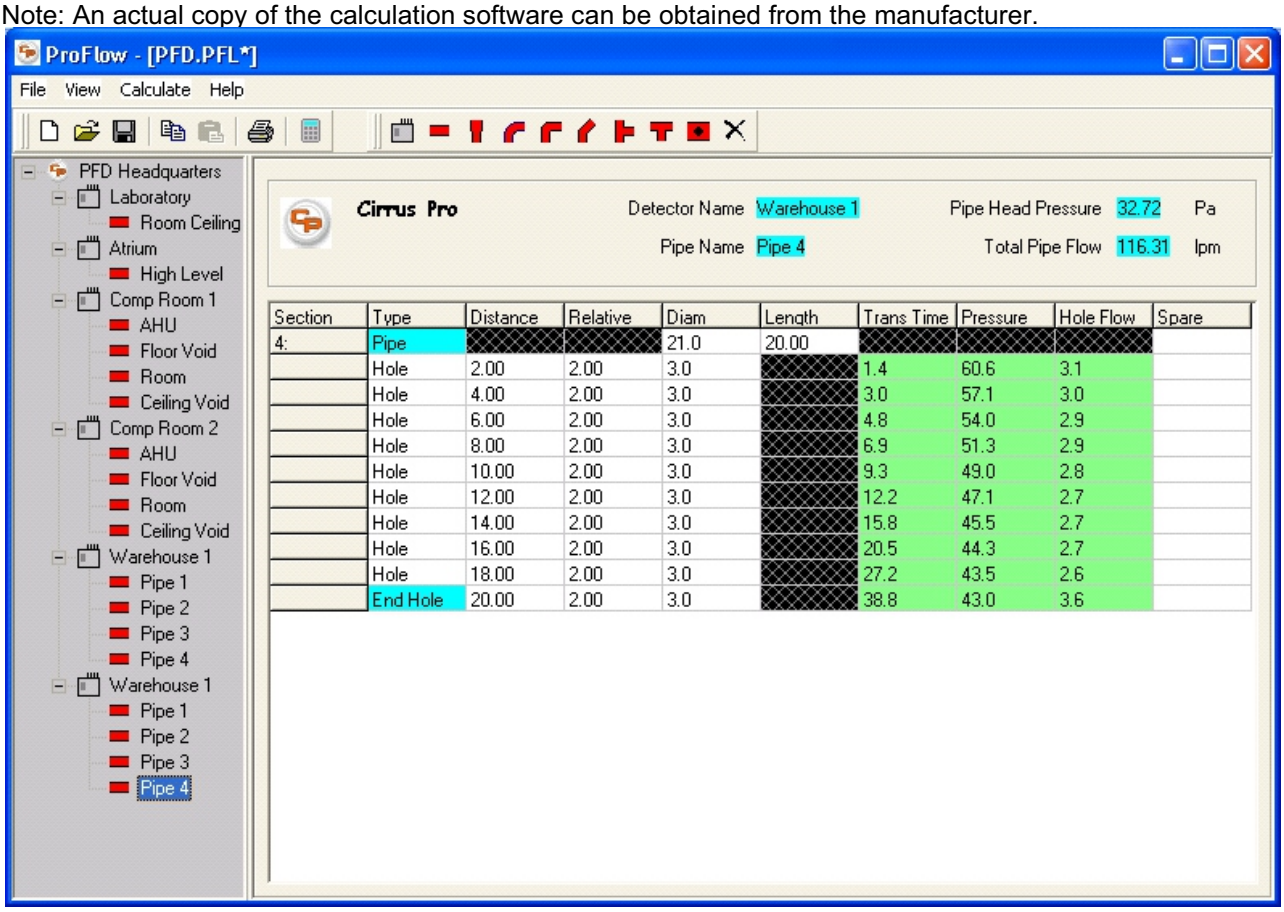
'Pro Flow' can allow many design configurations to be evaluated and helps the designer to choose the most suitable layout for each individual application.

Some software 'default' parameters may be changed to allow compliance with local codes or project specific problems.

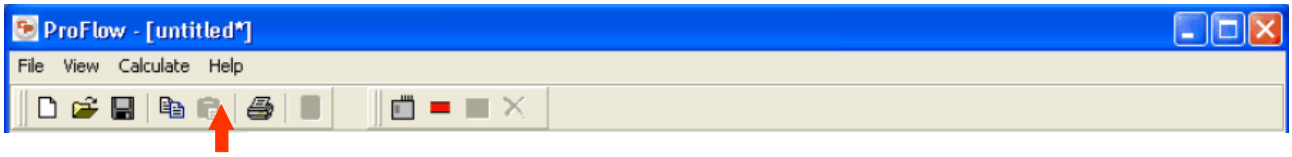
The completed calculations may be saved and should be presented to the system installer to ensure the proposed design is followed accurately. The installer should advise the designer if any part of the works cannot be completed inline with the original proposal, whereupon a revised sampling pipe design and calculation should be completed to ensure correct operation.

In addition the calculations should also be presented to the commissioning or test engineer to allow the detector to be configured correctly and confirm through actual sampling pipe and sampling hole testing the correct aspirating detection system operation inline with the design proposals.

Note: An actual copy of the calculation software can be obtained from the manufacturer.

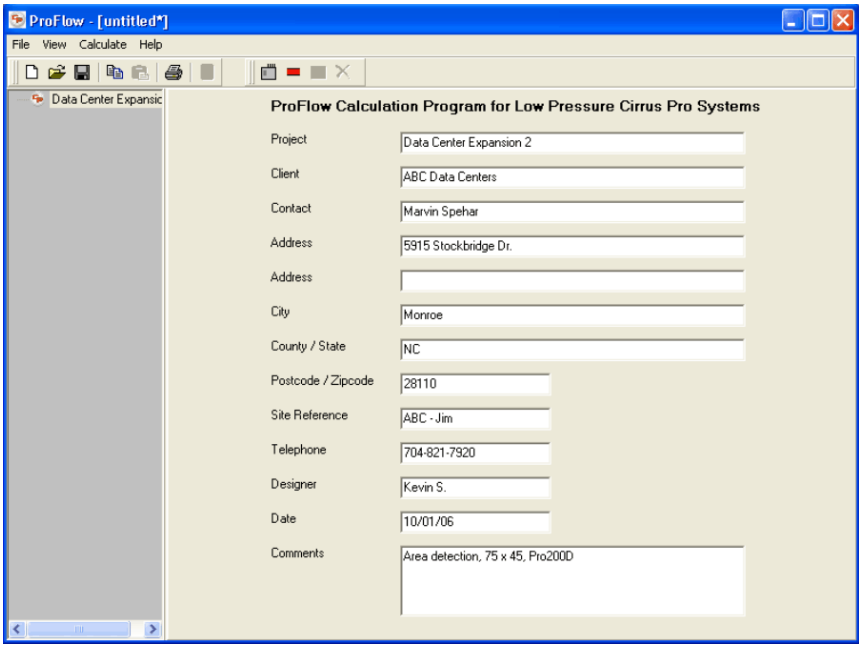


This section will demonstrate how to use the ProFlow Commercial Sample Pipe Calculation Software. Be sure to read the ProFlow Help File for further instruction on how to operate the software prior to performing calculations on your first system.



Fill in the project information on the information screen when the software is first brought up.

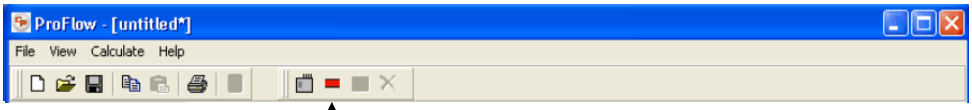
You may wish to save the file at this time. The file will have a PFL extension.



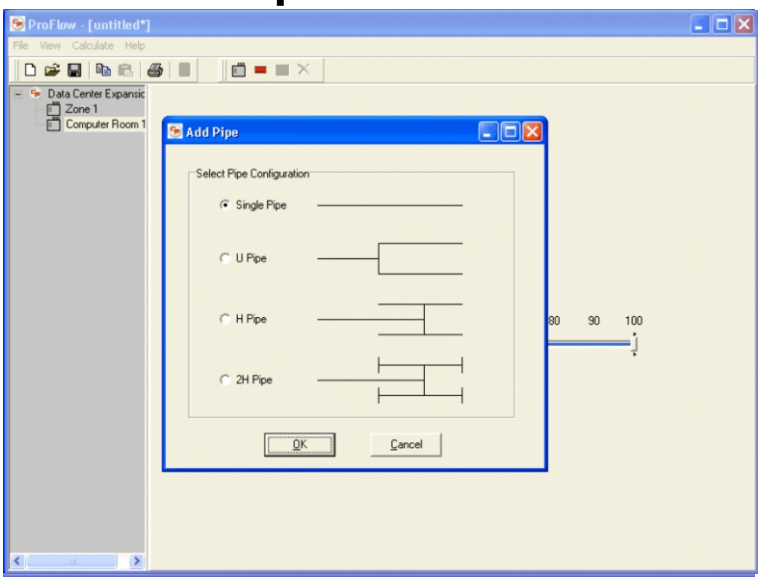
Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Select your Detector Type and number of Pipes

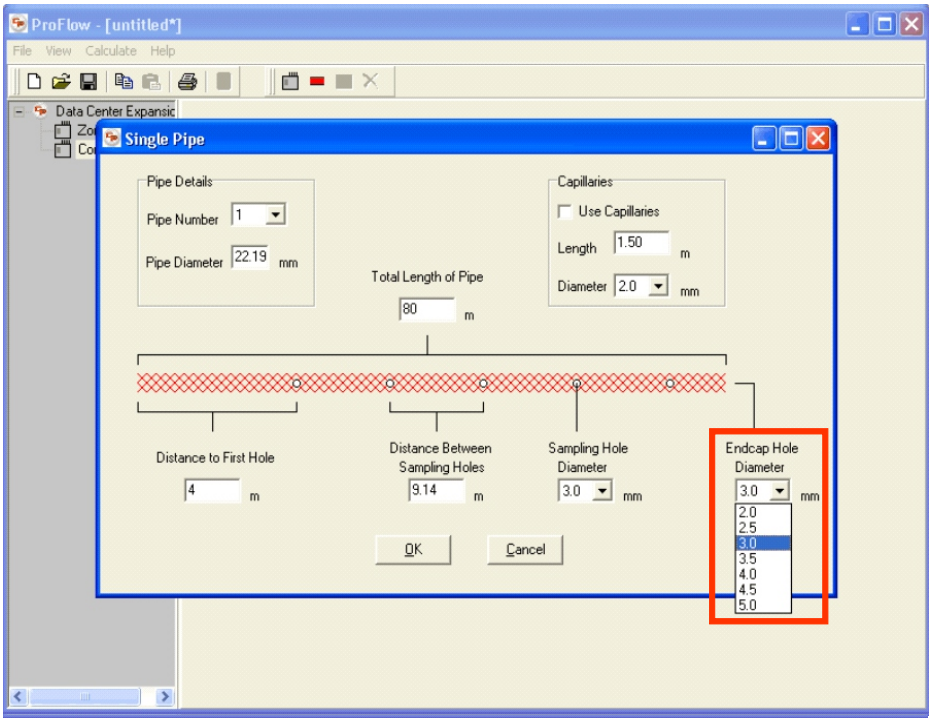
Select the pipe icon to display the pipe layout options.



Choose the type of design you wish to calculate.



Use the drop down box to select the endcap hole diameter.

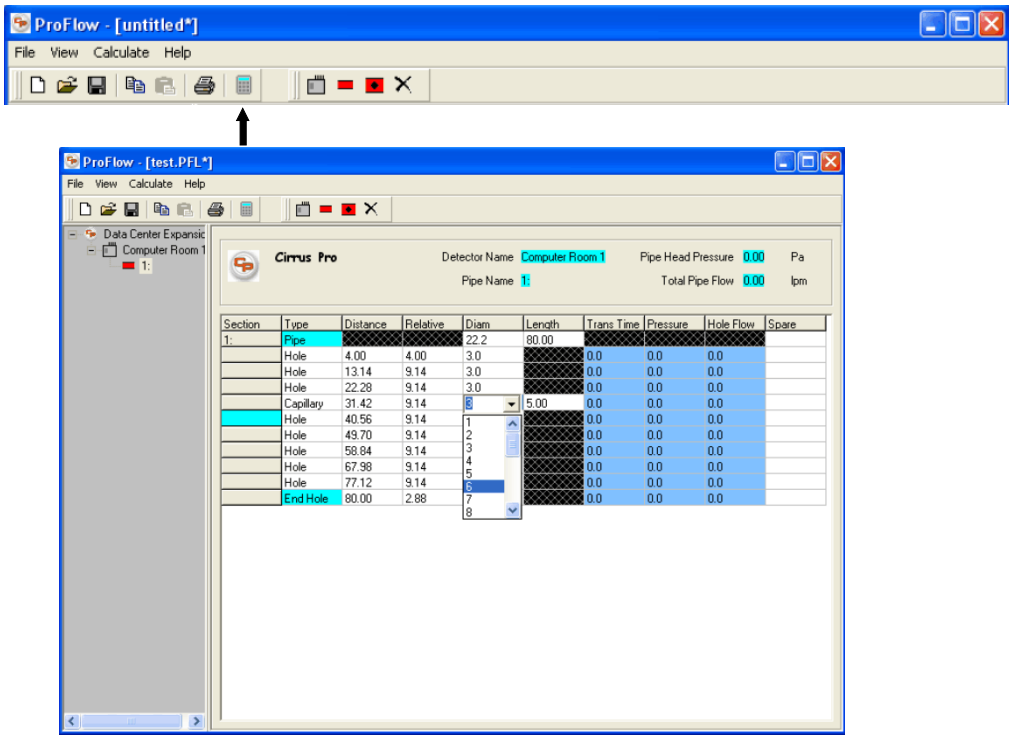


At this time you may use the drop down box to include a capillary drop for any sampling point.

Enter the length of the capillary drop.

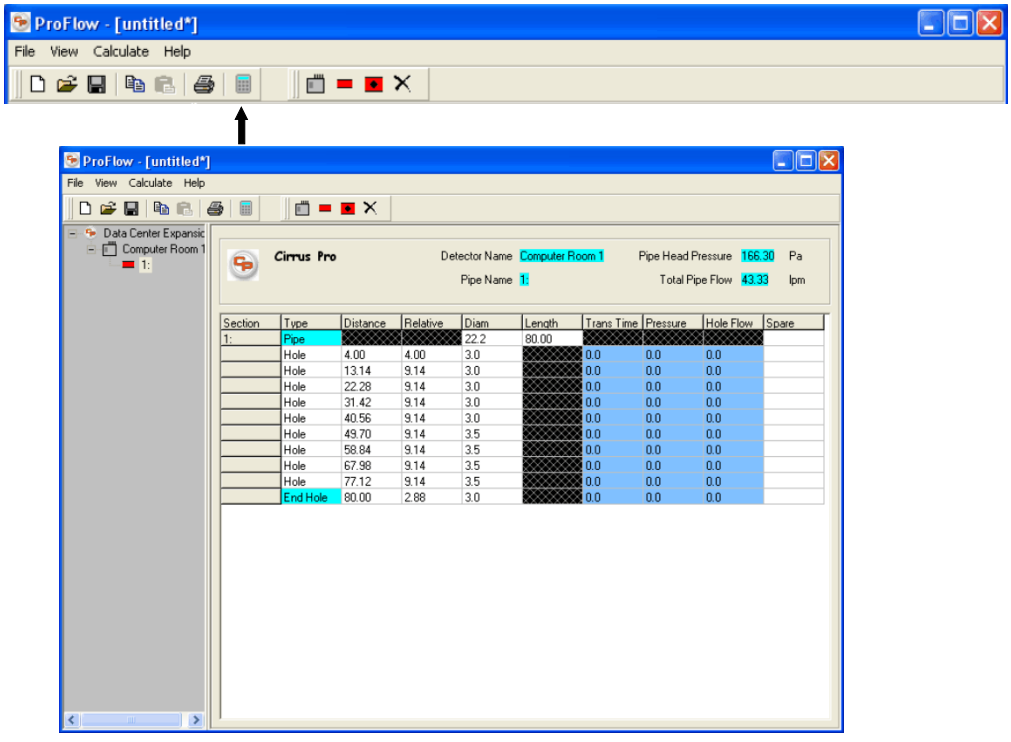
Select a sampling hole size.

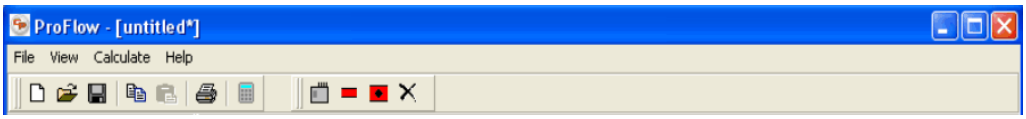
Perform the calculation by selecting the Calculate Icon on the menu bar.



Clicking off of the table to refresh the screen so you may view the changes.

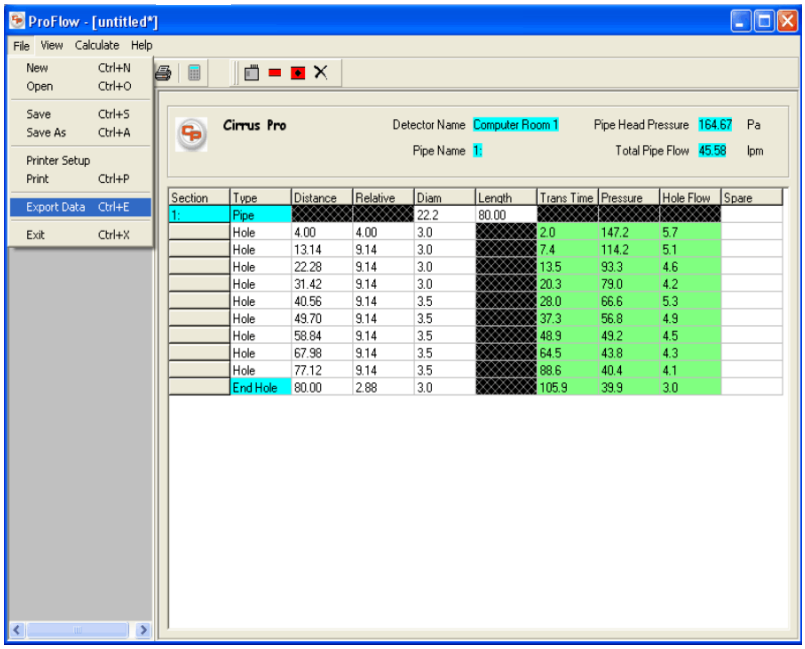
Perform the calculation by selecting the Calculate Icon on the menu bar.

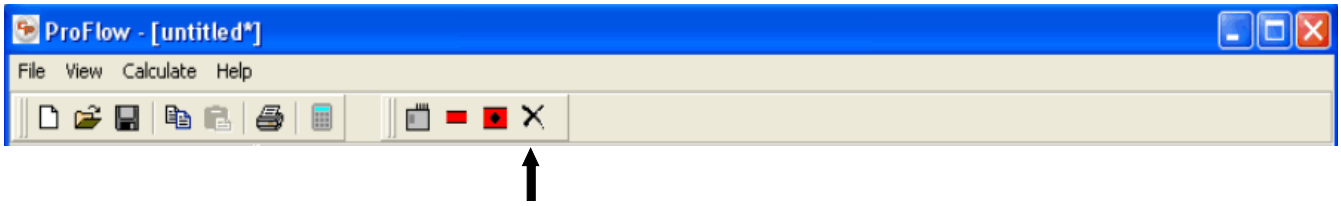




You may export the results to a CSV file which can be imported into CAD. This file may be opened using Excel®

The CSV file will be placed in the same directory as the saved file.





The “Delete” Icon allows you to remove a particular hole in the pipe run.

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Detector Networking

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Multiple Detector Networking Options

Hybrid detectors provide several networking options. From a simple RS485 Peer to Peer network between detectors using a detector LCD display or RDP as the network hub, to software driven networks using TCP/IP for access through any LAN, WAN, or internet connection.

Peer to Peer Detector Networking

Built-In RS485 Networking

Simply use a shielded Belden 9841 type cable to network the units together via the internal RS485 connections.

Network Simplicity

A RDP may be used to Program, View, Display Historic Graph and Event Logs, Troubleshoot, and provide Alarm Notification for any unit on the network.

Remote Display

A Remote Display may be placed in areas which are populated after hours such as guard stations or office areas.

Remote Display

ProView

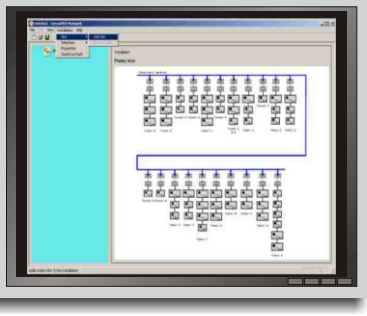
Networking Software for PC

Networking Software comes with the systems and will allow you to easily Program, View, Display Historic Graph and Event Logs, or Troubleshoot any detector on the network via a PC. Simply connect a PC running CirrusPro software to any detector on a Peer to Peer network.

Hercules 6 Networking Software

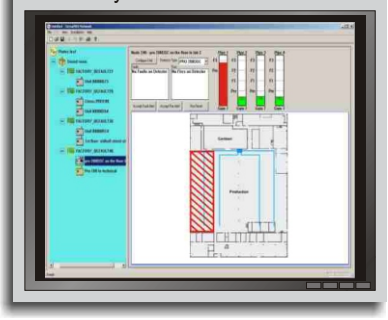
Remotely monitor a detector network using Hercules High Level Interface software via an internet, LAN, or WAN connection. Detailed graphic maps of an area are used to isolate alarms and display specific zone information. You may also Program, View Detector Status, Display Historic Graphs and Event Logs, as well as Troubleshoot any detector on the network.

View entire detector network tree remotely via TCP/IP



View status of any detector on network in any hazard

Receive real time notification of any detector zone in alarm



Maximum 98 Protec air sampling detectors on RS485 wired network
Maximum 1.2km RS485 network length with one ADRDP (can be extended using multiple ADRDPs)

Integrated TCP/IP Networking

The Hybrid TCP/IP Interface Module works with Hercules 6 software to access the detector network through any internet, LAN, or WAN connection. The included module is built in to the detector and can be programmed using ProFlow

Installation

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Installing RedPipe Air Sampling Network

All sampling pipe should be UL Approved RedPipe which is ¾" smooth bore, nominal diameter CPVC Pipe

General Information
RedPipe CPVC is a homogenous material with good chemical resistance and high impact strength. Other advantageous features are its suitability for use at low temperatures (-40°) and its ease of jointing. RedPipe is also Self-Extinguishing.

Color: RedPipe supplied CPVC products is manufactured in Red (other colors Available)

Temperature: CPVC is suitable for use over a wide temperature range from -75°F to +200°F.

Assembling of sampling pipe and fittings

Safe Fire Detection supplied 'Solvent Cement' for CPVC sampling pipe is specially formulated to chemically weld pipes and fittings together. The solvent cement chemically melts the two surfaces to be joined, so that when they are fitted together they form a homogenous mass, which then cures to form a weld. Note that this is not a glued joint. It is therefore important to choose the correct type of adhesive as other types may be detrimental to the integrity of the system.

When Assembling 'always':
a) Cut the pipe at right angles, and to the required length using the correct cutting shears.(not Saws)
b) Dry fit the pipe to the socket of the fittings. When the pipe is fully inserted in the socket, draw a line around the pipe at the edge of the socket. Where this is not possible measure the socket depth and draw a line at the corresponding point along the pipe. This will give a visual indication, to ensure that the pipe is fully pushed home in the socket.
c) Apply a small amount of the solvent cement with a suitably sized brush or the brush provided in the adhesive lid. Ensure that the area of the pipe up to the visual indicator is completely covered with an even layer of cement. This part of the operation must be done quickly and neatly, as the solvent must still be wet when the pipe and fitting is pushed together.
d) Push the pipe and fittings together and hold in place for up to 30 seconds. When the joint is made, a bead of solvent cement will form around the outer joint of the pipe and socket. This excess cement should be wiped away leaving the outer part of the joint clean.

When Assembling 'never':-
a) in rain or wet conditions.
b) Use dirty brushes or cleaning rags (which can be dirty or oily).
c) Use the same brushes with different solvent cements.
d) Dilute or thin solvent cements with cleaner.
e) Leave solvent cement cans open.
f) Use near lights, or smoke while jointing. Solvents are highly flammable.
g) Make joints in a confined space. Solvents emit hazardous vapors, which are dangerous.

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project

Sampling Pipe Clips, Bracketing and Labeling

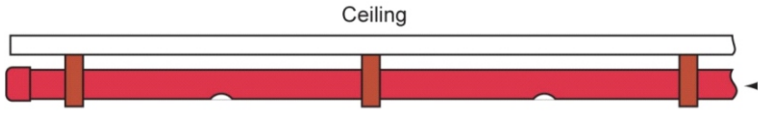
All pipe clips/brackets need to be made with the inside diameter of the bracket marginally larger than that of the pipe outer diameter. This allows for free lineal movement of the pipe, and avoids inhibiting expansion or contraction. They should also be smooth, to avoid damage to the outer surface of the pipe. It should be noted that many of the 'caddie' type knock-on girder clips do not allow for lineal pipe movement as they 'grip' the sampling pipe and therefore should not be used.

OPEN **CLOSED**

The RedPipe sampling pipe clip for ¾" CPVC sampling pipe is a two position 'locking' clip. The first locking position is really for 27mm sampling pipe but may be used for ¾" sampling pipe if the clip is installed facing upwards. The second locking position 'holds' the sampling pipe within the clip more firmly but still allows for lineal movement of the sampling pipe through the clip caused by expansion and contraction of the sampling pipe due to temperature changes. The clip may be installed in any orientation in this locking position.

Bracket Spacing Intervals

Plastic sampling pipes require regular support, and the spacing of clips or brackets is 3' unless otherwise stated by the AHJ. The exact type and spacing of sampling pipe fittings should be determined utilizing sampling pipe manufacturers recommendations.



The system installer should check that the sampling pipe installation is secured adequately to the building structure. Many types of sampling pipe and capillary pipe fittings are available and it should be ensured that the type method selected is suitable for the both the application and the environment.

Sample Hole Markers (SHMs)

SHMs

All Sample holes must be clearly marked using Sample Hole Markers (SHMs). SHMs are available in in the following Sizes.

5/64	3/32	7/64	1/8	9/64	5/32	11/64	3/16	13/64
RP5248	RP5249	RP5250	RP5251	RP5252	RP5253	RP5254	RP5255	RP5256

Environmental Condensation Considerations

It may be very important to consider the effects of condensation on some aspirating detection systems with regards to the aspirating detector, the sampling pipe installation and the future servicing of such a system.

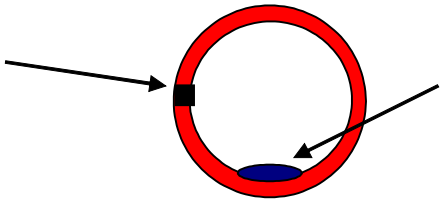
Condensation with regards to the aspirating detector.
Many aspirating detectors may cause false (unwanted) alarms when installed in environments where condensation may be permanent or be created due to changing environmental conditions of the protected area. This is particularly a problem for most 'optical' based aspirating detectors.
Condensation with regards to the sampling pipe installation.
Where condensation can be expected or be permanently present, the complete sampling pipe installation should be installed to allow a gradient where by any condensation formed inside the sampling pipe will, through gravity, drain to its lowest point where it can be managed using a dedicated condensation drain point.

Sampling Pipe Condensation Trap.
Where high levels or permanent condensation is anticipated a 'Sampling Pipe Condensation Trap' may be placed within the sampling pipe installation. This trap should be located close to the aspirating detector, in a position that is 'off centre' from the detector sampling pipe inlet port, and must be installed in the vertical plane to allow any condensation formed within the sampling pipe to be held in the sampling pipe condensation trap. A sampling pipe condensation trap will be required on each sampling pipe where condensation may be expected.

Typical
Condensation
Trap.

Sampling Pipe Holes.
Normally sampling holes are drilled into the sampling pipe on the bottom (or lower) face of the sampling pipe. However, where condensation may be present it is an advantage to drill the sampling holes on the side wall of the sampling pipe (but still ensuring as much free space as possible around the area of the sampling hole). This should prevent any sampling holes becoming blocked when condensation is formed by water droplets and even 'streams' of condensation droplets within the sampling pipe.

'Revised' location of drilled sampling hole within sampling pipe when condensation may be expected. Thereby not allowing any condensation to restrict or block any sampling holes.



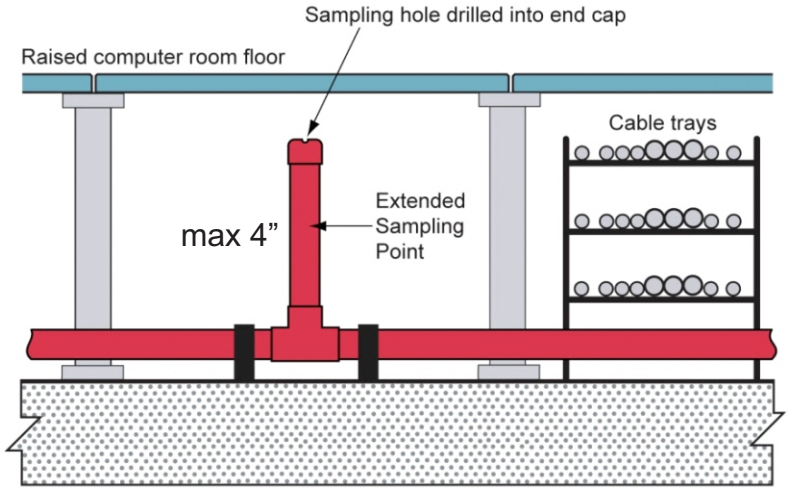
possible
condensation.

For further more detailed information on sampling pipe condensation issues please see our Safe Fire Detection Aspirating System Sampling Pipe Installation Guidelines and General Information Guide.

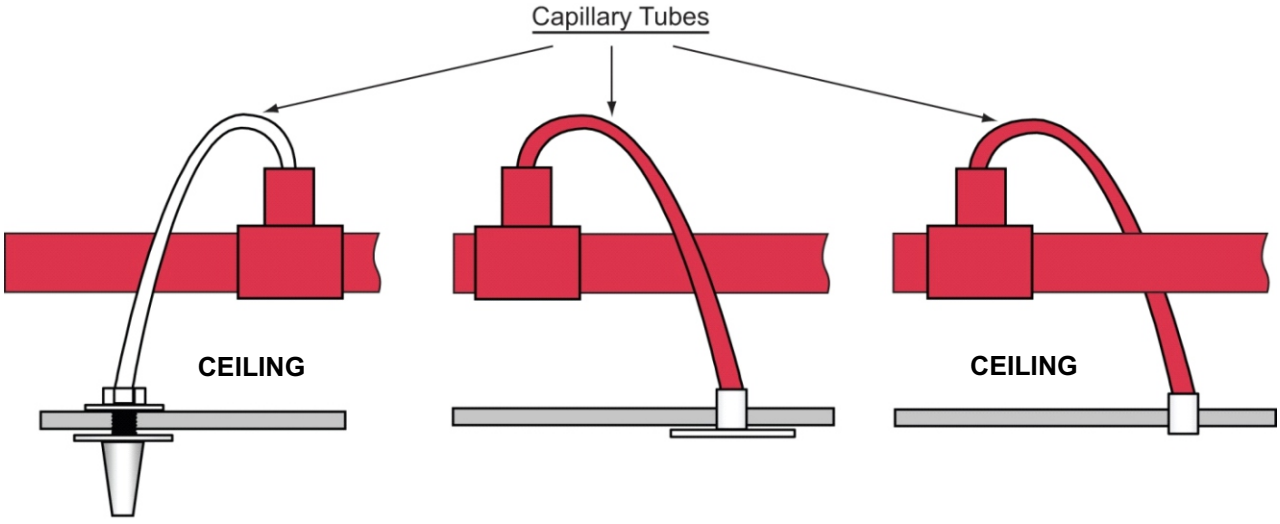
Extended or Capillary Sampling Pipe

All extended or capillary sampling pipe and fittings should be low-pressure loss and be of a smooth bore to prevent turbulence of flow. The selected extended or capillary sampling pipe should be suitable for the environment in which it is to be installed.

Extended Sampling Point



Capillary Sampling Points



“Conical Head”
Capillary Sampling Point

“Flush Disc”
Capillary Sampling Point

“Discrete”
Capillary Sampling Point

Sampling Pipe ‘Test Points’

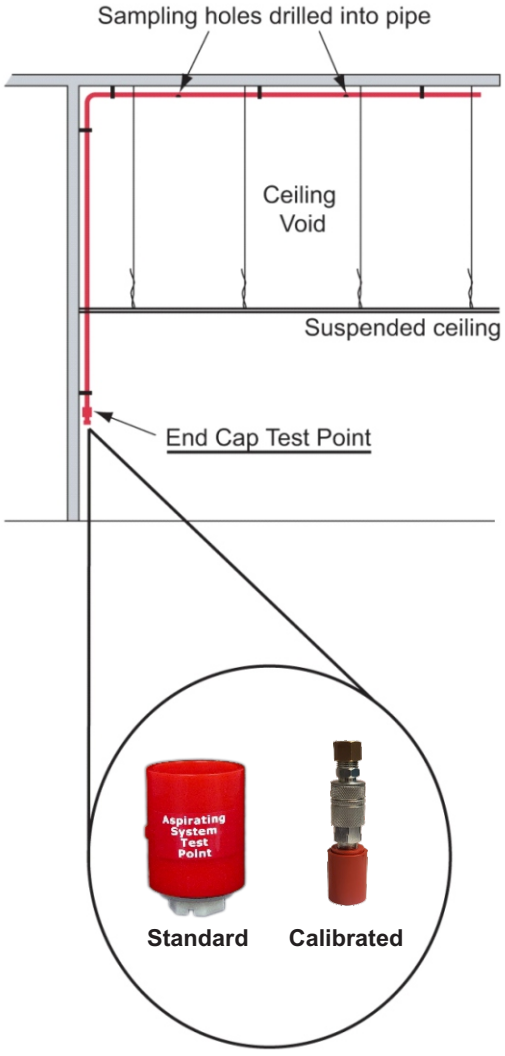
Where sampling pipes are installed at high levels or within enclosed voids or compartments it is necessary to install sampling pipe ‘Test Points.’

These ‘Test points’ should be installed at the end of each sampling pipe array. They are used to provide a dedicated orifice into the sampling pipe in order that the entire length of pipe can be tested during system servicing. Once testing is complete the ‘Test Point’ should be re-sealed as it does not form part of the sampling pipe detection system.

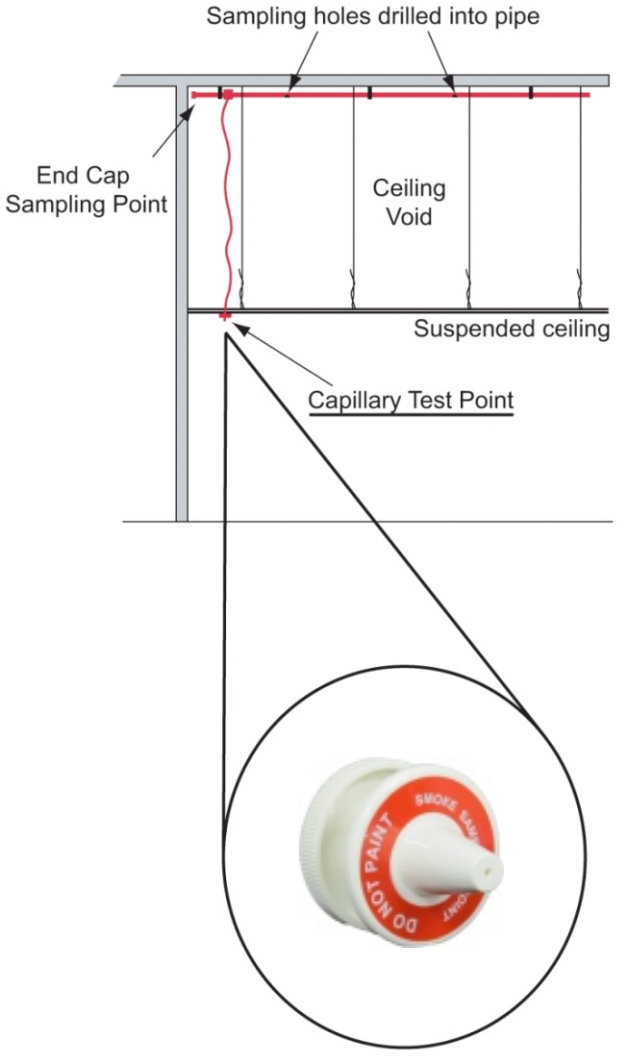
As ‘Test Points’ do not form part of the sampling pipe detection system the transport time taken from the ‘Test Point’ to the detector is not restricted. However the transport time taken from each ‘test point’ should be recorded and repeated on each visit with any changes in time investigated.

All sampling pipe ‘Test Points’ should be installed in safe and secure locations and should be made from a material suitable for the environment in which it is to be installed.

End Cap Test Point



Capillary Test Point



Performance Testing

Unlike standard 'spot type' smoke detectors it is often requested that completed aspirating detection system installations be subjected to a 'Performance Test' to verify the system response to simulated fire scenarios.

SYSTEM TESTING
Test the response times by introducing smoke into the furthest hole or test point on each zone. The response of detector can be viewed using the Real Time Graph on the display or software.

NOTE:
Be sure to use the “Hold Pipe” function on the zone you are testing.

Do not use Synthetic or Canned Smoke for any testing.

Methods of Testing:
Veri-Fire (overheating wire test) Transport Time Test and Cotton Wick Smoke Pen Test

NFPA Suggested Method

Test the air sampling network transport times from the furthest sample point or test point on every pipe. Per NFPA 72, transport times must not exceed 120 seconds. For NFPA 76, 60 Seconds.

The Veri-Fire test is the preferred method of producing combustion particles for performing transport time tests.

START the stopwatch and turn the power ON the Veri-Fire(leave the Veri-Fire on for approximately 35 seconds before shutting it off). When the detectors registers combustion particles above background levels, STOP the stopwatch. Record the elapsed time displayed on the Stopwatch. Allow the particles to return to normal background levels. Reset Alarms on the detector.

NOTE:
To perform a successful transport time test, it is important that you run the Veri-Fire for 10 seconds before you begin timing. Continue running the Veri-Fire for 35 seconds or until an increase in particle level is indicated.

Cotton Wick Smoke Test - NFPA Suggested Method
Test the air sampling network transport times from the furthest sample point on every pipe. Per NFPA, transport times must not exceed 120 seconds, +/- 20%. The Cotton Wick Test is the preferred method of producing smoke when performing a transport time test. A 3” piece of cotton wick, or oil lamp wick, is ideal for transport time testing since the exact time that smoke enters the sample point can easily be determined. This will provide an accurate transport time. When performing this test, light the wick and let it burn for about one minute and then put it out after which it will begin to smoke. Place the smoldering cotton wick at the sample point until an increase in particle level is indicated. NOTE: To perform a successful transport time test, it is important that you see the smoke enter the pipe before you begin the timing. Continue introducing smoke until an increase in particle level is indicated, 20-30 seconds.
Note: The Detector does NOT need to alarm.

Service and Maintenance

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Cirrus HYBRID

Air Sampling Fire and Smoke Detection

Cirrus Hybrid Start-Up Guide

Cirrus Hybrid Site Details

Photocopy the following pages to use for system commissioning.

Hybrid Series Single and Multiple Pipe Detectors

Refer to the Hyrbid Engineers Manual for more details

Site Name:_____ Date:_____

Address: _____ Tech:_____

_____

UPS-24 Power Supply: Yes☐ No☐

Number of pipes on Detector:_____

Detector Serial Number: _____

Display Serial Number:_____

Vacuum Pump Serial Number:_____

RS485 Network: Yes☐ No☐ TCP/IP Interface: Yes☐ No☐

Network Settings: Network #:____ Node #: ____

Number of Detectors on Network: _____

Number of Displays on Network:_____

Firmware Version: _____

Startup

BEFORE APPLYING POWER TO THE DETECTOR, EXAMINE THE SAMPLING SYSTEM.

1) SAMPLE PIPE NETWORK:

- ☐ Piping specified correct for installation.
- ☐ Verify that ID size of pipe matches the flow calculations.
- ☐ Check for crimps, corrosion, or breaks in sample pipe.
- ☐ Proper number of sample points per detector or zone.
- ☐ Proper size SHMs used
- ☐ Proper installation. (i.e. correct pipe size, etc.)
- ☐ Sampling pipe properly anchored.
- ☐ Pipe labels placed on sampling pipe per NFPA

2) PRELIMINARY PANEL CHECK OUT:

- ☐ Remove all shipping material.(Exhaust and Fan plugs)
- ☐ Check for kinked tubing (the clear plastic tubes inside unit).
- ☐ Check for debris or loose material in pipe.
- ☐ Insure inlet ports are covered during all phases of construction until final connection.
- ☐ Check wiring to terminal strips.
- ☐ Check electrical connectors for proper mating.

3) WATER BOTTLE

- ☐ Install and connect the Water Cartridge using distilled water only.

4) APPLYING POWER

a) Apply DC power to unit, power LED will turn on.
b) Unit will perform an initializing sequence.
c) After initializing, perform Commissioning via PC or LCD display.

5) COMMISSIONING

For further information, please refer to the Engineers Manual supplied with each detector.

5.1) SET AIRFLOW

5.2) AIRFLOW - Accept Airflow before recording values below.

	Current Airflow	% Fault Level	Ignore	Accepted %
Pipe 1			☐	
Pipe 2 (If used)			☐	
Pipe 3 (If used)			☐	
Pipe 4 (If used)			☐	

5.3) RECORD INPUT ASSIGNMENTS

Input Assignments

I/P 1:	☐ Normally Closed
I/P 2:	☐ Normally Closed
I/P 3:	☐ Normally Closed

5.4) RECORD OUTPUT ASSIGNMENTS

Zone One - Output Assignments

O/P 1:	Delay:	sec.	☐ Normally Closed
O/P 2:	Delay:	sec.	☐ Normally Closed
O/P 3:	Delay:	sec.	☐ Normally Closed
O/P 4:	Delay:	sec.	☐ Normally Closed
O/P 5:	Delay:	sec.	☐ Normally Closed

GAIN (SENSITIVITY) SETTINGS

Hybrid/CCD Alarm Level defaults:
Pre-Alarm - 300 **Fire 1** - 400 **Fire 2** - 500 and **Fire 3** - 600

Pipe One -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Two -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Three -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Four -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

CAUTION:
Please use caution when igniting materials for system testing and have a fire extinguisher on hand. Always use every safety procedure. Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken. Inform personnel and alarm company prior to any testing. After completing testing, be sure to notify personnel, reactivate suppression systems, and bring all systems back online.

SYSTEM TESTING
Test the response times by introducing smoke into the furthest hole on each zone. For units with Display, or when using PC software, response of detector can be viewed using the Real Time Graph.

NOTE:
Be sure to use the "Hold Zone" function on the zone you are testing if applicable.

Do not use Synthetic or Canned Smoke for any testing.

Methods of Testing:
Veri-Fire or Cotton Wick Smoke

NFPA Suggested Method
Test the air sampling network transport times from the furthest sample point or test point on every pipe. Per NFPA 72, transport times must not exceed 120 seconds. For NFPA 76, 60 Seconds.

There are two methods. You can use a Veri-Fire (smokeless) or a Cotton Wick (smoke) at the furthest sample or test point. Activate the Veri-Fire or place the Cotton Wick at the sample or test point until the detector senses the event. When the dials react (not necessarily an alarm) and the percentage rises (even slightly) record the time, stop the test and remove the test device from the sample/test point.

NOTE:
To perform a successful transit time test, it is important that you see the overheat/smoke enter the pipe before you start timing. Continue introducing smoke until an increase in particle level is indicated.

	Time to first indication of particle level increase	Time to first alarm indication
Pipe 1	sec.	sec.
Pipe 2 (If used)	sec.	sec.
Pipe 3 (If used)	sec.	sec.
Pipe 4 (If used)	sec.	sec.

Customer Signature:_____

Print Name & Title:_____

Company Name:_____

Address:_____

City, State, Zip:_____

Phone:_____

Date:_____

Cirrus HYBRID
Air Sampling Fire and Smoke Detection

Cirrus Hybrid Maintenance Guide

Cirrus Hybrid Site Details

Hybrid Series Single and Multiple Pipe Detectors

Refer to the Hyrbid Engineers Manual for more details

Site Name:_____ Date:_____

Address: _____ Tech:_____

_____

UPS-24 Power Supply: Yes☐ No☐

Number of pipes on Detector:_____

Detector Serial Number: _____

Display Serial Number:_____

Vacuum Pump Serial Number:_____

RS485 Network: Yes☐ No☐ TCP/IP Interface: Yes☐ No☐

Network Settings: Network #:____ Node #: ____

Number of Detectors on Network: _____

Number of Displays on Network: _____

Firmware Version: _____

Maintenance

☐ Semi-Annual:

The following maintenance procedures must be done on a semi-annual basis by a Safe Fire Detection authorized service technician.

- ☐ Check event log to determine any abnormalities.
- ☐ Inspect Pipe Network
- ☐ Replace water cartridge #61986SVRKT
- ☐ Check Alarm levels are as per specification. Verify that there is no change.
- ☐ Check the Sampling System airflow readings. Verify that there is no change.
- ☐ Check inlet integrity
- ☐ Check Power Supply
- ☐ Check LED Current

☐ Annual:

The following maintenance procedures must be done on an annual basis by a Safe Fire Detection authorized service technician.

- ☐ Cloud Chamber Filters* included with Part#:61986SVRKT
- ☐ Inspect Pipe Network
- ☐ 3 Stage Inline Filter Medium Part# RP7127
- ☐ Check the Sampling System airflow readings. Verify that there is no change.
- ☐ Replace water cartridge #61986SVRKT
- ☐ Check that all unit tubing is properly connected with no kinks.
- ☐ Check event log to determine any abnormalities.
- ☐ Check Alarm and Gain levels are as per installation. Verify that there is no change.
- ☐ Check transport time at the furthest Sampling Point on each pipe. Verify that there is no change.
- ☐ Inspect and Clean/Replace if necessary the inline filters
- ☐ Inspect and Clean/Replace if necessary the flow thermistors
- ☐ Inspect and Clean/Replace if necessary the cloud chamber filters/optics

AIRFLOW - Accept Airflow before recording values below.

	Current Airflow	% Fault Level	Ignore	Accepted %
Pipe 1			☐	
Pipe 2 (If used)			☐	
Pipe 3 (If used)			☐	
Pipe 4 (If used)			☐	

RECORD INPUT ASSIGNMENTS

Input Assignments

I/P 1:	☐ Normally Closed
I/P 2:	☐ Normally Closed
I/P 3:	☐ Normally Closed

RECORD OUTPUT ASSIGNMENTS

Zone One - Output Assignments

O/P 1:	Delay:	sec.	☐ Normally Closed
O/P 2:	Delay:	sec.	☐ Normally Closed
O/P 3:	Delay:	sec.	☐ Normally Closed
O/P 4:	Delay:	sec.	☐ Normally Closed
O/P 5:	Delay:	sec.	☐ Normally Closed

GAIN (SENSITIVITY) SETTINGS

PPP Alarm Level defaults:
Pre-Alarm - 0.5% **Fire 1** - 1% **Fire 2** - 1.5% and **Fire 3** - 2%.

Hybrid/CCD Alarm Level defaults:
Pre-Alarm - 300 **Fire 1** - 400 **Fire 2** - 500 and **Fire 3** - 600

Pipe One -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Two -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Three -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Four -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

CAUTION:
Please use caution when igniting materials for system testing and have a fire extinguisher on hand. Always use every safety procedure. Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken. Inform personnel and alarm company prior to any testing. After completing testing, be sure to notify personnel, reactivate suppression systems, and bring all systems back online.

SYSTEM TESTING
Test the response times by introducing smoke into the furthest hole on each zone. For units with Display, or when using PC software, response of detector can be viewed using the Real Time Graph.

NOTE:
Be sure to use the "Hold Zone" function on the zone you are testing if applicable.

Do not use Synthetic or Canned Smoke for any testing.

Methods of Testing:
Veri-Fire or Cotton Wick Smoke

NFPA Suggested Method
Test the air sampling network transport times from the furthest sample point or test point on every pipe. Per NFPA 72, transport times must not exceed 120 seconds. For NFPA 76, 60 Seconds.

There are two methods. You can use a Veri-Fire (smokeless) or a Cotton Wick (smoke) at the furthest sample or test point. Activate the Veri-Fire or place the Cotton Wick at the sample or test point until the detector senses the event. When the dials react (not necessarily an alarm) and the percentage rises (even slightly) record the time, stop the test and remove the test device from the sample/test point.

NOTE:
To perform a successful transit time test, it is important that you see the overheat/smoke enter the pipe before you start timing. Continue introducing smoke until an increase in particle level is indicated.

	Time to first indication of particle level increase	Time to first alarm indication
Pipe 1	sec.	sec.
Pipe 2 (If used)	sec.	sec.
Pipe 3 (If used)	sec.	sec.
Pipe 4 (If used)	sec.	sec.

Customer Signature:_____

Print Name & Title:_____

Company Name:_____

Address:_____

City, State, Zip:_____

Phone:_____

Date:_____

ProPointPlus

ProPointPlus Start-Up Guide

ProPointPlus Site Details

Photocopy the following pages to use for system commissioning.

ProPointPlus Single and Multiple Pipe Detectors

Refer to the Engineers Manual for more details

Site Name:_____ Date:_____

Address: _____ Tech:_____

UPS-24 Power Supply: Yes☐ No☐

Number of pipes on Detector:_____

Detector Serial Number: _____

Display Serial Number:_____

Vacuum Pump Serial Number:_____

RS485 Network: Yes☐ No☐ TCP/IP Interface: Yes☐ No☐

Network Settings: Network #:____ Node #: ____

Number of Detectors on Network: _____

Number of Displays on Network:_____

Firmware Version: _____

Startup

BEFORE APPLYING POWER TO THE DETECTOR, EXAMINE THE SAMPLING SYSTEM.

1) SAMPLE PIPE NETWORK:

- ☐ Piping specified correct for installation.
- ☐ Verify that ID size of pipe and SHMS match the flow calculations.
- ☐ Check for crimps, corrosion, or breaks in sample pipe.
- ☐ Proper number of sample points per detector or zone.
- ☐ Proper installation. (i.e. correct pipe size, etc.)
- ☐ Sampling pipe properly anchored.
- ☐ Pipe labels placed on sampling pipe per NFPA

2) PRELIMINARY PANEL CHECK OUT:

- ☐ Remove all shipping material.(Exhaust and Fan plugs)
- ☐ Check for kinked tubing (the clear plastic tubes inside unit).
- ☐ Check for debris or loose material in pipe.
- ☐ Insure inlet ports are covered during all phases of construction until final connection.
- ☐ Check wiring to terminal strips.
- ☐ Check electrical connectors for proper mating.

3) APPLYING POWER

a) Apply DC power to unit, power LED will turn on.
b) Unit will perform a Start-up and Auto Commissioning sequence.
c) After initializing, perform Commissioning via PC or LCD display.

4) COMMISSIONING

For further information, please refer to the Engineers Manual supplied with each detector.

5) SET AIRFLOW

5.1) AIRFLOW - Accept Airflow before recording values below.

	Current Airflow	% Fault Level	Ignore	Accepted %
Pipe 1			☐	
Pipe 2 (If used)			☐	
Pipe 3 (If used)			☐	
Pipe 4 (If used)			☐	

5.2) RECORD INPUT ASSIGNMENTS

Input Assignments

I/P 1:	☐ Normally Closed
I/P 2:	☐ Normally Closed
I/P 3:	☐ Normally Closed

5.3) RECORD OUTPUT ASSIGNMENTS

Zone One - Output Assignments

O/P 1:	Delay:	sec.	☐ Normally Closed
O/P 2:	Delay:	sec.	☐ Normally Closed
O/P 3:	Delay:	sec.	☐ Normally Closed
O/P 4:	Delay:	sec.	☐ Normally Closed
O/P 5:	Delay:	sec.	☐ Normally Closed

GAIN (SENSITIVITY) SETTINGS

PPP Alarm Level defaults:
Pre-Alarm - 0.5% **Fire 1** - 1% **Fire 2** - 1.5% and **Fire 3** - 2%.

Pipe One -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Two -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Three -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Four -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

CAUTION:
Please use caution when igniting materials for system testing and have a fire extinguisher on hand. Always use every safety procedure. Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken. Inform personnel and alarm company prior to any testing. After completing testing, be sure to notify personnel, reactivate suppression systems, and bring all systems back online.

SYSTEM TESTING
Test the response times by introducing smoke into the furthest hole on each zone. For units with Display, or when using PC software, response of detector can be viewed using the Real Time Graph.

NOTE:
Be sure to use the "Hold Zone" function on the zone you are testing if applicable.

Do not use Synthetic or Canned Smoke for any testing.

Methods of Testing:
Veri-Fire or Cotton Wick Smoke

NFPA Suggested Method

Test the air sampling network transport times from the furthest sample point or test point on every pipe. Per NFPA 72, transport times must not exceed 120 seconds. For NFPA 76, 60 Seconds.

There are two methods. You can use a Veri-Fire (smokeless) or a Cotton Wick (smoke) at the furthest sample or test point. Activate the Veri-Fire or place the Cotton Wick at the sample or test point until the detector senses the event. When the detector reacts (not necessarily an alarm) and the percentage rises (even slightly) record the time, stop the test and remove the test device from the sample/test point.

NOTE:
To perform a successful transit time test, it is important that you see the overheat/smoke enter the pipe before you start timing. Continue introducing smoke until an increase in particle level is indicated.

	Time to first indication of particle level increase	Time to first alarm indication
Pipe 1	sec.	sec.
Pipe 2 (If used)	sec.	sec.
Pipe 3 (If used)	sec.	sec.
Pipe 4 (If used)	sec.	sec.

Customer Signature:_____

Print Name & Title:_____

Company Name:_____

Address:_____

City, State, Zip:_____

Phone:_____

Date:_____

ProPointPlus

ProPointPlus Maintenance Guide

ProPointPlus Site Details

ProPointPlus Single and Multiple Pipe Detectors

Refer to the Hyrbid Engineers Manual for more details

Site Name:_____ Date:_____

Address: _____ Tech:_____

_____

UPS-24 Power Supply: Yes☐ No☐

Number of pipes on Detector:_____

Detector Serial Number: _____

Display Serial Number:_____

Vacuum Pump Serial Number:_____

RS485 Network: Yes☐ No☐ TCP/IP Interface: Yes☐ No☐

Network Settings: Network #:____ Node #: ____

Number of Detectors on Network: _____

Number of Displays on Network:_____

Firmware Version: _____

Maintenance

☐ Semi-Annual:

The following maintenance procedures must be done on a semi-annual basis by a Safe Fire Detection authorized service technician.

- ☐ Inspect Pipe Network
- ☐ Check event log to determine any abnormalities.
- ☐ Check Alarm levels are as per specification. Verify that there is no change.
- ☐ Check the Sampling System airflow readings. Verify that there is no change.
- ☐ Check inlet integrity
- ☐ Check Power Supply
- ☐ Check LED Current

☐ Annual:

The following maintenance procedures must be done on an annual basis by a Safe Fire Detection authorized service technician.

- ☐ Inspect Pipe Network
- ☐ 3 Stage Inline Filter Medium Part# RP7127
- ☐ Check the Sampling System airflow readings. Verify that there is no change.
- ☐ Check that all unit tubing is properly connected with no kinks.
- ☐ Check event log to determine any abnormalities.
- ☐ Check Alarm and Gain levels are as per installation. Verify that there is no change.
- ☐ Check transport time at the furthest Sampling Point on each pipe. Verify that there is no change.
- ☐ Inspect and Clean/Replace if necessary the inline filters
- ☐ Inspect and Clean/Replace if necessary the flow thermistors

AIRFLOW - Accept Airflow before recording values below.

	Current Airflow	% Fault Level	Ignore	Accepted %
Pipe 1			☐	
Pipe 2 (If used)			☐	
Pipe 3 (If used)			☐	
Pipe 4 (If used)			☐	

RECORD INPUT ASSIGNMENTS

Input Assignments

I/P 1:	☐ Normally Closed
I/P 2:	☐ Normally Closed
I/P 3:	☐ Normally Closed

RECORD OUTPUT ASSIGNMENTS

Zone One - Output Assignments

O/P 1:	Delay:	sec.	☐ Normally Closed
O/P 2:	Delay:	sec.	☐ Normally Closed
O/P 3:	Delay:	sec.	☐ Normally Closed
O/P 4:	Delay:	sec.	☐ Normally Closed
O/P 5:	Delay:	sec.	☐ Normally Closed

GAIN (SENSITIVITY) SETTINGS

PPP Alarm Level defaults:
Pre-Alarm - 0.5% **Fire 1** - 1% **Fire 2** - 1.5% and **Fire 3** - 2%.

Pipe One -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Two -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Three -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

Pipe Four -

	LEVEL:
PRE-ALARM:	
FIRE 1:	
FIRE 2:	
FIRE 3:	

Time Zoning: ☐

Latching:

	Start Time		
	A	B	C
Mon.			
Tue.			
Wed.			
Thur.			
Fri.			
Sat.			
Sun			

CAUTION:
Please use caution when igniting materials for system testing and have a fire extinguisher on hand. Always use every safety procedure. Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken. Inform personnel and alarm company prior to any testing. After completing testing, be sure to notify personnel, reactivate suppression systems, and bring all systems back online.

SYSTEM TESTING
Test the response times by introducing smoke into the furthest hole on each zone. For units with Display, or when using PC software, response of detector can be viewed using the Real Time Graph.

NOTE:
Be sure to use the "Hold Zone" function on the zone you are testing if applicable.

Do not use Synthetic or Canned Smoke for any testing.

Methods of Testing:
Veri-Fire or Cotton Wick Smoke

NFPA Suggested Method

Test the air sampling network transport times from the furthest sample point or test point on every pipe. Per NFPA 72, transport times must not exceed 120 seconds. For NFPA 76, 60 Seconds.

There are two methods. You can use a Veri-Fire (smokeless) or a Cotton Wick (smoke) at the furthest sample or test point. Activate the Veri-Fire or place the Cotton Wick at the sample or test point until the detector senses the event. When the Detector reacts (not necessarily an alarm) and the percentage rises (even slightly) record the time, stop the test and remove the test device from the sample/test point.

NOTE:
To perform a successful transit time test, it is important that you see the overheat/smoke enter the pipe before you start timing. Continue introducing smoke until an increase in particle level is indicated.

	Time to first indication of particle level increase	Time to first alarm indication
Pipe 1	sec.	sec.
Pipe 2 (If used)	sec.	sec.
Pipe 3 (If used)	sec.	sec.
Pipe 4 (If used)	sec.	sec.

Customer Signature:_____

Print Name & Title:_____

Company Name:_____

Address:_____

City, State, Zip:_____

Phone:_____

Date:_____

Technical
Data Sheets

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Cirrus Hybrid™

Very Early Warning Air Sampling Fire and Smoke Detector

Data Sheet

Features

- **The First and Only "Combined Fire & Smoke" air sampling Detector**
- **Unique "Cloud Chamber Detection" (CCD) - Primary Detection Technology**
- **Optical "Scattering Chamber Detectors" (SCD) - Secondary Detection Technology**
- **Independent and integrated intelligent alarm signal decision making**
- **The largest sensitivity range of any air sampling detector 0%obs/m - 20%obs/m**
- **HYBRID "Smart Signal" to verify alarms and discriminate false alarms**
- **7" full color multi-function touchscreen LCD Display**
- **Live Camera Stream from up to 6 IP color cameras**
- **Built-In Troubleshooting Videos**

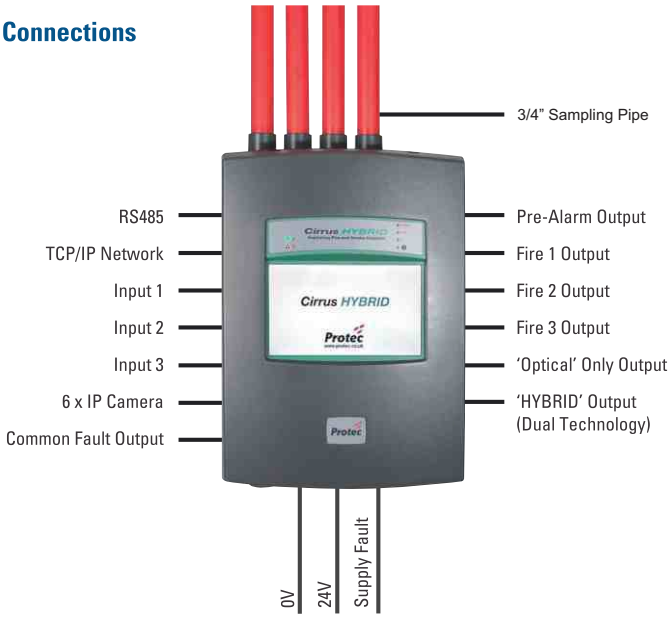
Part Numbers

61-986-H4-FMUL1	Hybrid 1 Pipe
61-986-H4-FMUL4	Hybrid 4 Pipe
61-986-H4S-FMUL4	Hybrid 4 Pipe w/scanner

Description

History tells us that in reality there are really only two types of air sampling detector technology. These technologies are 'Cloud Chamber' air sampling detection identifying optically invisible fire particulate, and laser or LED 'Optical' air sampling detection identifying small amounts of visible smoke. Cirrus HYBRID is the only air sampling detector available to identify the optically invisible fire particulate by utilizing the unique 'Cloud Chamber Detection' (CCD) technology. Depending on the materials burning, particularly in the many modern applications for air sampling detection systems, some fires burn with only a small amount of visible smoke, whereas others burn with greater volumes of visible smoke. Cirrus HYBRID detects these wide-ranging 'smokier' fire types too. Early Warning Smoke Detection (EWSD) is provided using high performance optical 'Scatter Chamber Detectors' (SCD) that identify both small and larger smoke particles entering the detector. By utilising the two most effective methods of air sampling system technologies (CCD and EWSD) in a single detector the Cirrus HYBRID detector provides a device able to detect fire and smoke over the largest range of fire types. However, what makes this totally new and genuinely unique concept in air sampling fire and smoke detection technology so different is that these two technologies work both independently from each other, and through the use of complex algorithms also interact together, to provide true intelligent alarm decision making. The result of this synergy of technologies is a device that can verify true alarm conditions across the largest range of fire types. A further and equally as important result of this synergy of technologies, is the discrimination of unwanted or false alarms which have historically and still continue to plague so many optical only air sampling detectors.

Connections



From External Power Supply

Application Guide

Class A - High Sensitivity Applications include:- Computer rooms, Cleanrooms, Data Centres, Control Rooms, Valve Halls, Archive Storage, Anechoic Chambers & EDP areas.

Class B - Enhanced Sensitivity Applications include:- Historic Buildings, Museums, Hospitals, Airports, Cathedrals, Theatres, Art Galleries, Clean Warehouses, Atria & Indoor Stadiums.

Class C - Normal Sensitivity and Harsh Environment Applications include:- Cold Storage Facilities, Specialist Production Facilities, Food Processing Areas, Paper Production Facilities, Transportation Terminals, Inaccessible Voids & General Warehousing.

Note: Non-scanning detectors (standard detectors) - can have up to four sampling pipes which share a common Cloud Chamber to provide fire particle detection. Each pipe inlet is provided with an individual Scatter Chamber Detector to provide optical smoke particle detection. This does not provide individual pipe identification of the Combined Fire & Smoke signals.

Scanning detectors - can have up to four sampling pipes. The air entering each pipe inlet is direct through the Cloud Chamber to provide fire particle detection and an individual Scatter Chamber Detector to provide optical smoke particle detection. This provides individual pipe identification of the Combined Fire & Smoke signals.

Supply Voltage	20 - 29VDC
Power Consumption	16.8 watts quiescent (24VDC 100% Fan Speed)
Current Consumption	500mA with blower @ 30%
Operating Conditions	700mA with blower @ 100%
Detector Ambient	0˚C to 38˚C (32˚F to 100˚F)
Tested to	0˚C to 55˚C (32˚F to 131˚F)
Sampled Air	-20˚C to 60˚C (-4˚F to 140˚F)
Humidity	10 - 95%RH, non-condensing
IP Rating	IP30
Cable Access	10 x 20mm knock outs
Cable Termination	Screw terminal blocks (0.2 - 2.5mm², 30 - 12AWG)
Sampling Network	Four inlet ports with combined sampling pipe length up to 630m (2,066ft) subject to 'ProFlow' sampling pipe calculation program. Maximum transport time = 120 seconds.
Pipe ID	3/4" or 25mm
Alarm Indications	Pre-alarm, Fire 1, Fire 2, Fire 3
Sample Points	Up to 100 Holes

Other Indications	Supply Healthy, General Fault
Sensitivity Range	10,000 PCC to 10 million PCC 0 - 1000CFS (Combined Fire & Smoke scale)
Programmable Inputs	3 monitored inputs that may be configured for Isolate, Reset, Silence, Day/Night, Battery Fault and Mains Fault
Programmable Output Relays	5 Relays rated 1A @ 30VDC (Volt-free change over contacts)
Camera Inputs	6 x Protec specified IP cameras
Event Log / Data Retention	24,000 events stored on FIFO basis (alarms, actions, faults and data points)(Approx 30 day historical graph data) zones per day. Day-time/Night-time setting
EN54 & AS7240 Approved Sensitivity Settings	Class A - 36 holes @ 200CFS Class B - 44 holes @ 400CFS Class C - 44 holes @ 600CFS
Airflow Monitoring	'High Airflow' and 'Low Airflow' fault monitoring.
Weight	3.5kg (7.7lbs)
Dimensions (mm)	380(H) x 250(W) x 137(D)
Coverage	Up to 57,600sq.ft.

ProPointPlus™

Early Warning Air Sampling Fire Detector

Data Sheet

Features

•1 - 4 Individual detectors per aspirator(providing up to 4 separately identifiable areas)

•High performance optical 'Scatter Chamber Detectors' (SCD)

•Multiple language, multi-function LCD display

• Simple install and commission process generally without the need for a laptop connection

• Built-In algorithm to reduce unwanted alarms

• Airflow monitoring per pipe

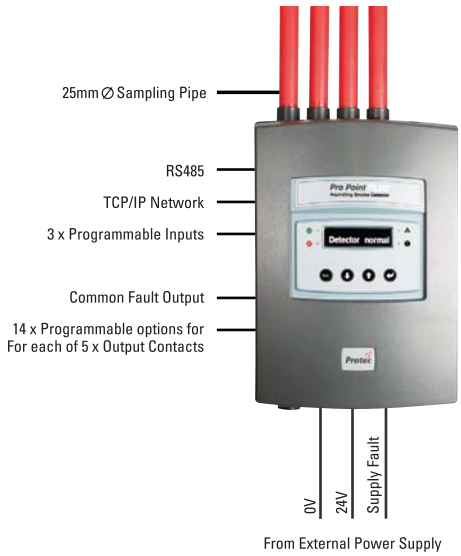
Part Numbers

61-986-104-FMUL-OP1	ProPoint Plus 1 Pipe
61-986-104-FMUL-OP4	ProPoint Plus 4 Pipe

Description

air sampling detection is now a recognised solution for many different fire detection applications. ProPointPlus provides up to four separate detectors within a common aspirator enclosure and therefore provides four individually identifiable areas of detection per aspirator. Each of the four plug-in 'Scatter Chamber Detectors' (SCD)'s detector modules can be either 'optical' only or combined 'optical/enhanced CO' detectors, the CO sensor is only suitable for small room applications. Independent and integrated alarm decision making through the use of complex algorithms extend the range of particle detection, confirm genuine alarms and reduce unwanted alarms.Installation, configuration and commissioning of ProPointPlus detectors is very simple and installer friendly. Configuration to either Class A, Class B or Class C sensitivity options is achieved through a multi-language, multi-function LCD display generally without the need for a laptop connection. Detector set up allows the installer to configure the detector sensitivity to an equivalent setting, as a known number of point type smoke detectors. This ensures the system specifier, designer, installer and commissioning engineerconfigure the ProPointPlus SCD's to the correct sensitivity for the particular application. Aspirator fan speed and airflow configuration is a also a very simple process allowing ProPointPlus air sampling detectors to be installed in a variety of applications with short and relatively long pipe runs.

Connections



Application Guide

Class A - High Sensitivity Applications include:-
Small Computer Rooms, Cleanrooms, Data Centres, Control Rooms, Archive Storage & EDP areas

Class B - Enhanced Sensitivity Applications include:-
Small Historic Buildings, Museums, Theatres, Galleries, High Ceiling Areas, Small Clean Warehouses & Small Atria Areas

Class C - Normal Sensitivity and Harsh Environment Applications include:-
Lift/Elevator Shafts, Small Cold Storage Facilities, Clean Warehouses, Atria, Inaccessible Voids & Up to 4 x separately identifiable Prison Cells per aspirator.

Supply Voltage	21 - 29VDC
Power Consumption	9.6 watts quiescent (24VDC 100% Fan Speed)
Current Consumption	300mA with blower @ 30% 400mA with blower @ 100%
Operating Conditions	
Detector Ambient	0˚C to 38˚C (32˚F to 100˚F)
Tested to	0˚C to 55˚C (32˚F to 131˚F)
Sampled Air	-20˚C to 60˚C (-4˚F to 140˚F)
Humidity	10 - 95%RH, non-condensing
IP Rating	Ip20
Sampling Network	Up to four inlet ports. Maximum pipe lengths specific to each individual design. All designs to be verified by 'ProFlow' sampling pipe calculation program. Maximum transport time 120 seconds.
Pipe ID	3/4" or 25mm
Alarm Indications	Pre-alarm warning and Fire per pipe
Other Indications	Supply Healthy, General Fault

Programmable Inputs	3 monitored inputs that may be configured for Isolate, Reset, Silence, Battery Fault and Mains Fault
Programmable Output Relays	5 Relays rated 1A @ 30VDC (Volt-free change over contacts)
Event Log / Data Retention	24,000 events stored on FIFO basis (alarms, actions, faults and data points) (Approx 30 day historical graph data)
EN54 & AS7240 Approved	Optical only SCD
Sensitivity Settings	Class A - 3 holes per detector (per pipe) Class B - 5 holes per detector (per pipe) Class C - 12 holes per detector (per pipe)
Coverage	Up to 54,000sq.ft.
Sample Points	Up to 60
Airflow Monitoring	'High Airflow' and 'Low Airflow' fault monitoring.
Weight	3kg (6.6lbs)
Dimensions (mm)	380(H) x 250(W) x 137(D)
Relevant Standard	EN54 Part 17 & 20, AS 7240 Part 20

Cirrus CCD™

Very Early Warning Air Sampling Fire Detector

Data Sheet

Part Number: 61986C4S

Features

- **The only 'Cloud Chamber' based Air Sampling Fire Detector available**
- **Resistant to unwanted alarms from dust, humidity & temperature changes**
- **Programmable 'Pre-alarm' warning**
- **3 x Programmable 'Fire' alarm warnings (Fire 1, Fire 2 & Fire 3)**
- **Widest sensitivity range**
- **Full Airflow Monitoring**
- **7" full colour multi-function touch screen LCD display**
- **Live camera stream from up to 6 IP color cameras**
- **In-built IP interface**

SECURITY & FIRE EXCELLENCE AWARDS 2015
Supported by IFSEC International and FIREX International
WINNER
Active Fire Innovation Product of the Year

GOLD MEDAL 2016
GOLD MEDAL OF THE POZNAN INTERNATIONAL FAIR SECUREX FOR INNOVATION AND SUPERIOR TECHNOLOGY

GALERÍA DE NUEVOS PRODUCTOS sicur
Dos novedades para la detección precoz de incendios: Cirrus HYBRID y Cirrus HYBRID SCAN de PROTEC FIRE DETECTION SPAIN SL
IFEMA Feria de Madrid

INTERNATIONAL FIRE INDIA 2017
EXHIBITION & CONFERENCE
INNOVATION 2017

Description

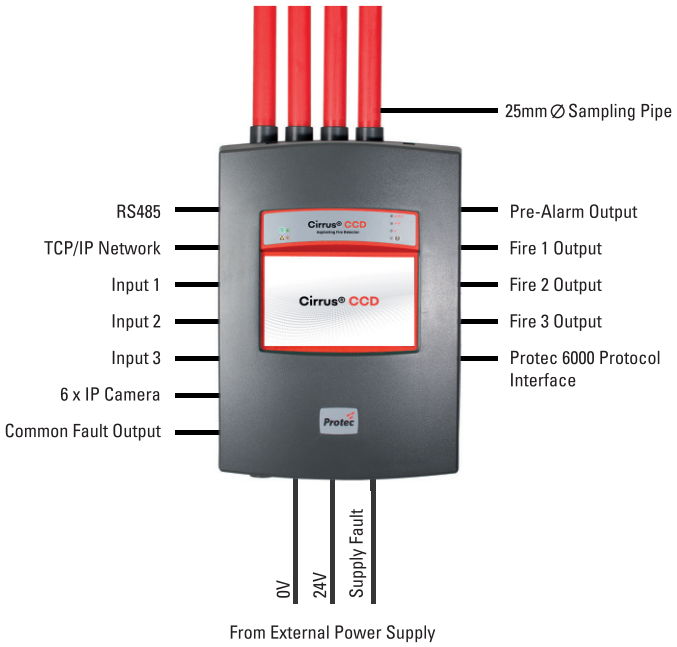
The 'sensitivity range' is the key feature that makes the Cirrus CCD Series Fire Detector a most versatile fire detection device.

For over 30 years Cloud Chamber detectors have been known as the most sensitive fire detection device, able to detect at the true incipient stage of a developing fire.

The New Cirrus CCD Detectors have a vast sensitivity range capable of being even more sensitive than previous versions.

Cirrus CCD detectors can be installed in dusty, humid and high & low temperature applications. In these harsh environment applications design and installation consideration must be given to the complete installation to ensure the sampling pipes,sampling holes and detector remain operational.

Connections



Application Guide

Class A - High Sensitivity Applications include:-
Small Computer Rooms, Cleanrooms, Data Centres, Control Rooms, Archive Storage & EDP areas

Class B - Enhanced Sensitivity Applications include:-
Small Historic Buildings, Museums, Theatres, Galleries, High Ceiling Areas, Small Clean Warehouses & Small Atria Areas

Class C - Normal Sensitivity and Harsh Environment Applications include:-
Lift/Elevator Shafts, Small Cold Storage Facilities, Clean Warehouses, Atria, Inaccessible Voids & Up to 4 x separately identifiable Prison Cells per aspirator.

Supply Voltage	20 - 29VDC
Power Consumption	16.8 watts quiescent (24VDC 100% Fan Speed)
Current Consumption	500mA with blower @ 30% 700mA with blower @ 100%
Operating Conditions	
Detector Ambient	0˚C to 38˚C (32˚F to 100˚F)
Tested to	0˚C to 55˚C (32˚F to 131˚F)
Sampled Air	-20˚C to 60˚C (-4˚F to 140˚F)
Humidity	10 - 95%RH, non-condensing
IP Rating	IP30
Cable Access	10 x 20mm knock outs
Cable Termination	Screw terminal blocks (0.2 - 2.5mm², 30 - 12AWG)
Sampling Network	Four inlet ports with combined sampling pipe length up to 630m (2,066ft) all sampling pipe operational parameters to be verified using 'ProFlow' sampling pipe calculation program. Maximum transport time = 120 seconds.

Pipe ID	19mm to 25mm (preferred OD 25mm)
Alarm Indications	Pre-alarm, Fire 1, Fire 2, Fire 3
Other Indications	Supply Healthy, General Fault
Sensitivity Range	10,000 PCC to 10 million PCC
Programmable Inputs	3 monitored inputs that may be configured for Isolate, Reset, Silence, Day/Night, Battery Fault and Mains Fault
Programmable Output Relays	5 Relays rated 1A @ 30VDC (Volt-free change over contacts)
Camera Inputs	6 x Protec specified IP cameras
Event Log / Data Retention	24,000 events stored on FIFO basis (alarms, actions, faults and data points) (Approx 30 day historical graph data)
Variable Sensitivity Settings	7 day programmable settings with 2 time zones per day. Day-time/Night-time setting
Airflow Monitoring	'High Airflow' and 'Low Airflow' fault monitoring.
Weight	3.5kg (7.7lbs)
Dimensions (mm)	380(H) x 250(W) x 137(D)

RedPipe

RedPipe Kit

Everything Needed for a 2,500sq.ft. area

Data Sheet

PART# RP5240

Features

Easily organize your project with all the pipe and fittings for a 2,500sq.ft. area in a single box or multiple boxes for multiple areas

Divide your total Sq. Ft. by 2,500, Equals the number of pipe kits you need

The ONLY pipe and fittings UL Listed for use with ALL air sampling smoke detection systems.

Plenum rated self-extinguishing pipe and fittings

Pipe lengths are 7.5' for Easy Shipping (Overnight Shipping Available)

No Labels Required. NFPA identification imprinted directly on the pipe

UL Listed for ANY Brand Air Sampling Smoke Detector

Pipe Specifications - 3/4" SCH40

Rating:	Plenum
Pipe Fitting OD:	Nominal 1.30"
Pipe Fitting ID:	Nominal 1.05"
Pipe Fitting Wall Thickness:	Nominal 0.09"
Pipe OD:	Nominal 1.05"
Pipe ID:	Nominal 0.87"
Pipe Wall Thickness:	Nominal 0.88"
Flammability:	V-2, NFPA 90A
Polyethylene Classification:	Type 1, Class C, Category 4
Installation Temp:	0°F-201°F (-17°C-93°C)
Operational Temp:	-40°F-201°F (-40°C-93°C)

Contents

97.5' of RedPipe
5- Sample Point Labels
3-90 Degree Elbows
13-Couplings
1-Tee
2-Endcaps
32-Pipe Clip Hangers

Divide your total Sq. Ft. by 2,500
Equals the number of pipe kits you need

Weights and Dimensions

RedPipe Box Dims: 8" x 7.18" x 91"

RedPipe Box Total Weight: 22lbs

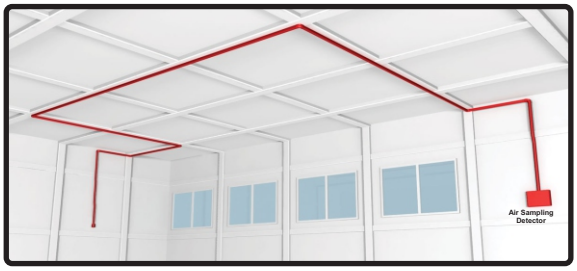
RedPipe and Fittings

For Air Sampling Smoke Detection Systems

RedPipe

Data Sheet

- **The ONLY pipe and fittings UL listed for use with air sampling smoke detection systems.**
- **Plenum rated self-extinguishing pipe and fittings**
- **For use with all air sampling smoke detectors**
- **Pipe lengths - 7.5’ and 15’**
- **Fittings available in packs of 10**
- **No Labels Required. NFPA identification imprinted directly on the pipe**
- **Custom Pipe Available with Your Company Name. (custom colors also available)**



Pipe Specifications - 3/4” SCH40

Rating:	Plenum
Pipe OD:	Nominal 1.05”
Pipe ID:	Nominal 0.87”
Pipe Wall Thickness:	Nominal 0.88”
Flammability:	V-2, NFPA 90A
Polyethylene Classification:	Type 1, Class C, Category 4
Installation Temp:	-75°F-201°F (-60°C-93°C)
Operational Temp:	-75°F-201°F (-60°C-93°C)

RedPipe Products

RedPipe 3/4" Smoke Detection
ID: Nominal .87
OD: Nominal 1.05
Part #**RP5209** = 7.5’ Length
Part #**RP5209-15** = 15’ Length

Pipe to Detector Adapter
ID: Nominal .87
OD: Nominal 1.05
Part #**RP5207** = each

3/4" 45° ELBOW
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5203X**

3/4" 90° ELBOW
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5202X**

3/4" 90° Radius Bend
ID: Nominal 1.05
OD: Nominal 1.42
Part #**RP5215X**

3/4" TEE
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5204X**

3/4" Coupling
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5206X**

3/4" End Cap
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5205X**

3/4" (27mm) ABS Union
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5208** = each

3/4" 90° Low Profile Radius Bend
ID: Nominal 1.05
OD: Nominal 1.30
Part #**RP5230X**

Engineers Specifications

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Very Early Warning Air Sampling
Fire and Smoke Detection
Cirrus Hybrid (non-scanning)

Engineering Specification
February 2023

5915 Stockbridge Dr. • Monroe, NC 28110 • Phone: 704-821-7920 • Fax: 704-821-4327
Email: staff@safefiredetection.com • www.safefiredetection.com

Contents

1 GENERAL

1.1 Scope

This document provides specification details of the Hybrid Air-sampling Fire and Smoke Detection (ASD) products to assist in their installation and commissioning. Hybrid range provides a single pipe through four pipe products. Hybrid ASD is referred to as ASD throughout this document.

1.2 ASD System Information

1. A Very Early Warning Fire Detection System like the Hybrid System shall be installed throughout the areas nominated on the drawings.
2. The ASD system shall consist of highly sensitive cloud chamber and optical-based Detectors in one enclosure with aspirators connected to networks of sampling pipes.
3. When required, an optional Display unit may be provided to monitor each ASD detector.

1.3 Approvals and Standards

The ASD must be of a type submitted to, tested, approved, and/or listed to the Standards mentioned below by a Nationally Recognized Testing Laboratory (NRTL):

1. UL268 and UL268A: UL (Underwriters Laboratories Inc), USA
2. UL268: ULC (Underwriters Laboratories Canada), Canada
3. FM3230 (Factory Mutual)
4. CSFM (California State Fire Marshall, USA)

1.4 Codes, Standards or Regulations

The ASD shall be installed to comply with one or more of the following codes or standards:

1. AS 1670.1-2004, AS1603.8 – 1996, ASNZS 3000
2. Fire Industry Association (FIA), Code of Practice for Design, Installation, Commissioning & Maintenance of Aspirating Smoke Detector (ASD) Systems
3. NFPA Standards, US
4. NEC Standards, US
5. Local codes and standards

1.5 Quality Assurance

1.5.1 Manufacturer

1. The manufacturer shall have a minimum of 28 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2015.

1.5.2 Equipment Supplier

1. The equipment supplier shall be authorized trained by the manufacturer to calculate/design, install, test and maintain the ASD system.
2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

1.5.3 Installer

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

1.5.4 Warranty

1. The manufacturer shall guarantee the product by warranty for a period of one year.
2. Any damage to the ASD due to poor handling or operating outside its operation limits will void its warranty.
3. The installation and programming of the ASD shall be completed by a factory-trained installer.

1.5.5 Training

1. The manufacturer and their representatives shall make available adequate training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

1.6 Documentation

The following documentation shall be supplied.

1. Product data and site drawings shall be submitted and shall include pipe layout, operational calculations and performance criteria. Tools such as ProFlow may be used to generate this material.
2. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.
3. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

2 SYSTEM DESCRIPTION

2.1 ASD System Features

The ASD system shall:

1. Consist of a highly sensitive, optical-based, light scattering smoke detector, Cloud chamber-based fire detector, aspirator, and SCD.
2. Be modular, with each detector having a display with indicator LEDs, and a reset control button on the 7” touch screen Display showing detector status including fault categories and smoke level.
3. Consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
4. Support optional equipment which may include intelligent remote displays and/or a high level interface (HLI) with the building fire alarm system, or a dedicated graphics package such as H6.
5. Be tested and approved to cover up to 28,800 sq. ft. for four pipe Hybrid
6. Be approved to provide Very Early Warning Fire Detection (VEWFD) / Class A, Early Warning Fire Detection (EWFD) / Class B and Standard Fire Detection (SFD) / Class C.
7. Provide five output levels corresponding to Pre-alarm, Fire 1, Fire 2, and Fire 3. These levels shall be programmable and able to be set at sensitivities ranging from 1-1000 CFS.
8. Report any fault on the detector by using configurable fault relay outputs, via a peer-to-peer network or by communications to a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
9. Incorporate a flow sensor in each pipe inlet and provide staged airflow faults against flow fault thresholds that may be determined and set for each pipe individually.
10. Be commissionable without an additional device for programming.
11. Capability to connect directly to 6 IP cameras
12. Include troubleshooting videos built into the detector
13. Be able to provide relay outputs for both detection technologies allowing cross zoning with a single pipe on a single detector

2.2 Detection Technology

2.2.1 Light Source

The Detection Chamber shall employ a highly sensitive, optical light source.

2.2.2 Detection Method

The detection sensing method shall include using a cloud chamber; as well as, photodiodes spaced inside the chamber to detect various scattering angles.

The output data from the sensing method shall include both particle counting as well as measured obscuration level, viewable both separately and as a combined CFS.

2.3 Peer-to-Peer Communications Networking

A peer-to-peer networking facility shall be provided for the purposes of reporting alarms, faults and monitoring status, history and for potential configuration of devices.

The peer-to-peer network shall:

1. Be able to support up to 100 devices (detectors, displays)
2. Be configurable at the detector, at the remote displays, and by PC based configuration tools that are available to configure and manage the network of detectors.

2.4 Secondary Communications

Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

1. USB
2. 10/100 BaseT Ethernet (2 ports)
3. RS485

3 PRODUCTS

3.1 Manufacturer

Air Sampling Smoke Detection System: Acceptable Manufacturer.

Safe Fire Detection, 5915 Stockbridge Dr., Monroe, NC 28110

3.2 Manufactured Units(s)

The Hybrid ASD system can be supplied in the following configurations:

Part Number	Description
61986H4-FMUL1	CIRRUS HYBRID 1 (1 PIPE) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED
61986H4-FMUL2	CIRRUS HYBRID 2 (2 PIPE) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED
61986H4-FMUL3	CIRRUS HYBRID 3 (3 PIPE) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED

61986H4-FMUL4	CIRRUS HYBRID 4 (4 PIPE) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED

3.3 Detector Features

The detector shall incorporate the following features.

1. The Detector, SCD, CCD, Aspirator, Touchscreen Display, Vacuum Pump, Water cartridge and Relay Outputs shall be housed in a plastic enclosure and shall be arranged in such a way that air is drawn from the fire risk area by an aspirator and a sample passed through a sample filter and detection chamber.
2. The Detector shall employ a Cloud Chamber Detector (CCD) in addition to an optical light source and incorporate light scattering using a scatter pattern measurement using photodiodes.
3. The detector shall have an obscuration sensitivity range of 0.01%-20% obs/m (0.03%-6.6% obs/ft) and a CFS range of 1-1000.
4. The Detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0-2000 seconds.
5. The detector shall employ modular construction allowing field replacement of the SCD, CCD, touchscreen display, vacuum pump, water cartridge, and aspirator.
6. The detector shall allow future hardware expansion via modular SCDs inside detector enclosure up to four.
7. The Detector shall also incorporate facilities to transmit the following fault categories:
   a) Detector
   b) Air flow
   c) System
   d) Network
   e) Power
   f) Chamber
   g) Module
8. The detector shall support the generation and transmission of urgent and minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
9. The single through four pipe Hybrid shall include up to four sample pipe inlets respectively, and must contain a flow sensor and optical based smoke detector for each pipe inlet; as well as, a shared CCD for all used inlets.
10. The filter shall be a disposable filter and shall be capable of filtering particles in excess of 20 microns from the air sample and shall be installed outside the detector and inside the CCD.
11. An additional filter shall be optional and installed outside the detector to provide a clean air barrier around the detector's optics to prevent contamination and increased service life.
12. The aspirator shall be a centrifugal blower with the ability to allow up to 800ft of pipe, subject to local codes and calculations.

13. The Assembly must contain nine (9) or more relays for inputs, alarm conditions, and fault conditions. The relays shall be software programmable to the required functions. The relays must be rated 1 Amp at 30 VDC. Remote relays can be offered as an option and either configured to replicate those on the detector or programmed differently.
14. The detector shall incorporate a replaceable and recyclable water cartridge.
15. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector shall allow storage of up to 256 events and does not require the presence of a display in order to do so.
16. The detector shall have built-in graphical airflow and smoke logging for both the CCD and SCD. The data logged every 10 seconds to 4 minutes, and shall include CCD and SCD levels along with date and times. Each detector shall allow storage of approximately 24,000 data points (about 1 months' of data).
17. The detector shall incorporate 3 Inputs which can be assigned by configuration to activate one of several functions including (Isolate, Silence, Reset, Mains Fault, Battery Fault, Pause AF, Disable AF).
18. The detector shall incorporate two levels of logins to protect against unauthorized access.

3.4 Displays

The single through four pipe Hybrid detectors shall provide a 7" touchscreen display and LED user interface support commands; LEDs to indicate alarm events; trouble LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text.

In addition to the LED user interface, the touch screen user interface with following characteristics:

1. Full color touch screen user interface with the ability to see the level of each pipe and all other menus
2. Program and commission the detector from solely the touch screen.
3. Alarm threshold indicators for Pre-alarm, Fire 1, Fire 2, and Fire 3
4. Fault indicating the fault condition.
5. Include built in troubleshooting videos
6. Include the available view up to 6 color IP cameras
7. A remotely mounted Display may be optionally equipped with an alarm and fault output.

3.5 Monitoring

The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1. Windows Operating System

3.6 Configuration and Programming

Configuration and programming may be performed at the detector without needing any additional software, hardware, or programmers; by accessing the detector through a remote display; or by direct connection to a detector or through Ethernet network.

Configuration and programming tool shall support the following features at a minimum:

1. Programming of the device.
2. Viewing of the status of the device in the system.
3. Adjustment of the alarm thresholds of the detector.
4. Setting of Day/Night, weekend sensitivity threshold settings.
5. Multi-level password control.
6. Programmable latching or non-latching relay operation.
7. Programmable energized or de-energized relays.
8. Programmable high and low flow settings for airflow supervision.
9. Programmable aspirator speed control.
10. Testing of relays assigned to a specific pipe to aid commissioning.
11. Viewing built in troubleshooting videos
12. Commissioning and Viewing optional IP cameras

3.7 Security

The following security measures shall be provided.

1. Access to a detector via Ethernet shall be protected using a detector password specific to the detector

3.8 Upgrading

There shall be provision for field upgrading the firmware in the system using a PC for this function.

4 APPLICATION

4.1 Detection Alarm Levels

Each pipe shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

1 Alarm Level 1 (Pre-Alarm) - Activate a visual and audible alarm in the fire risk area.

2 Alarm Level 2 (Fire 1) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.

3 Alarm Level 3 (Fire 2) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

4 Alarm Level 4 (Fire 3) - Activate a suppression system and/or other suitable countermeasures.

4.2 Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the protected environment. Default settings of the unit shall be:

1. Alarm Level 1 (Pre-alarm) 300 CFS
2. Alarm Level 2 (Fire 1) 400 CFS
3. Alarm Level 3 (Fire 2) 500 CFS
4. Alarm Level 4 (Fire 3) 600 CFS

4.3 Initial (factory default) settings for the alarm/fault delays

1. Alarm Level 1 (Pre-Alarm) 0 seconds
2. Alarm Level 2 (Fire 1) 0 seconds
3. Alarm Level 3 (Fire 2) 0 seconds
4. Alarm Level 4 (Fire 3) 0 seconds

4.4 Faults

The Detector Fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel (FACP) in such a way that a Detector Fault would register a fault condition on the FACP.

(Check local Codes, Standards or Regulations to determine whether compliance with this set up is required).

4.5 Power Supply and Batteries

The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 5 minutes in an alarm condition.

Local Power Supply Standards that may apply:

1. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
2. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.

4.6 Sampling Pipe Design

4.6.1 Sampling Pipe

The sampling pipe shall comply with the following requirements.

1. The sampling pipe shall be smooth bore RedPipe. Normally, pipe with an outside diameter (OD) of 25mm or 1.05" and internal diameter (ID) of .87" should be used. It should be marked along its length with "RedPipe Smoke Detector Sampling Tube Do Not Disturb" via printing directly on the pipe.

2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Air Sampling/Aspirating Smoke Detector Pipe (or similar wording) along its entire length printed directly onto the pipe at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
5. All piping should be supported at centers of the lesser of 1.5m (5ft) apart or that specified by local codes or standards.
6. The end of each trunk or branch pipe shall be fitted with an end-cap and made air-tight by using solvent cement. Use of a hole in the end-cap will be dependent on the network design (see ProFlow calculations).

4.6.2 Sampling Holes

The sampling holes shall comply with the following requirements.

1. Sampling holes shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations.
2. Each sampling hole shall be identified and in accordance with Codes or Standards.

   a) It is manufacturer's recommendation to use the correct size Sample Hole Markers (SHM) for identification as it provides hole size verification from a distance, and are visually distinct from the pipe network.
3. Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.
4. Sample point size and indeed the entire pipe design and installation design shall be supported by ProFlow calculations.

5 EXECUTION

5.1 System Installation

The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's System Design Manual.

5.1.1 ASD Detector Mounting

1 The detector shall be capable of vertical mounting with sample air inlet port(s) directed upward the ceiling (normal mounting).

2 The detector shall be capable of mounting directly to a wall using screw fasteners.

5.1.2 The Capillary Sampling Network

The capillary sampling network shall comply with the following requirements:

1. Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.
2. The typical internal diameter of the capillary tube shall be 5mm or 3/8", the maximum length of the capillary tube shall be 8m (26 ft) unless otherwise specified in consultation with the manufacturer.
3. The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

5.1.3 Air Sampling Pipe Network Calculations

Air Sampling Pipe Network Calculations shall be provided by Air Sampling Pipe Network modelling program such as ProFlow. Pipe network calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria:

5.1.3.1 Transport Time

Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling point shall be less than 120 seconds for open hole sampling and capillary tubes. Longer transport times may be tolerated where long pipe runs are required and local codes and standards permit.

Local codes and standards may also apply. For example:

1.	NFPA 72	The Americas	120 Seconds
2.	NFPA 76	The Americas	60 Second

5.1.3.2 Balance %

1. The balance is the ratio of lowest sampling hole flow rate to the highest, expressed as a percentage. The sampling hole balance for the pipe shall not be less than 60%.

5.2 System Commissioning

5.2.1 Detector commissioning

The detector shall incorporate a 7-inch color touch screen to allow full commissioning and programming of the detector without the need of additional hardware, software, or programmers.

5.2.2 Commissioning Tests

1 The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.

2 All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.

3 The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

5.2.3 System Checks

Visually check all pipes to ensure that all joints, fittings, bends, sampling points, SHMs, etc., comply with the Specification.

Check the system to ensure the following features are operational and programmed in accordance with the specification.

1. Alarm threshold levels (for both day and night settings),
2. Touchscreen operable
3. Time delays,
4. Pipes in use,
5. Detector address,
6. Display address where applicable,
7. Clock time and date,
8. Air flow fault thresholds,
9. IP Cameras viewable
10. Referencing
11. Check to ensure that all ancillary warning devices operate as specified.
12. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

5.2.4 Final Tests

The contractor shall:

1. Introduce smoke into the detector assembly to provide a basic Go / No-Go functional test.
2. Verify that the transport time from the farthest sampling hole does not exceed the local code requirements using a transport time test while monitoring the CFS signal from the display.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

5.3 Maintenance and Service

5.3.1 Sample Filter

1. The detector shall incorporate a replaceable filter inline with pipe such as the RP7125 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover.
3. Once accessible, the filter shall be removable and replaceable by hand without the need of a tool.

5.3.2 Spare Parts

1. The detector shall incorporate a replaceable Aspirator. The manufacturer's instructions for replacing the Aspirator shall be followed.
2. The detector shall incorporate a replaceable SCD Assembly. The manufacturer's instructions for replacing the SCD Assembly shall be followed.
3. The detector shall incorporate a replaceable, and recyclable, water cartridge. The manufacturer's instructions for replacing the water cartridge shall be followed.
4. The detector shall incorporate replaceable Front Covers. The manufacturer's instructions for replacing the Front Cover shall be followed.

5915 Stockbridge Dr. • Monroe, NC 28110 • Phone: 704-821-7920 • Fax: 704-821-4327
Email: staff@safefiredetection.com • www.safefiredetection.com

Very Early Warning Air Sampling Smoke and Fire Detection Cirrus Hybrid (Scanning)

Engineering Specification

February 2023

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1

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1.5 Quality Assurance

1.5.1 Manufacturer

1. The manufacturer shall have a minimum of 28 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2015.

1.5.2 Equipment Supplier

1. The equipment supplier shall be authorized trained by the manufacturer to calculate/design, install, test and maintain the ASD system.
2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

1.5.3 Installer

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

1.5.4 Warranty

1. The manufacturer shall guarantee the product by warranty for a period of one year.
2. Any damage to the ASD due to poor handling or operating outside its operation limits will void its warranty.
3. The installation and programming of the ASD shall be completed by a factory-trained installer.

1.5.5 Training

1. The manufacturer and their representatives shall make available adequate training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

1.6 Documentation

The following documentation shall be supplied.

1. Product data and site drawings shall be submitted and shall include pipe layout, operational calculations and performance criteria. Tools such as ProFlow may be used to generate this material.
2. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.
3. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

2 SYSTEM DESCRIPTION

2.1 ASD System Features

The ASD system shall:

1. Consist of a highly sensitive, optical-based, light scattering smoke detector, Cloud chamber-based (CCD) fire detector, scanning module, aspirator, and SCD.
2. The system must be scanning such that:
   a) Enables a single detector to be divided into up to four separate pipes
   b) Provides real time detection by pipe to monitor fire growth
   c) Provides four individually configurable alarm levels (Pre-alarm, Fire 1, Fire 2, and Fire 3) for each pipe
3. Be modular, with each detector having a display with indicator LEDs, and a reset control button on the 7" touch screen Display showing detector status including fault categories and smoke level per pipe.
4. Consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
5. Support optional equipment which may include intelligent remote displays and/or a high level interface (HLI) with the building fire alarm system, or a dedicated graphics package such as H6.
6. Be tested and approved to with a hole coverage of up to 90,000 sq. ft. for four pipe Hybrid
7. Be approved to provide Very Early Warning Fire Detection (VEWFD) / Class A, Early Warning Fire Detection (EWFD) / Class B and Standard Fire Detection (SFD) / Class C.
8. Provide five output levels corresponding to Pre-alarm, Fire 1, Fire 2, and Fire 3. These levels shall be programmable and able to be set at sensitivities ranging from 1-1000 CFS.
9. Report any fault on the detector by using configurable fault relay outputs, via a peer-to-peer network or by communications to a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
10. Incorporate a flow sensor in each pipe inlet and provide staged airflow faults against flow fault thresholds that may be determined and set for each pipe individually.
11. Be commissionable without an additional device for programming.
12. Capability to connect directly to 6 IP cameras
13. Include troubleshooting videos built into the detector
14. Be able to provide relay outputs for both detection technologies allowing cross zoning with a single pipe on a single detector

2.2 Detection Technology

2.2.1 Light Source

The Detection Chamber shall employ a highly sensitive, optical light source.

2.2.2 Detection Method

The detection sensing method shall include using a cloud chamber; as well as, photodiodes spaced inside the chamber to detect various scattering angles.

The output data from the sensing method shall include both particle counting as well as measured obscuration level, viewable both separately and as a combined CFS.

2.3 Peer-to-Peer Communications Networking

A peer-to-peer networking facility shall be provided for the purposes of reporting alarms, faults and monitoring status, history and for potential configuration of devices.

The peer-to-peer network shall:

1. Be able to support up to 100 devices (detectors, displays)
2. Be configurable at the detector, at the remote displays, and by PC based configuration tools that are available to configure and manage the network of detectors.

2.4 Secondary Communications

Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

1. USB
2. 10/100 BaseT Ethernet (2 ports)
3. RS485

3 PRODUCTS

3.1 Manufacturer

Air Sampling Smoke Detection System: Acceptable Manufacturer.

Safe Fire Detection, 5915 Stockbridge Dr., Monroe, NC 28110

3.2 Manufactured Units(s)

The Hybrid ASD system can be supplied in the following configurations:

Part Number	Description
61986H4S-FMUL2	CIRRUS HYBRID 2 (2 PIPE SCANNER) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED
61986H4S-FMUL3	CIRRUS HYBRID 3 (3 PIPE SCANNER) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED

61986H4S-FMUL4	CIRRUS HYBRID 4 (4 PIPE SCANNER) ASPIRATING 'FIRE & SMOKE' DETECTOR WITH DISPLAY FM UL APPROVED

3.3 Detector Features

The detector shall incorporate the following features.

1. The Detector, SCD, CCD, Aspirator, Touchscreen Display, Vacuum Pump, Water cartridge and Relay Outputs shall be housed in a plastic enclosure and shall be arranged in such a way that air is drawn from the fire risk area by an aspirator and a sample passed through a sample filter and detection chamber.
2. The Detector shall employ a Cloud Chamber Detector (CCD) in addition to an optical light source and incorporate light scattering using a scatter pattern measurement using photodiodes.
3. The detector shall have an obscuration sensitivity range of 0.01%-20% obs/m (0.03%-6.6% obs/ft) and a CFS range of 1-1000.
4. The Detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0-2000 seconds.
5. The detector shall employ modular construction allowing field replacement of the SCD, CCD, touchscreen display, vacuum pump, water cartridge, and aspirator.
6. The detector shall allow future hardware expansion via modular SCDs inside detector enclosure up to four.
7. The Detector shall also incorporate facilities to transmit the following fault categories:
   a) Detector
   b) Air flow
   c) System
   d) Network
   e) Power
   f) Chamber
   g) Module
8. The detector shall support the generation and transmission of urgent and minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
9. The single through four pipe Hybrid shall include up to four sample pipe inlets respectively, and must contain a flow sensor and optical based smoke detector for each pipe inlet, as well as, a shared CCD for all used inlets.
10. The filter shall be a disposable filter and shall be capable of filtering particles in excess of 20 microns from the air sample and shall be installed outside the detector and inside the CCD.
11. An additional filter shall be optional and installed outside the detector to provide a clean air barrier around the detector's optics to prevent contamination and increased service life.
12. The aspirator shall be a centrifugal blower with the ability to allow up to 1000ft of pipe, subject to local codes and calculations.

13. The Assembly must contain nine (9) or more relays for inputs, alarm conditions, and fault conditions. The relays shall be software programmable to the required functions. The relays must be rated 1 Amp at 30 VDC. Remote relays can be offered as an option and either configured to replicate those on the detector or programmed differently.
14. The detector shall incorporate a replaceable and recyclable water cartridge.
15. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector shall allow storage of up to 256 events and does not require the presence of a display in order to do so.
16. The detector shall have built-in graphical airflow and smoke logging for both the CCD and SCD. The data logged every 10 seconds to 4 minutes, and shall include CCD and SCD levels along with date and times. Each detector shall allow storage of approximately 24,000 data points (about 1 months' of data).
17. The detector shall incorporate 3 Inputs which can be assigned by configuration to activate one of several functions including (Isolate, Silence, Reset, Mains Fault, Battery Fault, Pause AF, Disable AF).
18. The detector shall incorporate two levels of logins to protect against unauthorized access.

3.4 Displays

The single through four pipe Hybrid detectors shall provide a 7" touchscreen display and LED user interface support commands; LEDs to indicate alarm events; trouble LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text.

In addition to the LED user interface, the touch screen user interface with following characteristics:

1. Full color touch screen user interface with the ability to see the level of each pipe and all other menus
2. Indication of Scanning
3. Program and commission the detector from solely the touch screen.
4. Alarm threshold indicators for Pre-alarm, Fire 1, Fire 2, and Fire 3 per pipe
5. Fault indicating the fault condition.
6. Include built in troubleshooting videos
7. Include the available view up to 6 color IP cameras
8. A remotely mounted Display may be optionally equipped with an alarm and fault output.

3.5 Monitoring

The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1. Windows Operating System

3.6 Configuration and Programming

Configuration and programming may be performed at the detector without needing any additional software, hardware, or programmers; by accessing the detector through a remote display; or by direct connection to a detector or through Ethernet network.

Configuration and programming tool shall support the following features at a minimum:

1. Programming of the device.
2. Viewing of the status of the device in the system.
3. Adjustment of the alarm thresholds of the detector.
4. Setting of Day/Night, weekend sensitivity threshold settings.
5. Multi-level password control.
6. Programmable latching or non-latching relay operation.
7. Programmable energized or de-energized relays.
8. Programmable high and low flow settings for airflow supervision.
9. Programmable aspirator speed control.
10. Testing of relays assigned to a specific pipe to aid commissioning.
11. Viewing built in troubleshooting videos
12. Commissioning and Viewing optional IP cameras

3.7 Security

The following security measures shall be provided.

1. Access to a detector via Ethernet shall be protected using a detector password specific to the detector

3.8 Upgrading

There shall be provision for field upgrading the firmware in the system using a PC for this function.

4 APPLICATION

4.1 Detection Alarm Levels

Each pipe shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

1 Alarm Level 1 (Pre-Alarm) - Activate a visual and audible alarm in the fire risk area.

2 Alarm Level 2 (Fire 1) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.

3 Alarm Level 3 (Fire 2) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

4 Alarm Level 4 (Fire 3) - Activate a suppression system and/or other suitable countermeasures.

4.2 Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the protected environment. Default settings of the unit shall be:

1. Alarm Level 1 (Pre-alarm) 300 CFS
2. Alarm Level 2 (Fire 1) 400 CFS
3. Alarm Level 3 (Fire 2) 500 CFS
4. Alarm Level 4 (Fire 3) 600 CFS

4.3 Initial (factory default) settings for the alarm/fault delays

1. Alarm Level 1 (Pre-Alarm) 0 seconds
2. Alarm Level 2 (Fire 1) 0 seconds
3. Alarm Level 3 (Fire 2) 0 seconds
4. Alarm Level 4 (Fire 3) 0 seconds

4.4 Faults

The Detector Fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel (FACP) in such a way that a Detector Fault would register a fault condition on the FACP.

(Check local Codes, Standards or Regulations to determine whether compliance with this set up is required).

4.5 Power Supply and Batteries

The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 5 minutes in an alarm condition.

Local Power Supply Standards that may apply:

1. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
2. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.

4.6 Sampling Pipe Design

4.6.1 Sampling Pipe

The sampling pipe shall comply with the following requirements.

1. The sampling pipe shall be smooth bore RedPipe. Normally, pipe with an outside diameter (OD) of 25mm or 1.05" and internal diameter (ID) of .87" should be used. It should be marked along its length with "RedPipe Smoke Detector Sampling Tube Do Not Disturb" via printing directly on the pipe.

2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Air Sampling/Aspirating Smoke Detector Pipe (or similar wording) along its entire length printed directly onto the pipe at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
5. All piping should be supported at centers of the lesser of 1.5m (5ft) apart or that specified by local codes or standards.
6. The end of each trunk or branch pipe shall be fitted with an end-cap and made air-tight by using solvent cement. Use of a hole in the end-cap will be dependent on the network design (see ProFlow calculations).

4.6.2 Sampling Holes

The sampling holes shall comply with the following requirements.

1. Sampling holes shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations.
2. Each sampling hole shall be identified and in accordance with Codes or Standards.

   a) It is manufacturer's recommendation to use the correct size Sample Hole Markers (SHM) for identification as it provides hole size verification from a distance, and are visually distinct from the pipe network.
3. Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.
4. Sample point size and indeed the entire pipe design and installation design shall be supported by ProFlow calculations.

5 EXECUTION

5.1 System Installation

The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's System Design Manual.

5.1.1 ASD Detector Mounting

1 The detector shall be capable of vertical mounting with sample air inlet port(s) directed up toward the ceiling (normal mounting).

2 The detector shall be capable of mounting directly to a wall using screw fasteners.

5.1.2 The Capillary Sampling Network

The capillary sampling network shall comply with the following requirements:

1. Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.
2. The typical internal diameter of the capillary tube shall be 5mm or 3/8", the maximum length of the capillary tube shall be 8m (26 ft) unless otherwise specified in consultation with the manufacturer.
3. The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

5.1.3 Air Sampling Pipe Network Calculations

Air Sampling Pipe Network Calculations shall be provided by Air Sampling Pipe Network modelling program such as ProFlow. Pipe network calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria:

5.1.3.1 Transport Time

Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling point shall be less than 120 seconds for open hole sampling and capillary tubes. Longer transport times may be tolerated where long pipe runs are required and local codes and standards permit.

Local codes and standards may also apply. For example:

1.	NFPA 72	The Americas	120 Seconds
2.	NFPA 76	The Americas	60 Second

5.1.3.2 Balance %

1. The balance is the ratio of lowest sampling hole flow rate to the highest, expressed as a percentage. The sampling hole balance for the pipe shall not be less than 60%.

5.2 System Commissioning

5.2.1 Detector commissioning

The detector shall incorporate a 7-inch color touch screen to allow full commissioning and programming of the detector without the need of additional hardware, software, or programmers.

5.2.2 Commissioning Tests

1 The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.

2 All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.

3 The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

5.2.3 System Checks

Visually check all pipes to ensure that all joints, fittings, bends, sampling points, SHMs, etc., comply with the Specification.

Check the system to ensure the following features are operational and programmed in accordance with the specification.

1. Alarm threshold levels (for both day and night settings),
2. Touchscreen operable
3. Time delays,
4. Pipes in use,
5. Scanning in use,
6. Detector address,
7. Display address where applicable,
8. Clock time and date,
9. Air flow fault thresholds,
10. IP Cameras viewable
11. Referencing
12. Check to ensure that all ancillary warning devices operate as specified.
13. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

5.2.4 Final Tests

The contractor shall:

1. Introduce smoke into the detector assembly to provide a basic Go / No-Go functional test.
2. Verify that the transport time from the farthest sampling hole does not exceed the local code requirements using a transport time test while monitoring the CFS signal from the display.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

5.3 Maintenance and Service

5.3.1 Sample Filter

1. The detector shall incorporate a replaceable filter inline with pipe such as the RP7125 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover.

3. Once accessible, the filter shall be removable and replaceable by hand without the need of a tool.

5.3.2 Spare Parts

1. The detector shall incorporate a replaceable Aspirator. The manufacturer's instructions for replacing the Aspirator shall be followed.
2. The detector shall incorporate a replaceable SCD Assembly. The manufacturer's instructions for replacing the SCD Assembly shall be followed.
3. The detector shall incorporate a replaœable, and recyclable, water cartridge. The manufacturer's instructions for replacing the water cartridge shall be followed.
4. The detector shall incorporate replaceable Front Covers. The manufacturer's instructions for replacing the Front Cover shall be followed.

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Early Warning Air Sampling Smoke Detection ProPointPlus

Engineering Specification

February 2023

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Contents

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1 GENERAL

1.1 Scope

This document provides specification details of the ProPointPlus Air-sampling Smoke Detection (ASD) products to assist in their installation and commissioning. ProPointPlus range provides a single pipe through four pipe products. ProPointPlus ASD is referred to as ASD throughout this document.

1.2 ASD System Information

1. A Early Warning Fire Detection System like the ProPointPlus System shall be installed throughout the areas nominated on the drawings.
2. The ASD system shall consist of highly sensitive optical-based Smoke Detectors with aspirators connected to networks of sampling pipes.
3. When required, an optional Display unit may be provided to monitor each ASD detector.

1.3 Approvals and Standards

The ASD must be of a type submitted to, tested, approved, and/or listed to the Standards mentioned below by a Nationally Recognized Testing Laboratory (NRTL):

1. UL268 and UL268A: UL (Underwriters Laboratories Inc), USA
2. UL268: ULC (Underwriters Laboratories Canada), Canada
3. FM3230 (Factory Mutual)
4. CSFM (California State Fire Marshall, USA)

1.4 Codes, Standards or Regulations

The ASD shall be installed to comply with one or more of the following codes or standards:

1. AS 1670.1-2004, AS1603.8 – 1996, ASNZS 3000
2. Fire Industry Association (FIA), Code of Practice for Design, Installation, Commissioning & Maintenance of Aspirating Smoke De tector (ASD) Systems
3. NFPA Standards, US
4. NEC Standards, US
5. Local codes and standards

1.5 Quality Assurance

1.5.1 Manufacturer

1. The manufacturer shall have a minimum of 28 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2015.

1.5.2 Equipment Supplier

1. The equipment supplier shall be authorized trained by the manufacturer to calculate/design, install, test and maintain the ASD system.
2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

1.5.3 Installer

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

1.5.4 Warranty

1. The manufacturer shall guarantee the product by warranty for a period of one year.
2. Any damage to the ASD due to poor handling or operating outside its operation limits will void its warranty.
3. The installation and programming of the ASD shall be completed by a factory-trained installer.

1.5.5 Training

1. The manufacturer and their representatives shall make available adequate training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

1.6 Documentation

The following documentation shall be supplied.

1. Product data and site drawings shall be submitted and shall include pipe layout, operational calculations and performance criteria. Tools such as ProFlow may be used to generate this material.
2. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.
3. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

2 SYSTEM DESCRIPTION

2.1 ASD System Features

The ASD system shall:

1. Consist of a highly sensitive, optical-based, light scattering smoke detector, aspirator, and SCD.
2. Be modular, with each detector having a display with indicator LEDs and a reset control button and with a LCD Display showing detector status including fault categories and smoke level.
3. Consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
4. Support optional equipment which may include intelligent remote displays and/or a high level interface (HLI) with the building fire alarm system, or a dedicated graphics package such as H6.
5. Be tested and approved to cover up to 13,500 sq. ft. for the single pipe ProPointPlus, or up to 54,000 sq. ft.) for four pipe ProPointPlus.
6. Be approved to provide Very Early Warning Fire Detection (VEWFD) / Class A, Early Warning Fire Detection (EWFD) / Class B and Standard Fire Detection (SFD) / Class C.
7. Provide five output levels corresponding to Stage 1, 2, 3, and 4. These levels shall be programmable and able to be set at sensitivities ranging from 0.01%-20% obs/m (0.03%-6.6% obs/ft).
8. Report any fault on the detector by using configurable fault relay outputs, via a peer-to-peer network or by communications to a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
9. Incorporate a flow sensor in each pipe inlet and provide staged airflow faults against flow fault thresholds that may be determined and set for each pipe individually.
10. Be commissionable without an additional device for programming.

2.2 Detection Technology

2.2.1 Light Source

The Detection Chamber shall employ a highly sensitive, optical light source.

2.2.2 Detection Method

The detection sensing method shall photodiodes spaced inside the chamber to detect various scattering angles.

2.3 Peer-to-Peer Communications Networking

A peer-to-peer networking facility shall be provided for the purposes of reporting alarms, faults and monitoring status, history and for potential configuration of devices.

The peer-to-peer network shall:

1. Be able to support up to 100 devices (detectors, displays)
2. Be configurable at the detector, at the remote displays, and by PC based configuration tools that are available to configure and manage the network of detectors.

2.4 Secondary Communications

Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

1. USB
2. 10/100 BaseT Ethernet (1 ports)
3. RS485

3 PRODUCTS

3.1 Manufacturer

Air Sampling Smoke Detection System: Acceptable Manufacturer.

Safe Fire Detection, 5915 Stockbridge Dr., Monroe, NC 28110

3.2 Manufactured Units(s)

The ProPointPlus ASD system can be supplied in the following configurations:

Part Number	Description
61986104-FMULOP1	ProPoint Plus 1 OP Aspirating 'Smoke' Detector (c/w 1 x OP SCD) FM UL Approved
61986104-FMULOP2	ProPoint Plus 4 OP Aspirating 'Smoke' Detector (c/w 2 x OP SCD) FM UL Approved
61986104-FMULOP3	ProPoint Plus 4 OP Aspirating 'Smoke' Detector (c/w 3 x OP SCD) FM UL Approved
61986104-FMULOP4	ProPoint Plus 4 OP Aspirating 'Smoke' Detector (c/w 4 x OP SCD) FM UL Approved

3.3 Detector Features

The detector shall incorporate the following features.

1. The Detector, SCD, Aspirator and Relay Outputs shall be housed in a plastic enclosure and shall be arranged in such a way that air is drawn from the fire risk area by an aspirator and a sample passed through a sample filter and detection chamber.

2. The Detector shall employ a optical light source and incorporate light scattering using a scatter pattern measurement using photodiodes.
3. The detector shall have an obscuration sensitivity range of 0.01%-20% obs/m (0.03%-6.6% obs/ft).
4. The Detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0-2000 seconds.
5. The detector shall employ modular construction allowing field replacement of the SCD, chamber and aspirator.
6. The detector shall allow future hardware expansion via modular SCDs inside detector enclosure up to four.
7. The Detector shall also incorporate facilities to transmit the following fault categories:
   a) Detector
   b) Air flow
   c) System
   d) Network
   e) Power
   f) Chamber
   g) Module
8. The detector shall support the generation and transmission of urgent and minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
9. The single through four pipe ProPointPlus shall include up to four sample pipe inlets respectively, and must contain a flow sensor and optical based smoke detector for each pipe inlet.
10. The filter shall be a disposable filter and shall be capable of filtering particles in excess of 20 microns from the air sample and shall be installed outside the detector.
11. An additional filter shall be optional and installed outside the detector to provide a clean air barrier around the detector's optics to prevent contamination and increased service life.
12. The aspirator shall be a centrifugal blower.
13. The Assembly must contain nine (9) or more relays for inputs, alarm conditions, and fault conditions. The relays shall be software programmable to the required functions. The relays must be rated 1 Amp at 30 VDC. Remote relays can be offered as an option and either configured to replicate those on the detector or programmed differently.
14. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector shall allow storage of up to 256 events and does not require the presence of a display in order to do so.
15. The detector shall have built-in graphical airflow and smoke logging for the SCD. The data logged every 10 seconds to 4 minutes, and shall SCD levels along with date and times. Each detector shall allow storage of approximately 24,000 data points (about 1 months' of data)
16. The detector shall incorporate 3 Inputs which can be assigned by configuration to activate one of several functions including (Isolate, Silence, Reset, Mains Fault, Battery Fault, Pause AF, Disable AF).

3.4 Displays

The single through four pipe ProPointPlus detectors shall provide an LCD and LED user interface with push buttons to support commands; LEDs to indicate alarm events; trouble LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text.

In addition to the LED user interface, the LCD user interface with following characteristics:

1. Black and white LCD user interface.
2. Alarm threshold indicators for Stages 1 through 4.
3. Fault test indicating the fault condition.
4. A remotely mounted Display may be optionally equipped with an alarm and fault output.

3.5 Monitoring

The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1. Windows Operating System

3.6 Configuration and Programming

Configuration and programming may be performed at the detector without using a Windows® application such as ProView on a PC connected through a High Level Interfacing unit (PC-Link HLI) or by direct connection to a detector or through Ethernet network.

Configuration and programming tool shall support the following features at a minimum:

1. Programming of the device.
2. Viewing of the status of the device in the system.
3. Adjustment of the alarm thresholds of the detector.
4. Setting of Day/Night, weekend sensitivity threshold settings.
5. Multi-level password control.
6. Programmable latching or non-latching relay operation.
7. Programmable energized or de-energized relays.
8. Programmable high and low flow settings for airflow supervision.
9. Programmable aspirator speed control.
10. Testing of relays assigned to a specific pipe to aid commissioning.

3.7 Security

The following security measures shall be provided.

1. Access to a detector via Ethernet shall be protected using a detector password specific to the detector

3.8 Upgrading

There shall be provision for field upgrading the firmware in the system using a PC for this function.

4 APPLICATION

4.1 Detection Alarm Levels

Each pipe shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

1 Alarm Level 1 (Stage 1) - Activate a visual and audible alarm in the fire risk area.

2 Alarm Level 2 (Stage 2) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.

3 Alarm Level 3 (Stage 3) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

4 Alarm Level 4 (Stage 4) - Activate a suppression system and/or other suitable countermeasures.

4.2 Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the protected environment. Default settings of the unit shall be:

1. Alarm Level 1 (Stage 1) 0.5% obs/m
2. Alarm Level 2 (Stage 2) 1.0% obs/m
3. Alarm Level 3 (Stage 3) 1.5% obs/m
4. Alarm Level 4 (Stage 4) 2.0% obs/m

4.3 Initial (factory default) settings for the alarm/fault delays

1. Alarm Level 1 (Stage 1) 0 seconds
2. Alarm Level 2 (Stage 2) 0 seconds
3. Alarm Level 3 (Stage 3) 0 seconds
4. Alarm Level 4 (Stage 4) 0 seconds

4.4 Faults

The Detector Fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel (FACP) in such a way that a Detector Fault would register a fault condition on the FACP.

(Check local Codes, Standards or Regulations to determine whether compliance with this set up is required).

4.5 Power Supply and Batteries

The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 5 minutes in an alarm condition.

Local Power Supply Standards that may apply:

1. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
2. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.

4.6 Sampling Pipe Design

4.6.1 Sampling Pipe

The sampling pipe shall comply with the following requirements.

1. The sampling pipe shall be smooth bore RedPipe. Normally, pipe with an outside diameter (OD) of 25mm or 1.05" and internal diameter (ID) of .87" should be used. It should be marked along its length with "RedPipe Smoke Detector Sampling Tube Do Not Disturb" via printing directly on the pipe.
2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Air Sampling/Aspirating Smoke Detector Pipe (or similar wording) along its entire length printed directly onto the pipe at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
5. All piping should be supported at centers of the lesser of 1.5m (5ft) apart or that specified by local codes or standards.
6. The end of each trunk or branch pipe shall be fitted with an end-cap and made air-tight by using solvent cement. Use of a hole in the end-cap will be dependent on the network design (see ProFlow calculations).

4.6.2 Sampling Holes

The sampling holes shall comply with the following requirements.

1. Sampling holes shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations.
2. Each sampling hole shall be identified and in accordance with Codes or Standards.

   a) It is manufacturer's recommendation to use the correct size Sample Hole Markers (SHM) for identification as it provides hole size verification from a distance, and are visually distinct from the pipe network.

3. Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.

4. Sample point size and indeed the entire pipe design and installation design shall be supported by ProFlow calculations.

5 EXECUTION

5.1 System Installation

The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's System Design Manual.

5.1.1 ASD Detector Mounting

1 The detector shall be capable of vertical mounting with sample air inlet port(s) directed up toward the ceiling (normal mounting).

2 The detector shall be capable of mounting directly to a wall using screw fasteners.

5.1.2 The Capillary Sampling Network

The capillary sampling network shall comply with the following requirements:

1. Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.

2. The typical internal diameter of the capillary tube shall be 5mm or 3/8", the maximum length of the capillary tube shall be 8m (26 ft) unless otherwise specified in consultation with the manufacturer.

3. The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

5.1.3 Air Sampling Pipe Network Calculations

Air Sampling Pipe Network Calculations shall be provided by Air Sampling Pipe Network modelling program such as ProFlow. Pipe network calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria:

5.1.3.1 Transport Time

Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling point shall be less than 120 seconds for open hole sampling and capillary tubes. Longer transport times may be tolerated where long pipe runs are required and local codes and standards permit.

Local codes and standards may also apply. For example:

1. NFPA 72 The Americas 120 Seconds

2.	NFPA 76	The Americas	60 Second

5.1.3.2 Balance %

1. The balance is the ratio of lowest sampling hole flow rate to the highest, expressed as a percentage. The sampling hole balance for the pipe shall not be less than 60%.

5.2 System Commissioning

5.2.1 Detector commissioning

The detector shall incorporate push buttons to facilitate commissioning without the need for separate PC or programmers.

5.2.2 Commissioning Tests

1 The contractor shall allow for the manufacturer's representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.

2 All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.

3 The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

5.2.3 System Checks

Visually check all pipes to ensure that all joints, fittings, bends, sampling points, SHMs, etc., comply with the Specification.

Check the system to ensure the following features are operational and programmed in accordance with the specification.

1. Alarm threshold levels (for both day and night settings),
2. Time delays,
3. Pipes in use,
4. Detector address,
5. Display address where applicable,
6. Clock time and date,
7. Air flow fault thresholds,
8. Push buttons operable,
9. Referencing
10. Check to ensure that all ancillary warning devices operate as specified.
11. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

5.2.4 Final Tests

The contractor shall:

1. Introduce smoke into the detector assembly to provide a basic Go / No-Go functional test.
2. Verify that the transport time from the farthest sampling hole does not exceed the local code requirements using a transport time test.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

5.3 Maintenance and Service

5.3.1 Sample Filter

1. The detector shall incorporate a replaceable filter inline with pipe such as the RP7125 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover.
3. Once accessible, the filter shall be removable and replaceable by hand without the need of a tool.

5.3.2 Spare Parts

1. The detector shall incorporate a replaceable Aspirator. The manufacturer's instructions for replacing the Aspirator shall be followed.
2. The detector shall incorporate a replaceable SCD Assembly. The manufacturer's instructions for replacing the SCD Assembly shall be followed.
3. The detector shall incorporate replaceable Front Covers. The manufacturer's instructions for replacing the Front Cover shall be followed.

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Very Early Warning Air Sampling
Fire Detection
Cirrus CCD (Scanning)
Engineering Specification
February 2023

5915 Stockbridge Dr. • Monroe, NC 28110 • Phone: 704-821-7920 • Fax: 704-821-4327
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Contents

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1 GENERAL

1.1 Scope

This document provides specification details of the CCD Air-sampling Fire Detection (ASD) products to assist in their installation and commissioning. Hybrid range provides a single pipe through four pipe products. CCD ASD is referred to as ASD throughout this document.

1.2 ASD System Information

1. A Very Early Warning Fire Detection System like the CCD System shall be installed throughout the areas nominated on the drawings.
2. The ASD system shall consist of highly sensitive cloud chamber in one enclosure with aspirators connected to networks of sampling pipes.
3. The detector will be able to identify which pipe is carrying smoke
4. When required, an optional Display unit may be provided to monitor each ASD detector.

1.3 Approvals and Standards

The ASD must be of a type submitted to, tested, approved, and/or listed to the Standards mentioned below by a Nationally Recognized Testing Laboratory (NRTL):

1. UL268 and UL268A: UL (Underwriters Laboratories Inc), USA
2. UL268: ULC (Underwriters Laboratories Canada), Canada
3. FM3230 (Factory Mutual)
4. CSFM (California State Fire Marshall, USA)

1.4 Codes, Standards or Regulations

The ASD shall be installed to comply with one or more of the following codes or standards:

1. AS 1670.1-2004, AS1603.8 – 1996, ASNZS 3000
2. Fire Industry Association (FIA), Code of Practice for Design, Installation, Commissioning & Maintenance of Aspirating Smoke Detector (ASD) Systems
3. NFPA Standards, US
4. NEC Standards, US
5. Local codes and standards

1.5 Quality Assurance

1.5.1 Manufacturer

1. The manufacturer shall have a minimum of 28 years production experience in the design and manufacture of high sensitivity air sampling smoke detection systems.
2. The manufacturer shall be certified as meeting ISO 9001:2015.

1.5.2 Equipment Supplier

1. The equipment supplier shall be authorized trained by the manufacturer to calculate/design, install, test and maintain the ASD system.
2. The equipment supplier shall be able to produce a certificate of training from the manufacturer.

1.5.3 Installer

1. The equipment installer shall be authorized and trained by the manufacturer and shall have the ability to design a system based on code requirements.
2. The installer shall be capable of providing calculations, design, and testing documents upon request.

1.5.4 Warranty

1. The manufacturer shall guarantee the product by warranty for a period of one year.
2. Any damage to the ASD due to poor handling or operating outside its operation limits will void its warranty.
3. The installation and programming of the ASD shall be completed by a factory-trained installer.

1.5.5 Training

1. The manufacturer and their representatives shall make available adequate training to all personnel involved in the supply, installation, commissioning, operation and maintenance of the ASD system.

1.6 Documentation

The following documentation shall be supplied.

1. Product data and site drawings shall be submitted and shall include pipe layout, operational calculations and performance criteria. Tools such as ProFlow may be used to generate this material.
2. A copy of the manufacturer's installation, operation and maintenance manuals shall be supplied upon completion of the installation.
3. System commissioning data shall be supplied (in a format recommended by the manufacturer and per the instructions provided by the manufacturer) within 30 days of completion of the installation.

2 SYSTEM DESCRIPTION

2.1 ASD System Features

The ASD system shall:

1. Consist of a highly sensitive Cloud chamber-based (CCD) fire detector, scanning module, and aspirator.
2. The system must be scanning such that:
   a) Enables a single detector to be divided into up to four separate pipes
   b) Provides real time detection by pipe to monitor fire growth
   c) Provides four individually configurable alarm levels (Pre-alarm, Fire 1, Fire 2, and Fire 3) for each pipe
3. Be modular, with each detector having a display with indicator LEDs, and a reset control button on the 7” touch screen Display showing detector status including fault categories and smoke level per pipe.
4. Consist of an air sampling pipe network to transport air to the detection system, supported by calculations from a computer-based design modelling tool.
5. Support optional equipment which may include intelligent remote displays and/or a high level interface (HLI) with the building fire alarm system, or a dedicated graphics package such as H6.
6. Be tested and approved to with a hole coverage of up to 54,000 sq. ft. for four pipe CCD
7. Be approved to provide Very Early Warning Fire Detection (VEWFD) / Class A, Early Warning Fire Detection (EWFD) / Class B and Standard Fire Detection (SFD) / Class C.
8. Provide five output levels corresponding to Pre-alarm, Fire 1, Fire 2, and Fire 3. These levels shall be programmable and able to be set at sensitivities ranging from 1-1000 CFS.
9. Report any fault on the detector by using configurable fault relay outputs, via a peer-to-peer network or by communications to a monitoring software tool running on a PC or hand-held device such as a tablet or smart phone.
10. Incorporate a flow sensor in each pipe inlet and provide staged airflow faults against flow fault thresholds that may be determined and set for each pipe individually.
11. Be commissionable without an additional device for programming.
12. Capability to connect directly to 6 IP cameras
13. Include troubleshooting videos built into the detector
14. Be able to provide relay outputs for both detection technologies allowing cross zoning with a single pipe on a single detector

2.2 Detection Technology

2.2.1 Light Source

The Detection Chamber shall employ a highly sensitive, optical light source.

2.2.2 Detection Method

The detection sensing method shall include using a cloud chamber.

The output data from the sensing method shall include particle counting as viewable as CFS.

2.3 Peer-to-Peer Communications Networking

A peer-to-peer networking facility shall be provided for the purposes of reporting alarms, faults and monitoring status, history and for potential configuration of devices.

The peer-to-peer network shall:

1. Be able to support up to 100 devices (detectors, displays)
2. Be configurable at the detector, at the remote displays, and by PC based configuration tools that are available to configure and manage the network of detectors.

2.4 Secondary Communications

Detectors shall provide inbuilt secondary communications for monitoring and configuration using the following physical media:

1. USB
2. 10/100 BaseT Ethernet (2 ports)
3. RS485

3 PRODUCTS

3.1 Manufacturer

Air Sampling Smoke Detection System: Acceptable Manufacturer.

Safe Fire Detection, 5915 Stockbridge Dr., Monroe, NC 28110

3.2 Manufactured Units(s)

The Hybrid ASD system can be supplied in the following configurations:

Part Number	Description
61986C4S-FMUL2	CIRRUS CCD 2 (2 PIPE SCANNER) ASPIRATING 'FIRE' DETECTOR WITH DISPLAY FM UL APPROVED
61986C4S-FMUL3	CIRRUS CCD 3 (3 PIPE SCANNER) ASPIRATING 'FIRE' DETECTOR WITH DISPLAY FM UL APPROVED

61986C4S-FMUL4	CIRRUS CCD 4 (4 PIPE SCANNER) ASPIRATING 'FIRE' DETECTOR WITH DISPLAY FM UL APPROVED

3.3 Detector Features

The detector shall incorporate the following features.

1. The Detector, CCD, Aspirator, Touchscreen Display, Vacuum Pump, Water cartridge and Relay Outputs shall be housed in a plastic enclosure and shall be arranged in such a way that air is drawn from the fire risk area by an aspirator and a sample passed through a sample filter and detection chamber.
2. The Detector shall employ a Cloud Chamber Detector (CCD).
3. The detector shall have an obscuration sensitivity range of CFS 1-1000.
4. The Detector shall have four independent field programmable smoke alarm thresholds across its sensitivity range with adjustable time delays for each threshold between 0 -2000 seconds.
5. The detector shall employ modular construction allowing field replacement of the CCD, touchscreen display, vacuum pump, water cartridge, and aspirator.
6. The detector shall allow future hardware expansion via modular cartridges inside detector enclosure up to four.
7. The Detector shall also incorporate facilities to transmit the following fault categories:
   a) Detector
   b) Air flow
   c) System
   d) Network
   e) Power
   f) Chamber
   g) Module
8. The detector shall support the generation and transmission of urgent and minor faults. Minor faults shall be considered as servicing or maintenance signals. Urgent faults indicate the unit may not be able to detect smoke.
9. The single through four pipe CCD shall include up to four sample pipe inlets respectively, and must contain a flow sensor for each pipe inlet; as well as, a shared CCD for all used inlets.
10. The filter shall be a disposable filter and shall be capable of filtering particles in excess of 20 microns from the air sample and shall be installed outside the detector and inside the CCD.
11. An additional filter shall be optional and installed outside the detector to provide a clean air barrier around the detector's optics to prevent contamination and increased service life.
12. The aspirator shall be a centrifugal blower with the ability to allow up to 800ft of pipe, subject to local codes and calculations.
13. The Assembly must contain nine (9) or more relays for inputs, alarm conditions, and fault conditions. The relays shall be software programmable to the required functions. The relays must be rated 1 Amp

at 30 VDC. Remote relays can be offered as an option and either configured to replicate those on the detector or programmed differently.

14. The detector shall incorporate a replaceable and recyclable water cartridge.
15. The detector shall have built-in event and smoke logging. It shall store smoke levels, alarm conditions, operator actions and faults. The date and time of each event shall be recorded. Each detector shall allow storage of up to 256 events and does not require the presence of a display in order to do so.
16. The detector shall have built-in graphical airflow and smoke logging for both the CCD and SCD. The data logged every 10 seconds to 4 minutes, and shall include CCD and SCD levels along with date and times. Each detector shall allow storage of approximately 24,000 data points (about 1 months' of data).
17. The detector shall incorporate 3 Inputs which can be assigned by configuration to activate one of several functions including (Isolate, Silence, Reset, Mains Fault, Battery Fault, Pause AF, Disable AF).
18. The detector shall incorporate two levels of logins to protect against unauthorized access.

3.4 Displays

The single through four pipe Hybrid detectors shall provide a 7" touchscreen display and LED user interface support commands; LEDs to indicate alarm events; trouble LED; and power On / Off indication. All LEDs shall have appropriate symbols without any text.

In addition to the LED user interface, the touch screen user interface with following characteristics:

1. Full color touch screen user interface with the ability to see the level of each pipe and all other menus
2. Indication of Scanning
3. Program and commission the detector from solely the touch screen.
4. Alarm threshold indicators for Pre-alarm, Fire 1, Fire 2, and Fire 3 per pipe
5. Fault indicating the fault condition.
6. Include built in troubleshooting videos
7. Include the available view up to 6 color IP cameras
8. A remotely mounted Display may be optionally equipped with an alarm and fault output.

3.5 Monitoring

The system shall have available software to monitor all devices connected to a system. Such software shall be provided to run on:

1. Windows Operating System

3.6 Configuration and Programming

Configuration and programming may be performed at the detector without needing any additional software, hardware, or programmers; by accessing the detector through a remote display; or by direct connection to a detector or through Ethernet network.

Configuration and programming tool shall support the following features at a minimum:

1. Programming of the device.
2. Viewing of the status of the device in the system.
3. Adjustment of the alarm thresholds of the detector.
4. Setting of Day/Night, weekend sensitivity threshold settings.
5. Multi-level password control.
6. Programmable latching or non-latching relay operation.
7. Programmable energized or de-energized relays.
8. Programmable high and low flow settings for airflow supervision.
9. Programmable aspirator speed control.
10. Testing of relays assigned to a specific pipe to aid commissioning.
11. Viewing built in troubleshooting videos
12. Commissioning and Viewing optional IP cameras

3.7 Security

The following security measures shall be provided.

1. Access to a detector via Ethernet shall be protected using a detector password specific to the detector

3.8 Upgrading

There shall be provision for field upgrading the firmware in the system using a PC for this function.

4 APPLICATION

4.1 Detection Alarm Levels

Each pipe shall have four (4) independently programmable alarm thresholds. The four alarm levels may be used as follows:

1 Alarm Level 1 (Pre-Alarm) - Activate a visual and audible alarm in the fire risk area.

2 Alarm Level 2 (Fire 1) - Activate the electrical/electronic equipment shutdown relay and activate visual and audible alarms in the Security Office or other appropriate location.

3 Alarm Level 3 (Fire 2) - Initiate an alarm condition in the Fire Alarm Control Panel to call the Fire Brigade and activate all warning systems.

4 Alarm Level 4 (Fire 3) - Activate a suppression system and/or other suitable countermeasures.

4.2 Initial Detection Alarm Settings

Initial settings for the alarm levels shall be determined by the requirements of the protected environment. Default settings of the unit shall be:

1. Alarm Level 1 (Pre-alarm) 300 CFS
2. Alarm Level 2 (Fire 1) 400 CFS
3. Alarm Level 3 (Fire 2) 500 CFS
4. Alarm Level 4 (Fire 3) 600 CFS

4.3 Initial (factory default) settings for the alarm/fault delays

1. Alarm Level 1 (Pre-Alarm) 0 seconds
2. Alarm Level 2 (Fire 1) 0 seconds
3. Alarm Level 3 (Fire 2) 0 seconds
4. Alarm Level 4 (Fire 3) 0 seconds

4.4 Faults

The Detector Fault relay shall be connected to the appropriate alarm zone on the Fire Alarm Control Panel (FACP) in such a way that a Detector Fault would register a fault condition on the FACP.

(Check local Codes, Standards or Regulations to determine whether compliance with this set up is required).

4.5 Power Supply and Batteries

The system shall be powered from a regulated supply of nominally 24V DC. The battery charger and battery shall comply with the relevant Codes, Standards or Regulations. Typically 24 hours standby battery backup is required followed by 5 minutes in an alarm condition.

Local Power Supply Standards that may apply:

1. UL 1481 Listed - provided the power supply and standby batteries have been appropriately sized / rated to accommodate the system's power requirements.
2. US Telecommunication Central Office Power Supply - the system shall operate on negative 48 VDC (provided continuously from the telephone central office power source) converted to 24VDC.

4.6 Sampling Pipe Design

4.6.1 Sampling Pipe

The sampling pipe shall comply with the following requirements.

1. The sampling pipe shall be smooth bore RedPipe. Normally, pipe with an outside diameter (OD) of 25mm or 1.05" and internal diameter (ID) of .87" should be used. It should be marked along its length with "RedPipe Smoke Detector Sampling Tube Do Not Disturb" via printing directly on the pipe.

2. The pipe material should be suitable for the environment in which it is installed, or should be the material as required by the specifying body.
3. All joints in the sampling pipe must be air tight and made by using solvent cement, except at entry to the detector.
4. The pipe shall be identified as Air Sampling/Aspirating Smoke Detector Pipe (or similar wording) along its entire length printed directly onto the pipe at regular intervals not exceeding the manufacturer's recommendation or that of local codes and standards.
5. All piping should be supported at centers of the lesser of 1.5m (5ft) apart or that specified by local codes or standards.
6. The end of each trunk or branch pipe shall be fitted with an end-cap and made air-tight by using solvent cement. Use of a hole in the end-cap will be dependent on the network design (see ProFlow calculations).

4.6.2 Sampling Holes

The sampling holes shall comply with the following requirements.

1. Sampling holes shall not be separated by more than the maximum distance allowed for conventional point detectors as specified in the local codes and standards. Intervals may vary according to calculations.
2. Each sampling hole shall be identified and in accordance with Codes or Standards.

   a) It is manufacturer's recommendation to use the correct size Sample Hole Markers (SHM) for identification as it provides hole size verification from a distance, and are visually distinct from the pipe network.
3. Consideration shall be given to the manufacturer's recommendations and standards in relation to the number of sampling holes and the distance of the sampling holes from the ceiling or roof structure and forced ventilation systems.
4. Sample point size and indeed the entire pipe design and installation design shall be supported by ProFlow calculations.

5 EXECUTION

5.1 System Installation

The contractor shall install the entire detection system in accordance with the national and local codes and manufacturer's System Design Manual.

5.1.1 ASD Detector Mounting

1 The detector shall be capable of vertical mounting with sample air inlet port(s) directed up toward the ceiling (normal mounting).

2 The detector shall be capable of mounting directly to a wall using screw fasteners.

5.1.2 The Capillary Sampling Network

The capillary sampling network shall comply with the following requirements:

1. Where false ceilings are installed, the sampling pipe shall be installed above the ceiling, and Capillary Sampling Points shall be installed on the ceiling and connected by means of a capillary tube.
2. The typical internal diameter of the capillary tube shall be 5mm or 3/8”, the maximum length of the capillary tube shall be 8m (26 ft) unless otherwise specified in consultation with the manufacturer.
3. The Capillary tube shall terminate at a Ceiling Sampling Point specifically designed and approved by the manufacturer. The performance characteristics of the Sampling Points shall be taken into account during the system design.

5.1.3 Air Sampling Pipe Network Calculations

Air Sampling Pipe Network Calculations shall be provided by Air Sampling Pipe Network modelling program such as ProFlow. Pipe network calculations shall be supplied with the proposed pipe layout design to indicate the following performance criteria:

5.1.3.1 Transport Time

Wherever possible the transport time (i.e. the time taken by smoke sampled to reach the detector) for the least favorable sampling point shall be less than 120 seconds for open hole sampling and capillary tubes. Longer transport times may be tolerated where long pipe runs are required and local codes and standards permit.

Local codes and standards may also apply. For example:

1.	NFPA 72	The Americas	120 Seconds
2.	NFPA 76	The Americas	60 Second

5.1.3.2 Balance %

1. The balance is the ratio of lowest sampling hole flow rate to the highest, expressed as a percentage. The sampling hole balance for the pipe shall not be less than 60%.

5.2 System Commissioning

5.2.1 Detector commissioning

The detector shall incorporate a 7-inch color touch screen to allow full commissioning and programming of the detector without the need of additional hardware, software, or programmers.

5.2.2 Commissioning Tests

1 The contractor shall allow for the manufacturer’s representative to attend commissioning of the entire installation in the presence of the owner and/or their representative.

2 All necessary instrumentation, equipment, materials and labor shall be provided by the Contractor.

3 The Contractor shall record all tests and system configuration and a copy of these results shall be retained on site in the System Log Book.

5.2.3 System Checks

Visually check all pipes to ensure that all joints, fittings, bends, sampling points, SHMs, etc., comply with the Specification.

Check the system to ensure the following features are operational and programmed in accordance with the specification.

1. Alarm threshold levels (for both day and night settings),
2. Touchscreen operable
3. Time delays,
4. Pipes in use,
5. Scanning in use,
6. Detector address,
7. Display address where applicable,
8. Clock time and date,
9. Air flow fault thresholds,
10. IP Cameras viewable
11. Referencing
12. Check to ensure that all ancillary warning devices operate as specified.
13. Check interconnection with Fire Alarm Control Panel to ensure correct operation.

5.2.4 Final Tests

The contractor shall:

1. Introduce smoke into the detector assembly to provide a basic Go / No-Go functional test.
2. Verify that the transport time from the farthest sampling hole does not exceed the local code requirements using a transport time test while monitoring the CFS signal from the display.
3. Activate the appropriate Fire Alarm zones and advise all concerned that the system is fully operational. Fill out the logbook and commissioning report accordingly.

5.3 Maintenance and Service

5.3.1 Sample Filter

1. The detector shall incorporate a replaceable filter inline with pipe such as the RP7125 to remove large contaminants from the sampled air.
2. The filter shall be accessible by opening the cover.

3. Once accessible, the filter shall be removable and replaceable by hand without the need of a tool.

5.3.2 Spare Parts

1. The detector shall incorporate a replaceable Aspirator. The manufacturer's instructions for replacing the Aspirator shall be followed.
2. The detector shall incorporate a replaceable cartridge Assembly. The manufacturer's instructions for replacing the cartridge Assembly shall be followed.
3. The detector shall incorporate a replaceable, and recyclable, water cartridge. The manufacturer's instructions for replacing the water cartridge shall be followed.
4. The detector shall incorporate replaceable Front Covers. The manufacturer's instructions for replacing the Front Cover shall be followed.

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2016 NFPA Air Sampling Fire Codes

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Air Sampling National Fire Codes

Below you will find portions of the NFPA 72®, 2016 National Fire Alarm and Signaling Codes pertinent to Air Sampling Smoke detection. Please refer to the specific NFPA Code publication for additional information.

3.1 General. The definitions contained in this chapter shall apply to the terms used in this Code. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. Merriam-Webster's Collegiate Dictionary, 11th edition, shall be the source for the ordinarily accepted meaning.

3.3.66 Detector. A device suitable for connection to a circuit that has a sensor that responds to a physical stimulus such as gas, heat, or smoke. (SIG-IDS)

3.3.66.1 Air Sampling-Type Detector. A detector that consists of a piping or tubing distribution network that runs from the detector to the area (s) to be protected. An aspiration fan in the detector housing draws air from the protected area back to the detector through air-sampling ports, piping, or tubing. At the detector, the air is analyzed fir fire products. (SIG-IDS)

3.3.66.12* Multi-Criteria Detector. A device that contains multiple sensors that separately responds to physical stimulus such as heat, smoke, or fire gases, or employs more than one sensor to sense the same stimulus. This sensor is capable of generating only one alarm signal from the sensors employed in the design either independently or in combination. The sensor output signal is mathematically evaluated to determine when an alarm signa is warranted. The evaluation can be performed either at the detector or at the control unit. This detector has a single listing that establishes the primary function of the detectors. (SIG-IDS)

3.3.266 Smoke Detectors

3.3.266.1 Cloud Chamber Smoke Detection. The principle of using an air sample drawn from the protected area into a high-humidity chamber combined with a lowering of chamber pressure to create an environment in which the resultant moisture in the air condenses on any smoke particles present, forming a cloud. The cloud density is measure by photoelectric principle. The density signal is processed and used to coney an alarm condition when it meet preset criteria. (SIG-IDS)

3.3.266.3* Photoelectric Light Obscuration Smoke Detection. The principle of using a light source and a photosensitive sensor onto which the principal portion of the source emissions is focused. When smoke particles enter the light path, some of the light is scattered and some is absorbed, thereby reducing the light reaching the receiving sensor. The light reduction signal is processed and used to convey and alarm condition when it meets preset criteria. (SIG-IDS)

3.3.266.4* Photoelectric Light-Scattering Smoke Detection. The principle of using a light source and photosensitive sensor arranged so that the rays form the light source do not normally fall onto the photosensitive sensor. When smoke particles enter the light path, some of the light is scattered by reflection and refraction on to the sensor. The light signal is processed and used to convey and alarm condition when it meet preset criteria. (SIG-IDS)

10.4 Design and Installation.

10.4.1* All systems shall be installed in accordance with the plans, specifications, and standards approved by the authority having jurisdiction.

10.5.3.* Inspections, Testing, and Service Personnel. (SIG-TMS)

10.5.3.1* Inspection Personnel. Inspections shall be performed by personnel who have developed competence through training and experience that are acceptable to the authority having jurisdiction or meet the requirement of 10.5.3.4.

10.5.3.2* Testing Personnel. Testing personnel shall have knowledge and experience of the testing requirements contain in the Code, of the equipment being tested, and of the test methods. That knowledge and experience shall be acceptable to the authority having jurisdiction or mee the requirement of 10.5.3.4.

- **10.5.3.3 Service Personnel.** Service personnel shall have knowledge and experience of the maintenance and servicing requirements contain in this Code, of the equipment being serviced or maintained, and of the servicing or maintenance methods. That knowledge and experience shall be acceptable to the authority having jurisdiction or meet the requirement of 10.5.3.4.

Testing

- **14.2.2.1.1** Inspection, testing and maintenance programs shall satisfy the requirements of this Code and conform to the equipment manufacturer's published instructions.

14.2.2.1.2 Inspection, testing and maintenance programs shall verify correct operation of the system.

Location and Spacing

17.7.3.2.3 On smooth ceilings, spacing for spot-type smoke detectors shall be in accordance with 17.7.3.2.3.1 through 17.7.3.2.3.4.

17.7.3.2.3.1* In the absence of specific performance-based design criteria, one of the following requirements shall apply:

(1) The distance between smoke detectors shall not exceed a nominal spacing of 30 ft (9.1 m) and there shall be detectors within a distance of one-half the nominal spacing, measured at right angles form all walls or partitions extending upward to with the top 15 percent of the ceiling height.

(2) * All point on the ceiling shall have a detector within a distance equal to or less than 0.7 times the nominal 30 ft (9.1 m) spacing (0.7S).

17.7.3.2.3.2 In all cases, the manufacturer's published instructions shall be followed.

17.7.3.2.3.3 Other spacing shall be permitted to be used depending on ceiling height, different conditions, or response requirements.

17.7.3.2.3.4 For the detection of flaming fires, the guidelines in Annex B shall be permitted to be used.

17.7.3.2.4* For slid joist and beam construction, spacing for spot-type smoke detectors shall be in accordance with 17.7.3.2.4.1 through 17.7.3.2.4.6

17.7.3.2.4.1 Solid joist shall be considered equivalent to beams for smoke detector spacing guidelines.

17.7.3.2.4.2 For level ceilings, the following shall apply:

(1) For ceiling with beams depths of less than 10 percent of the ceiling height (0.1 H), smooth ceiling spacing shall be permitted, Spot-type smoke detectors shall be permitted to be located on ceilings or on the bottom of beams

(2) For ceilings with beam depths equal to or greater than 10 percent of the ceiling height (0.1 H), the following shall apply

(a) Where beam spacing is equal to or greater than 40 percent of the ceiling height (0.4 H), spot-type detectors shall be located on the ceiling in each beam pocket.

(b) Where beam spacing is less than 40 percent of the ceiling height (0.4 H), the following shall be permitted for spot detectors:

i. Smooth ceiling spacing in the direction parallel to the beams and at one-half smooth ceiling spacing in the direction perpendicular to the beams.

ii. Location of detectors either on the ceiling or on the bottom of the beams.

(3)* For beam pockets formed by intersecting beam, including waffle or pan-type ceilings, the following shall apply:

(a) For the beam depths less than 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2 (1)

(b) For the depths greater than or equal to 10 percent of the ceiling height (0.1 H), spacing shall be in accordance with 17.7.3.2.4.2 (2).

(4) * For corridors 15 ft (4.6 m) in width or less having ceiling beams or solid joist perpendicular to the corridor length, the following shall apply:

(a) Smooth ceiling spacing shall be permitted

(b) Location of spot-type smoke detectors on ceilings, sidewalls, or the bottom of beams or solid joist

(5) For rooms of 900 ft2 (84 m2) or less, the following shall be permitted:

(a) Use on smooth ceiling

(b) Location of spot-type smoke detectors on ceilings or on the bottom of beams

17.7.3.2.4.3* For sloping ceilings with beams running parallel up slope, the following shall apply:

(1) Spot-type detector (s) shall be located on the ceiling within beam pockets ().

(2) The ceiling height shall be taken as the average height over slope.

(3) Spacing shall be measured along a horizontal projection of the ceiling.

(4) Smooth ceiling spacing shall be permitted within beam pocket (s) parallel to the beams.

(5) For beam depths less than or equal to 10 percent of the ceiling height (0.1 H), spot-type detectors shall be located with smooth ceiling spacing perpendicular to the beams.

(6) For beam depths greater than 10 percent of the ceiling height (0.1 H), the following shall apply for spacing perpendicular to the beams:(a) For beam spacing greater than or equal to 40 percent of the ceiling height (0.4 H), spot-type detectors shall be located in each beam pocket.

17.7.3.2.4.3* For sloping ceilings with beams running parallel up slope, the following shall apply:

(1) Spot-type detector (s) shall be located on the ceiling within beam pockets ().

(2) The ceiling height shall be taken as the average height over slope.

(3) Spacing shall be measured along a horizontal projection of the ceiling.

(4) Smooth ceiling spacing shall be permitted within beam pocket (s) parallel to the beams.

(5) For beam depths less than or equal to 10 percent of the ceiling height (0.1 H), spot-type detectors shall be located with smooth ceiling spacing perpendicular to the beams.

(6) For beam depths greater than 10 percent of the ceiling height (0.1 H), the following shall apply for spacing perpendicular to the beams:

(a) For beam spacing greater than or equal to 40 percent of the ceiling height (0.4 H), spot-type detectors shall be located in each beam pocket.

(b) For beam spacing less than 40 percent of the ceiling height (0.4 H), spot-type detectors shall not be required in every beam pocket but shall be spaced not greater than 50 percent of smooth ceiling spacing.

17.7.3.2.4.4* For sloping ceilings with beams running perpendicular across slope, the following shall apply:

(1) Spot-type detector (s) shall be located at the bottom of the beams.

(2) The ceiling height shall be measured along a horizontal projection of the ceiling.

(3) Spacing shall be measured along a horizontal projection of the ceiling.

(4) Smooth ceiling spacing shall be permitted within beam pocket (s).

(5) For beam depths less than or equal to 10 percent of ceiling height (0.1 H), spot-type detectors shall be located with smooth ceiling spacing.

(6) For beam depths greater than 10 percent of the ceiling height (0.1 H), spot-type detectors shall not be required to be located closer than 90.4 H) and shall not exceed 50 percent of smooth ceiling spacing.

17.7.3.2.4.5* For sloped ceilings with beam pockets formed by intersecting beams, the following shall apply:

(1) Spot-type detector (s) shall be located at the bottom of the beams.

(2) The ceiling height shall be taken as the average height over slope.

(3) Spacing shall be measured along a horizontal projection of the ceiling.

(4) For beam depths less than or equal to 10 percent of the ceiling height (0.1 H), spot-type detectors shall be spaced with not more than three beams between detectors and shall not exceed smooth ceiling spacing.

(5) For beam depths greater than 10 percent of the ceiling height (0.1 H), spot0type detectors shall be spaced with not more than two beams between detectors, but shall not be required to be spaced closer than (0.4 H), and shall not exceed 50 percent of smooth ceiling space.

17.7.3.2.4.6 For sloped ceilings with solid joist, the detectors shall be located on the bottom of the joist.

17.7.3.3* Peaked. Detectors shall first be spaced and located within 36 in. (910 mm) of the peak, measured horizontally. The number and spacing of additional detectors, if any, shall be based in the horizontal projection of the ceiling.

17.7.3.4* Shed. Detectors shall first be spaced and located within 36 in. (910 mm) of the high side of the ceiling, measured horizontally. The number and spacing of additional detectors, if any, shall be based on the horizontal projection of the ceiling.

17.7.3.5 Raised Floors and Suspended Ceilings. Spaces beneath raised floors and above suspended ceilings shall be treated as sperate rooms for smoke detector spacing purposed. Detectors installed beneath raised floors or above suspended ceilings, or both, include raised floors and suspended ceilings used for environmental air, shall not be used in lieu of providing detection within the room.

17.7.3.5.1 For raised floors, the following shall apply:

(1) Detectors installed beneath raised floors shall be spaced in accordance with 17.7.3.1, 17.7.3.1.3, and 17.7.3.2.2.

(2) Where the area beneath the raised floor is also used for environmental air, detector spacing shall also conform to 17.7.4.1 and 17.7.4.2

17.7.3.5.2 For suspended ceilings, the following shall apply:

(1) Detector spacing above suspended ceilings shall conform to the requirements of 17.7.3 for ceiling configuration.

(2) Where detectors are installed in ceilings used for environmental air, detector spacing shall also conform to 17.7.4.1, 17.7.4.2, and 17.7.4.3.

17.7.3.6 Air Sampling-Type Smoke Detector.

17.7.3.6.1 Each sampling port of an air sampling-type smoke detector shall be treated as a spot-type detector for the purpose of location and spacing.

17.7.3.6.2 Maximum air sample transport time form the farthest sampling port to the detector shall not exceed 120 seconds.

17.7.3.6.3* Sampling pipe networks shall be designed on the basis of, and shall be supported by, sound fluid dynamic principles to ensure required performance.

17.7.3.6.4 Sampling pipe network design details shall include calculations showing flow characteristics of the pipe network and each sample port.

17.7.3.6.5 Air-sampling detectors shall give trouble signal if the airflow is outside the manufacture's specific range.

17.7.3.6.6* The sampling port and in-line filter, if used, shall be kept clear in accordance with the manufacture's published instructions.

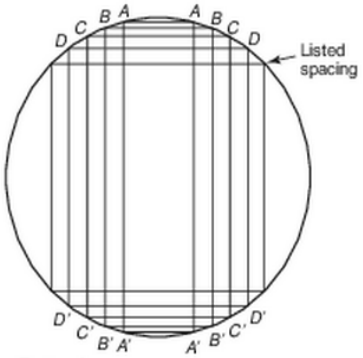
17.7.3.6.7 Air-sampling network piping and fittings shall be airtight and permanently fixed

17.7.3.6.8 Sampling system piping shall be conspicuously identified as "SMOKE DETECTOR SAMPLING TUBE – DO NOT DISTURB," as follows

(1) At change in direction of branches of piping.

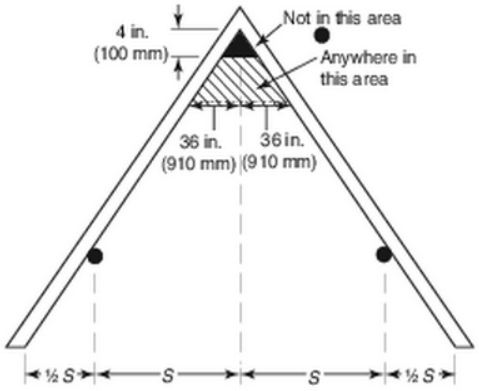
(2) At each side of penetrations of walls, floors, or other barriers.

(3) At intervals in piping that provide visibility within the space, but no greater than 20 ft (6.1 M).



Rectangles
A = 10 ft × 41 ft = 410 ft² (3.1 m × 12.5 m = 38 m²)
B = 15 ft × 39 ft = 585 ft² (4.6 m × 11.9 m = 54 m²)
C = 20 ft × 37 ft = 740 ft² (6.1 m × 11.3 m = 69 m²)
D = 25 ft × 34 ft = 850 ft² (7.6 m × 10.4 m = 79 m²)
Listed spacing for heat detectors only = 30 ft × 30 ft = 900 ft² (9.1 m × 9.1 m = 84 m²)

Note: Smoke detectors are not listed for spacing. Use manufacturer's coverage recommendations and this figure.



S = Space between detectors
● = Smoke detector or heat detector

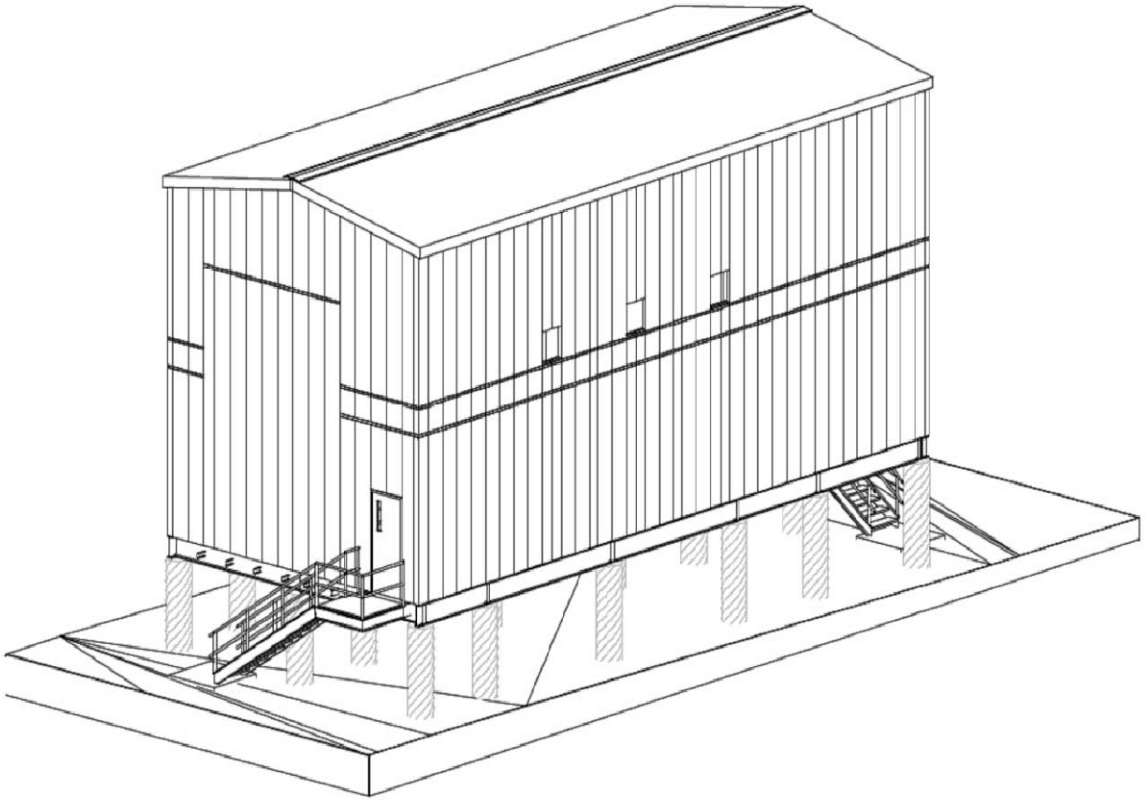
FIGURE A.17.6.3.4(a) Smoke or Heat Detector Spacing Layout, Sloped Ceilings (Peaked Type).

Air Sampling Smoke Detection System Design AutoCAD Example

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

EARLY WARNING AIR SAMPLING FIRE DETECTION SYSTEM

ELECTRICAL BUILDING



ELECTRICAL BUILDING

SAFE Fire Detection, Inc.
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www.safefiredetection.com

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EARLY WARNING AIR SAMPLING FIRE DETECTION SYSTEM

SCOPE OF WORK

INCIPIENT AIR SAMPLING FIRE DETECTION SYSTEM FOR THE ELECTRICAL BUILDING.
THE SYSTEM WILL CONSIST OF ONE PRO200D+ DETECTOR EARLY WARNING AIR SAMPLING DETECTORS WITH A SAMPLE PIPE NETWORK. THE SYSTEM WILL SAMPLE AIR FROM THE ROOM THROUGH THE SAMPLE PIPE NETWORK AND TRANSPORT THE SAMPLE BACK TO THE DETECTOR FOR ANALYSIS. THE DETECTOR WILL BE POWERED VIA POWER SUPPLY SUPPLIED BY OTHERS.

PRO200D+ WILL BE PROGRAMMED AS A TWO PIPE, SINGLE ZONE SYSTEM AND WILL PROVIDE CEILING DETECTION FOR THE ELECTRICAL BUILDING.

ALL DESIGN AND INSTALLATION SHALL BE IN ACCORDANCE WITH CAN/ULC-S537.

EQUIPMENT LIST

ITEM NO.	QTY	PART NUMBER	DESCRIPTION
1	1	6198652	PRO 200D+
2	29	RP5209	3/4" SMOKE DETECTION PIPE
3	4	RP5212	RED 3/4" PIPE CLIP HANGER
4	3	RP5206X	3/4" COUPLING
5	2	RP5205	3/4" END CAP
6	1	10702	LABEL, SAMPLE POINT
7	1	1100CPVC	CPVC ADHESIVE
8	2	RP2226	3/4" TEST POINT

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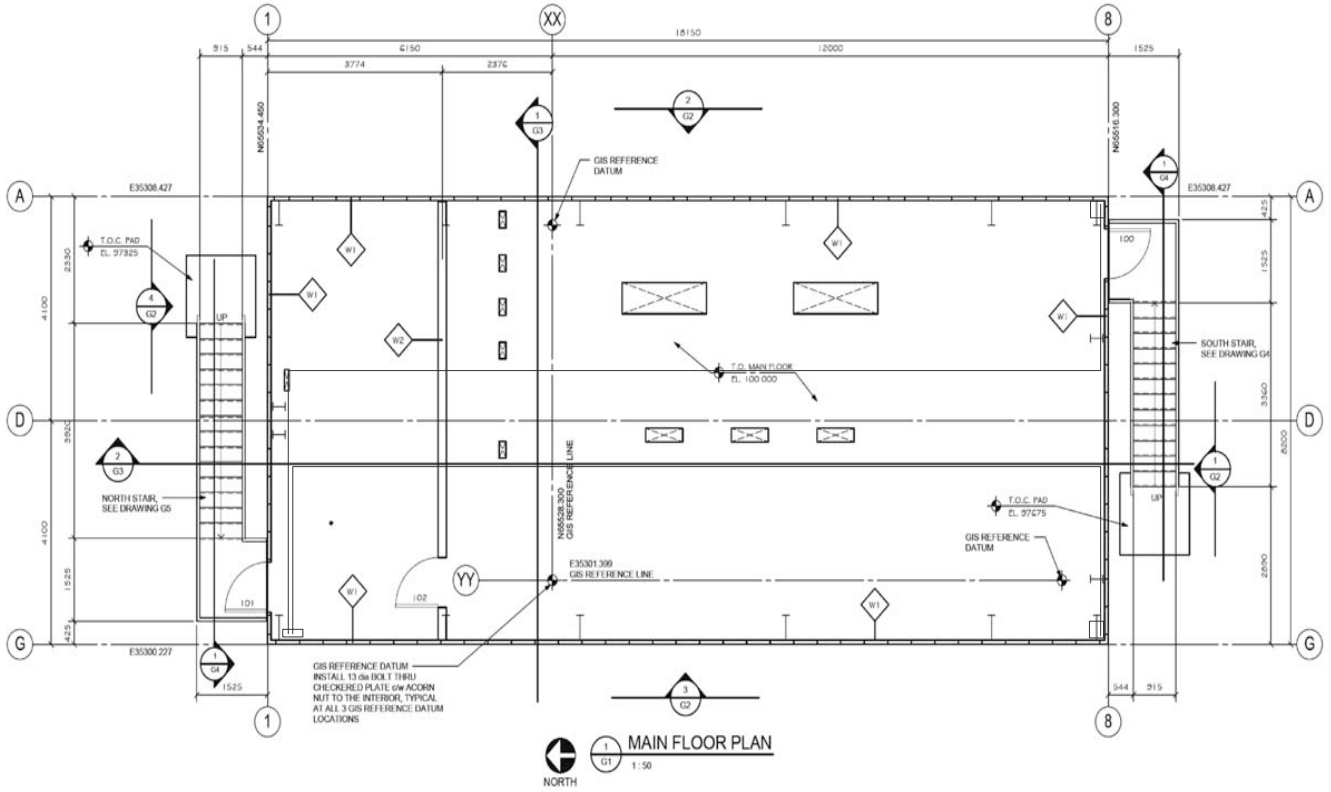
EARLY WARNING AIR SAMPLING FIRE DETECTION SYSTEM

FIRST FLOOR



BUILDING PLAN VIEW

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TITLE: PLAN VIEW

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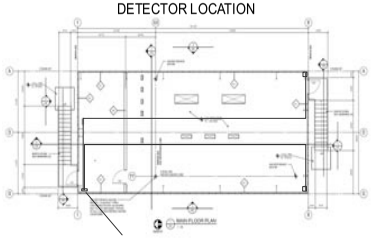
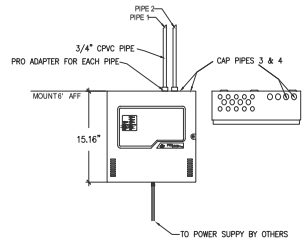
EARLY WARNING AIR SAMPLING FIRE DETECTION SYSTEM

DETECTOR LOCATION



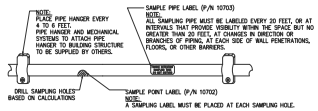
PRO200D+ (2 PIPE)



MOUNTING EXAMPLE
DETAIL "A"
N.T.S.

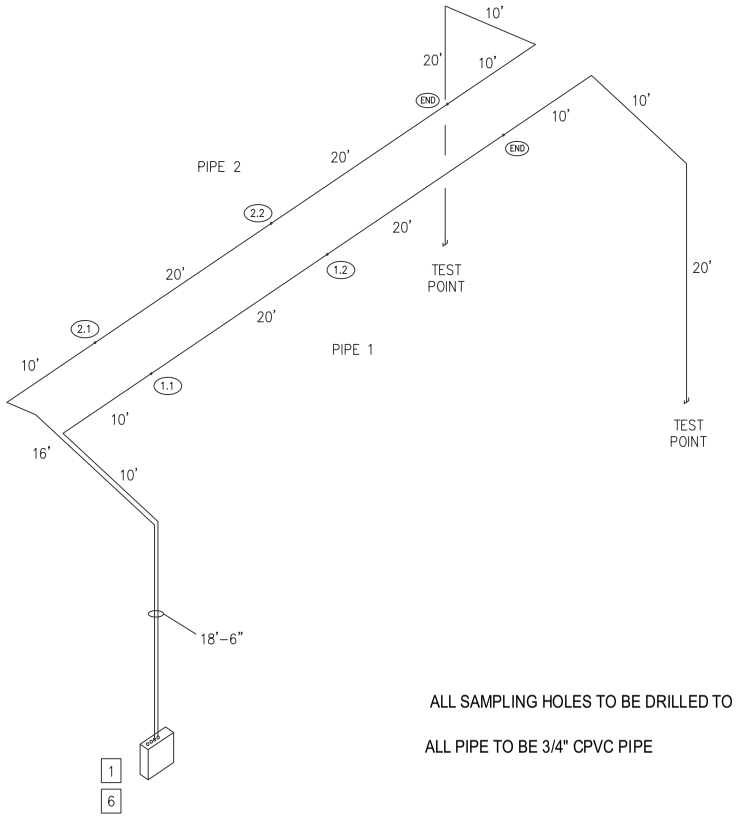
INSTALLATION NOTES:

1. ENSURE THAT ALL PIPES HAVE BEEN DE-BURRED AND BLOWN OUT PRIOR TO CONNECTING TO THE DETECTOR.
2. USE ONLY CPVC SLIP JOINT STYLE CONNECTIONS FOR ELBOWS, COUPLINGS, AND TEES.
3. ENSURE THAT ALL PIPE JOINTS ARE CLEAN AND THAT NO EXCESS GLUE OR MATERIAL IS REMAINING WHICH MAY REDUCE AIR FLOW.
4. ALL PIPING AND ELECTRICAL INSTALLATIONS SHALL COMPLY WITH NFPA, LOCAL, PROVINCE AND CANADIAN PIPING AND ELECTRICAL CODES.
5. ALL SAMPLING PIPE MUST BE SUPPORTED AT FOUR - SIX FOOT INTERVALS.
6. NORMAL PANEL MOUNTING IS 6' AFF.
7. LENGTHS SHOWN ARE APPROXIMATE. LENGTHS MAY VARY AS REQUIRED.
8. DIMENSIONS SHOWN ARE FOR REFERENCE ONLY.
9. ALL SAMPLING PIPE MUST BE LABELED EVERY 20 FEET, OR AT INTERVALS THAT PROVIDE VISIBILITY WITHIN THE SPACE BUT NO GREATER THAN 20 FEET, AT CHANGES IN DIRECTION OR BRANCHES OF PIPING, AT EACH SIDE OF WALL PENETRATIONS, FLOORS, OR OTHER BARRIERS.
10. ONLY USE THE APPROPRIATE I.D. PIPE AS INDICATED ON THE FLOW CALCUALTIONS.
11. SYSTEM MUST BE INSTALLED AS SHOWN IN DRAWINGS.



SAMPLE POINT
DETAIL "B"
N.T.S.

PIPING ISOMETRIC DETAIL
PRO200D+ (2 PIPE)



ALL SAMPLING HOLES TO BE DRILLED TO 1/8" DIA. SEE DETAIL "B"

ALL PIPE TO BE 3/4" CPVC PIPE

CALCULATION PIPE 1

Information for Detector	Electrical Building									
Detector Type	Pro 2000+									
Number of Pipes	2									
Blower Speed	100									
Pipe Information										
Pipe Number	1									
Pipe Name	1									
Total Pipe Length	79.00ft									
Section	Type	Distance ft	Relative ft	Pipe Diam in	Length ft	Hole Diam in	Trans s	Tim Pa	Pressure lpm	Hole Flow
	1 Pipe	-----	-----	0.87	79	-----	-----	-----	-----	
	1.1 Hole	39	39	-----	-----	1/8	9.4	314.5		9.4
	1.2 Hole	59	20	-----	-----	1/8	16.1	308.2		9.3
	End Hole	79	20	-----	-----	1/8	28.5	304.9		9.3

CALCULATION PIPE 2

Information for Detector	Electrical Building									
Detector Type	Pro 2000+									
Number of Pipes	2									
Blower Speed	100									
Pipe Information										
Pipe Number	2									
Pipe Name	2									
Total Pipe Length	85.00ft									
Section	Type	Distance ft	Relative ft	Pipe Diam in	Length ft	Hole Diam in	Trans s	Tim Pa	Pressure lpm	Hole Flow
	2 Pipe	-----	-----	0.87	85	-----	-----	-----	-----	
	2.1 Hole	45	45	-----	-----	1/8	10.9	312		9.4
	2.2 Hole	65	20	-----	-----	1/8	17.6	305.6		9.3
	End Hole	85	20	-----	-----	1/8	30.1	302.4		9.2

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TITLE: ISOMETRIC PRO200D+

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Section 2:
Linear Heat Detection

An Introduction

Better "Safe"..... Than Sorry

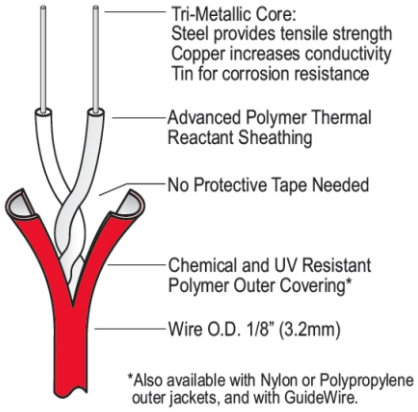
Introduction_

Linear Heat Detection_

Definition;
A cable comprised of an insulator that reacts at a specific temperature to detect fires anywhere along its entire length.

How Does it Work?
When the polymer reacts at its specific temperature, the inner wires make contact and send an alarm signal back to a fire alarm panel.

SafeCable Technology



Advantages
- Detects along entire length
- Compatible with any fire alarm panel or module
- Up to 15,000 ft (4571m) per zone
- Multiple Temperatures on same zone

MEA
ISO 9001 Registered

Spacing and Temperature
LHD is listed for spacing up to 35' (10.7m) between parallel runs, half the listed spacing from the sidewalls, and 0.7 times the listed spacing from the corners per NFPA 72. For installations above 30' the spacing is reduced by half.

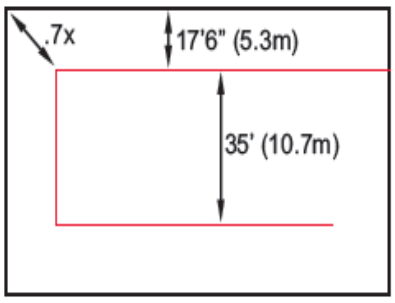
Maximum Listed Spacing

Temperature Rating	C-UL-US	FM
155°F (68°C)	35 ft. (10.7m)	30 ft. (9m)
172°F (78°C)	35 ft. (10.7m)	30 ft. (9m)
190°F (88°C)	35 ft. (10.7m)	30 ft. (9m)
220°F (104°C)	35 ft. (10.7m)	25 ft. (7.6m)
365°F (185°C)	35 ft. (10.7m)	25 ft. (7.6m)

Maximum Ambient Temperatures

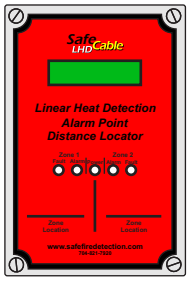
Maximum Ambient Install Temperature	Alarm Temp.	Part Number
Up to 113°F (45°C)	155°F (68°C)	TC155
Up to 122°F (50°C)	172°F (78°C)	TC172
Up to 158°F (70°C)	190°F (88°C)	TC190
Up to 158°F (70°C)	220°F (104°C)	TC220
Up to 305°F (152°C)	365°F (185°C)	TC365N

Area Spacing



Diameter:	1/8" (3.2mm)
Weight:	Nominal 15 lbs./1000 ft. (6.8kg/305m)
Bend Radius:	3" (76.2mm)
Max. Voltage Rating:	30 VAC, 42 VDC
Resistance:	.05 ohms/ft. (.164 ohms/m)
Temperature Ratings (°F):	155°, 172°, 190°, 220°, 365°
Temperature Ratings (°C):	68°, 78°, 88°, 105°, 185°
Sheathing Options:	PVC: Corrosive and UV resistant Nylon: Abrasion resistant Polypropylene: Chemical resistant
Optional Guidewire:	Minimal support -15 ft (4.6m) intervals

Distance Locating



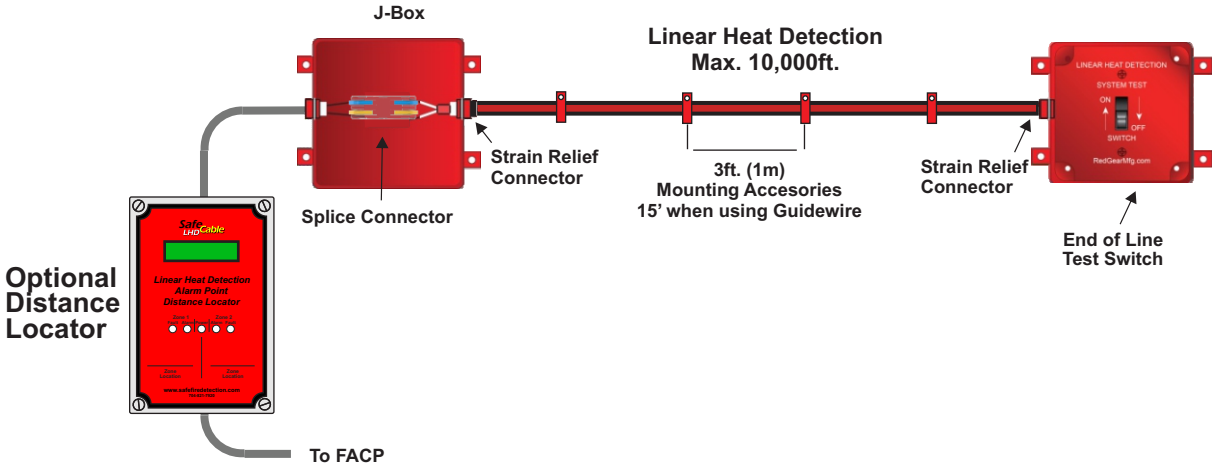
One Zone, Two Zone or Cross Zone distance locating that allows you yo locate where the fire is occurring. You can also use the Cross Zone mode where it takes both zones to be in alarm before it sends the alarm to the fire alarm panel. The distance locating option allows you to identify where the overheating condition is occurring anywhere along its entire length in both meters and feet.

Below you will find a typical linear heat detection zone. Standard components for a typical zone consist of the LHD wire or optional leaders wires that connect directly to the fire alarm panel or addressable module and the items below.

Components

1. Optional Distance Locator
2. Junction Box (JBox)
3. Strain Relief Connector
4. Mounting (Every 3' or 1m)
5. Strain Relief Connector
6. End of Line Resistor (ELR) Jbox

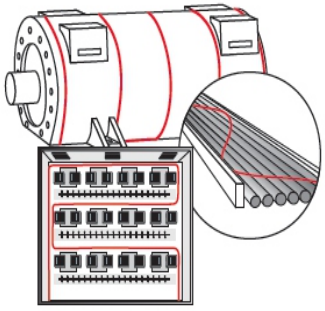
NOTE: End of Line Resistor Supplied with Fire Alarm Panel



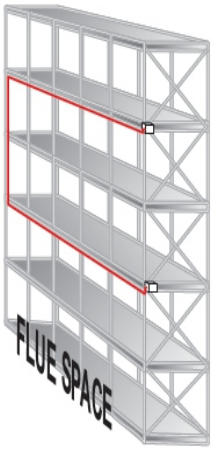
Cable Length Calculation

Hazard Length
+
10% Sag
+
10% Waste
Total Length

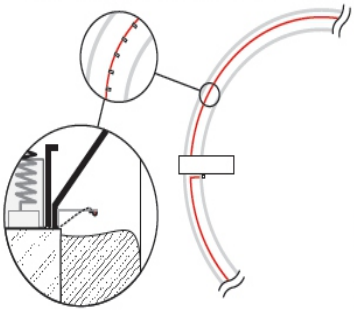
Equipment/Proximity



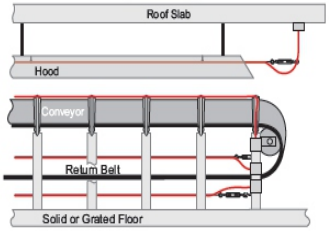
In-Rack



Floating Rooftop Tanks



Conveyor Systems



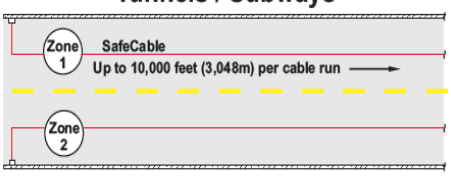
Typical Cable Temperatures

155°F (68°C), 172°F (78°C),
190°F (88°C), 220°F (105°C)
365ºF(185ºC)

Outer Jacket Coatings

(PVC) Standard, for all typical applications
(N) Nylon for conveyors industrial and outdoor aps
(P) Poly for chemical aps
(G) Guidewire applications

Tunnels / Subways



Inside The Technology

SafeCable is easy to design, install, operate, and maintain. Up to 15,000 feet (,000m) of SafeCable can be used on every zone of any approved conventional panel, and every contact monitor module of any approved addressable panel.

Below you will see a typical system, highlighting the easy to use SafeCable components. You start with any approved conventional panel or any approved addressable contact monitor module. You can then add the optional distance locating module followed by leader wires in a conduit to the beginning of the hazard zone, or you can connect ThermoCable directly to the distance locating module.

The NEMA 4 junction box is the beginning of each zone where you connect your leader wires (if used) to a screw terminal. Exit the junction box using a moisture proof strain relief connector which seals the box where the zone begins. Approved mounting devices placed at 3ft. (1 m) intervals allow the wire to expand and contract. Several styles of SafeCable mounting accessories are available which are designed to accommodate different types of hazards. SafeCable is spaced every 35 feet (10.7 meters), and may be strapped directly to the sprinkler piping if it is an integral part of a pre-action sprinkler system. At the end of the zone, terminate the SafeCable in an ELR box using the end of line resistor supplied by your panel manufacturer.

It's that easy. SafeCable does not require that you purchase any expensive proprietary panels which require additional maintenance and cost. Simply add SafeCable to an existing conventional system or add a contact monitor module to an already existing addressable system.

The Technology Behind New LHD

SafeCable Linear Heat Detection (LHD), uses advanced polymers and a newly developed alloy to provide exceptional detection, durability, and design flexibility. At the core of SafeCable is a twisted pair of extremely low resistance, tri-metallic conductors which are sheathed in new advanced thermal polymers. These polymers are chemically engineered to break down at specific fixed temperatures allowing the twisted conductors to make contact and initiate an alarm.

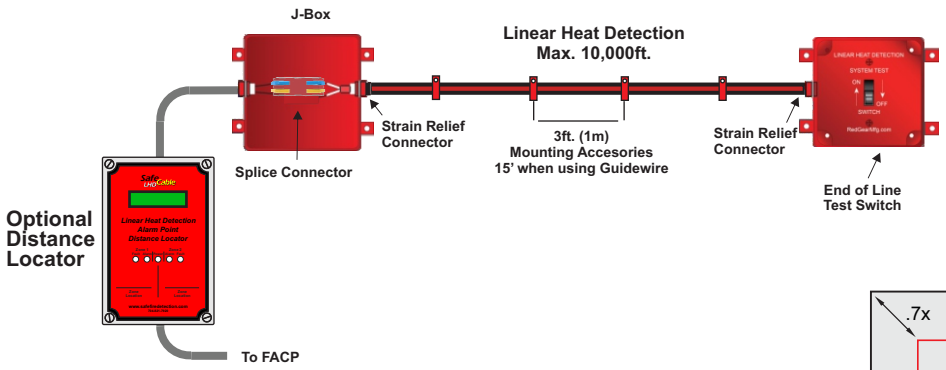
Tri-Metallic Core:
- Steel - Provides Tensile Strength
- Copper - Increases Conductivity
- Tin - Resists Corrosion

Thermal Reactant Sheathing:
- Advanced Polymers Provide Temperature Specific Activation

Polymer Outer Covering:
- Chemical Resistant
- UV Resistant
- Approved for Outdoor Use

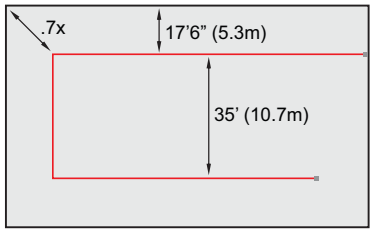
Wire:
- Only 1/8" Diameter
- Flexible for Easy Installation
- Spooled Lengths up to 3,000 ft.

SafeCable System Components:



Note:
- May also be used in a 4 Wire, Class "A" configuration.
- Reduce spacing by one half if 30 feet (10m) or above.

Area Spacing



Applications

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

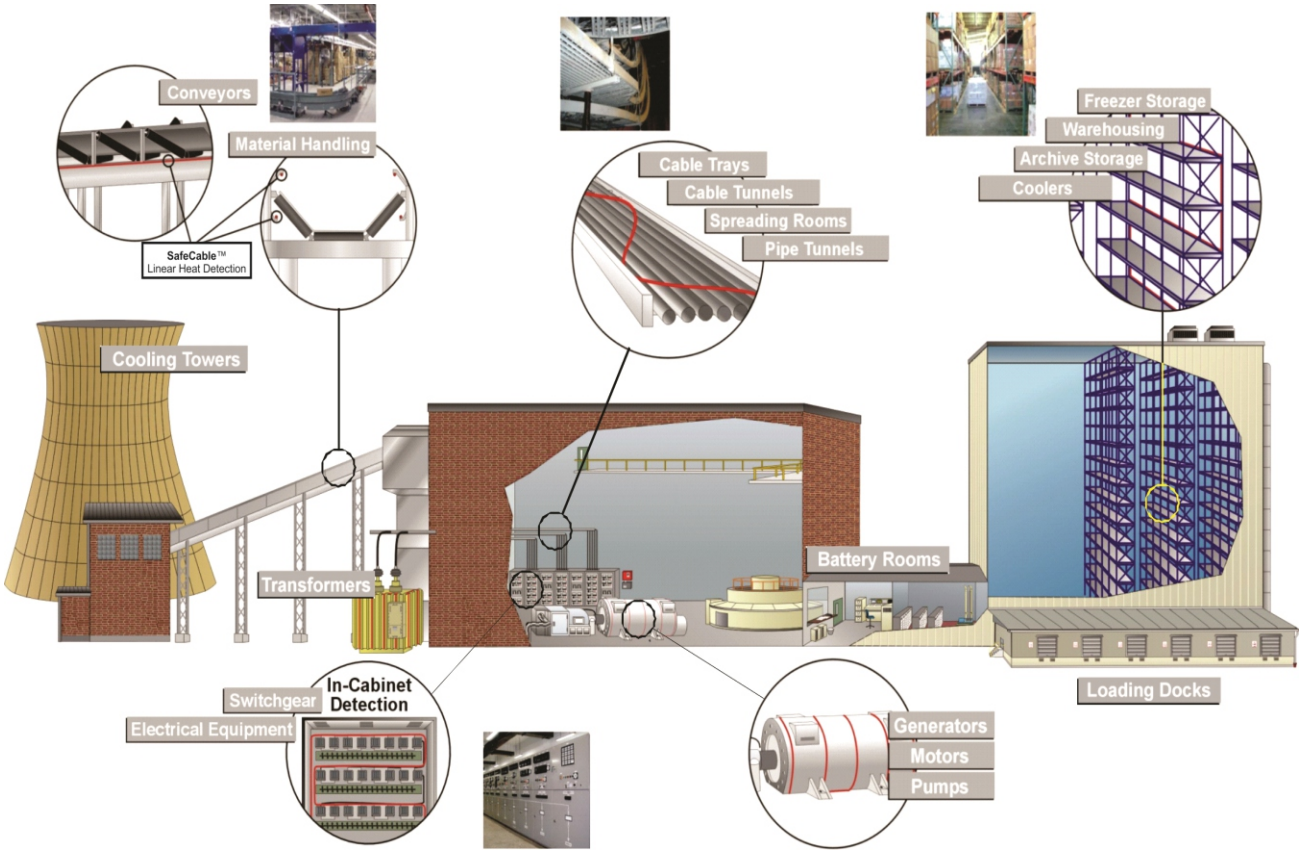
Applications

There are many commercial and industrial applications for linear heat detection. Linear heat detection works in many environments where smoke detection will not. Linear heat detection can withstand harsh chemical environments and outdoor applications as well.

Additional jacket coatings can be applied over the standard PVC outer covering for special applications.

Special Outer Jacket Coatings

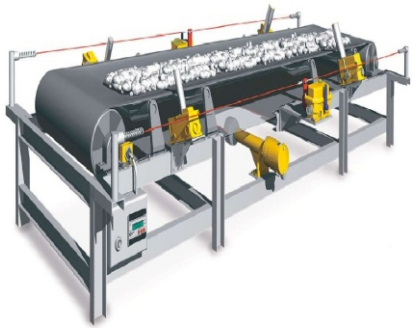
1. (PVC) Standard, for all typical indoor applications
2. (Nylon) Heavy Duty projects and outdoor applications
3. (Polypropylene) For chemical environments
4. (Guide-Wire) A steel cable wound around any LHD cable to allow for long distance suspension of the cable mounting every 15’ (3.5m) instead of every 3’ (1m).



Cable Trays			Pumps
Bulk Storage	Conveyors	Motors	Tunnels
Aircraft Hangars	Elevator Shafts	Parking Decks	Trash Rooms
Bridges and Piers	Cooling Towers	Off Shore Platforms	Rack Storage
Baggage Handling	Engine Compartments	Floating Rooftop Tanks	Storage Warehouses

Conveyor Application

Conveyor belts are found in a wide variety of industries. They move everything from chemicals, coal, minerals, grain to luggage and warehouse goods. The belts are usually combustible (many fire retardant belts will still burn). The products they carry may or may not add an additional fuel load. Industrial sites that have belt conveyors include power plants, paper mills, grain elevators, glass plants, cement plants, rock quarries, warehouses, and airports.



Typical Conveyor Belt

Conveyor belts are found in above ground, buildings and below ground applications. There are also transfer houses (areas) where the belt can change direction or be routed to a different belt.

Typical Outdoor Belt

Both outdoor above ground and indoor below ground have the same hazardous

Typical Underground Belt

Conveyor Belt Fire

Conveyor belt fires can be caused by friction from misaligned belts, overheated motors, burning material on the belts, smoking, hot work, and even arson. If the belt breaks and is not shut down, the resulting pile can burn like an equivalent size pile of tires.

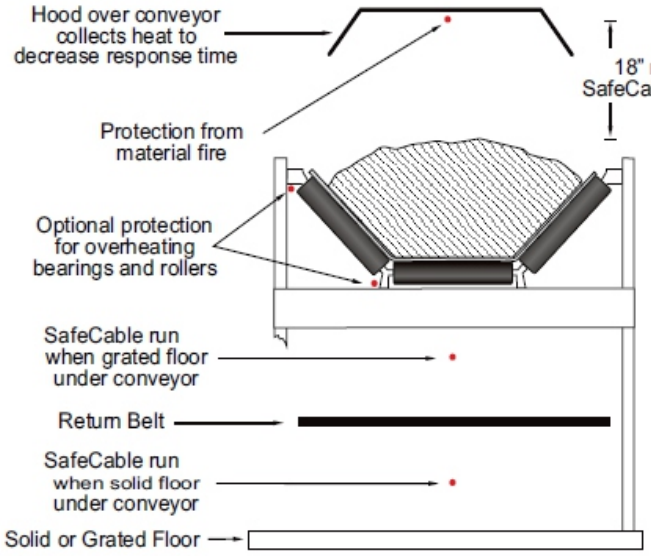
In addition, the roller bearings below the belt can wear and stop turning. This can cause friction with the belt causing a fire to start.

Conveyor Application

Below you will find the typical ways linear heat detection is used to protect conveyors. Normally the cable temperature is selected by finding the normal ambient temperature of the environment and then selecting the next cable temperature at least 30° to 50°[F] (17° to 28° C) above ambient. (Refer to Maximum Ambient Temperature Table Below)

In most applications a standard PVC type 190°[F] degree temperature cable with an additional Nylon protective coating is used. The black nylon second coating offers an additional heavy duty jacket and protects the cable from UV rays in outdoor applications.

For Hood Mount Cable 3' or 1 meter W/O Guide Wire



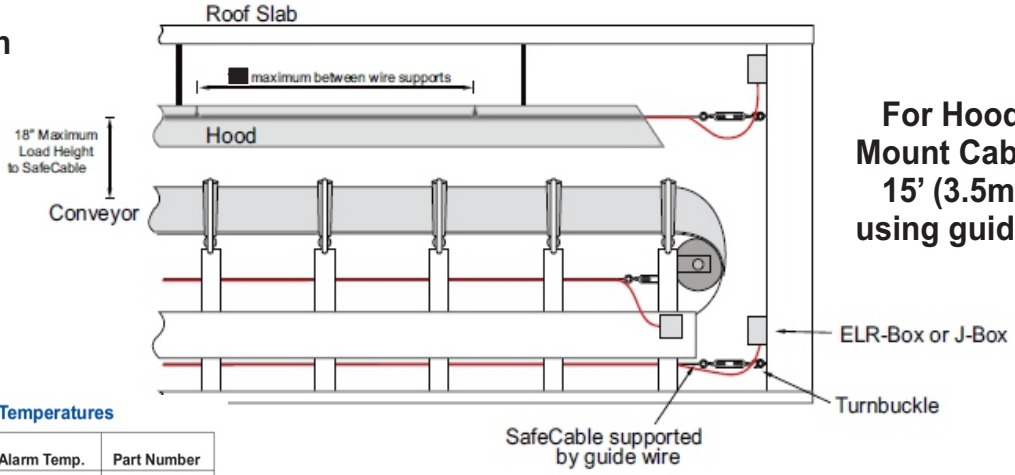
Typical Outdoor Belt Protection

Typical Cable Temperatures
155°F (68°C), 172°F (78°C), 190°F (88°C), 220°F (105°C) 365ºF(185ºC)

Outer Jacket Coatings
(PVC) Standard, for all typical applications
(N) Nylon for conveyors industrial and outdoor aps
(P) Poly for chemical aps
(G) Guidewire applications

Cable Length Calculation

Hazard Length
+
10% Sag
+
10% Waste
Total Length



For Hood/Slab Mount Cable every 15' (3.5m) when using guide wire

Maximum Ambient Temperatures

Maximum Ambient Install Temperature	Alarm Temp.	Part Number
Up to 113°F (45°C)	155°F (68°C)	TC155
Up to 122°F (50°C)	172°F (78°C)	TC172
Up to 158°F (70°C)	190°F (88°C)	TC190
Up to 158°F (70°C)	220°F (104°C)	TC220
Up to 305°F (152°C)	365°F (185°C)	TC365N

Typical Underground Belt Protection

Freezer Application

Commercial Freezers

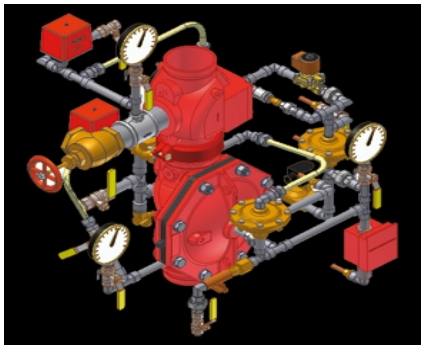
A cold storage warehouse (commercial freezer) is a refrigerated or deep-freeze storage facility for perishable goods such as fruits, vegetables, meats and beverages. It maintains a controlled interior temperature as low as -25°C to prevent rotting, sprouting, insect damage, and other forms of degradation.

Other variations of a refrigerated warehouse are refrigerated coolers for fresh fish and produce. And flash freezers that quick freeze frozen foods at temperatures down to -75 degrees F.

Fire Protection

Freezers and Coolers can contain combustible materials such as, but not limited to, wood, wood pallets, card board boxes, paper, paper wrappings, grease, egg cartons, cloth, waxed paper, electrical hazards, and components.

Most refrigerated warehouses (commercial freezers) have sprinkler systems to protect the building and contents from fire. These sprinkler systems are typically pre-action dry pipe systems. Pre-Action systems are specialized for use in locations where accidental activation of water is undesired. A typical double interlock system requires that a “preceding” fire detection event from an in-rack or area linear heat detection system and the activation of a sprinkler head before the



Typical Pre-Action System

Ammonia Pump Room

Ammonia pump rooms and electrical equipment rooms are additional areas in refrigerated warehouses that utilize linear heat detection for ceiling area detection.

Electrical Equip. Rooms

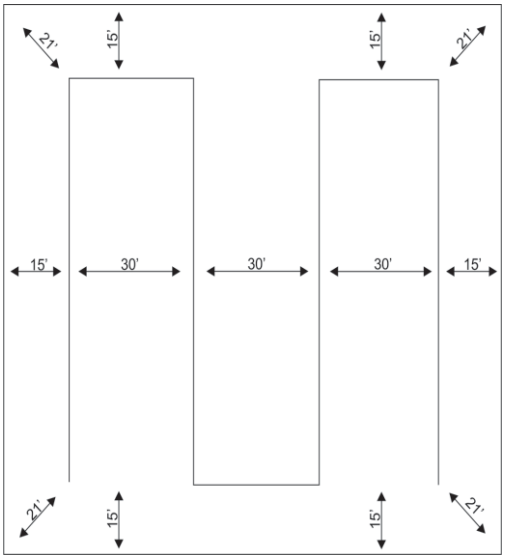
Freezer Application

Below you will find the typical ways linear heat detection is used to protect refrigerated warehouses (commercial freezers). The cable temperature for a freezer is 155° (68°C) and has a standard PVC coating.

Typically the linear heat detection (LHD) is installed in-rack either on the pre-action sprinkler piping (making it part of the sprinkler system) or on the racking itself. Some freezers or coolers will only require ceiling area protection while some have ceiling and in-rack detection depending on the size of the freezer and or the ceiling height (refer to underwriters, state and local requirements). Typical LHD freezer zones usually follow the sprinkler riser zones.

Area Ceiling Detection Spacing:

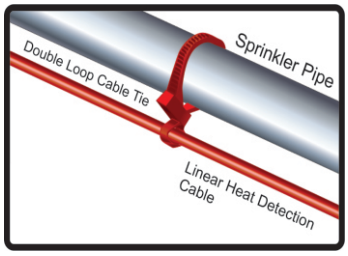
For use in freezer ceilings, coolers, electrical equipment rooms and ammonia pump rooms



Note: If ceiling height is above 30' reduce spacing by 1/2

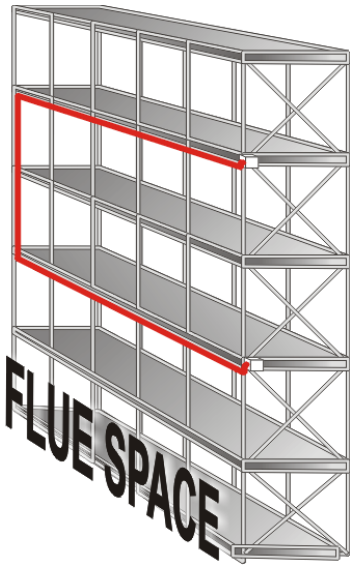
Cable Length Calculation

Hazard Length
+
10% Sag
+
10% Waste
Total Length



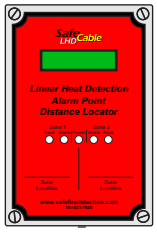
Typical Pre-Action System

If the LHD is made part of the pre-action system, a double loop cable tie is used every 3 ft. to keep the LHD from touching the pipe and acting as a heat sync.



Typical Rack Mounted Zone

Distance Locating



Distance locating devices are sometimes used to better identify the exact location the fire was detected.

Cable Tray Application

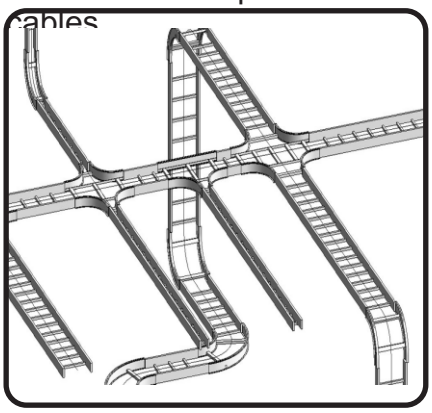
Electrical Cable Trays

A cable tray is an assembly of sections forming a rigid structural system used to support cables. Cable trays support cables the same way that bridges support car and truck traffic. A bridge that allows for safe transport of wires across open spans of a buildings electrical system.

There are many types of cable trays based on their shape and or function such as ladder, solid bottom, trough, channel, wire mesh etc. Most are made of steel, aluminum or fiberglass and come in straight sections for

Electrical Distribution

In addition to straight sections of the tray there are elbows, tees, crosses and risers. This requires a fire detection system that can follow the same path as the cables



Cable Tray Layout

Electrical Utility Room

The electrical cables laid in the cable tray can be high voltage and can breakdown with age and use. With time the cables can overheat causing electrical fires. Loosely packed cable trays are more susceptible to fires because of greater access to

Fire Detection

Linear heat detection (LHD) is a very effective and low cost method of protecting cable trays. The flexible LHD cable can be laid inside the tray with the cables following the exact same path while being in close proximity to the cables for quick detection.

Cable Tray Fire

Cable Tray Application

Below you will find the examples of how linear heat detection is used to protect electrical cable trays. The LHD cable temperature for cable trays is normally 190° degrees (88°C) and has a standard PVC coating. And depending on the difficulty of the hazard a second nylon coating is applied over the standard PVC. This adds a second layer of protection for heavy duty protection on difficult applications.

Typically the linear heat detection (LHD) is installed directly on top of the cables in the cable tray. The LHD cable is installed in a sine wave pattern for optimal coverage. The LHD can be zoned by areas, groups of trays or even individual trays as required by the project.

Sine Wave Design Pattern

A sine wave pattern, as shown in Figure 1 and 2 should be used when installing LHD cable in a cable tray application. The maximum distance between each peak or valley, should not exceed 6 feet. The LHD cable is secured in place using mounting clip hardware.

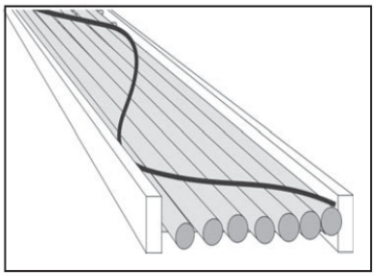


Figure 1

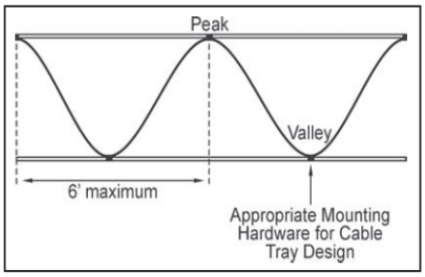


Figure 2

Determine The Length of Cable Needed

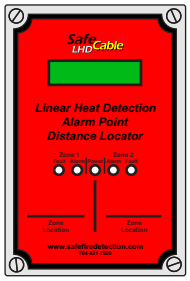
The calculation below will help you determine the actual cable length needed for a cable tray design using a sine wave pattern.

1. Determine Your Tray Length
2. Determine Your Tray Width
3. Pick The Width Coefficient of your Tray Width
4. Divide Tray Length by the Width Coefficient for your Tray Width
5. Equals Total Length of LHD cable needed. Add 10% for Sag and Loss.

Tray Width	Width Coefficient
1.5'	.87
2'	.78
3'	.65
4'	.57

NOTE: To determine the number of mounting clips needed, divide the total length of the cable tray by 3 and add 1.

Distance Locating



Distance locating devices are sometimes used to better identify the exact location the fire was detected in the cable tray.

Fuel Tank Application

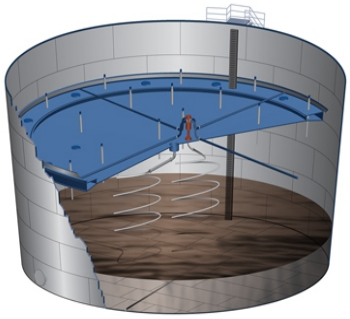
Floating Roof Tanks

Floating roof top storage tanks are commonly used to store large amounts of crude oil. A floating roof is primarily used for vapor control in the tank to help eliminate loss from production and reduce air pollution. The floating roof can be internal under a fixed roof which reduces the possibility of lightning strikes or external without a fixed second roof.

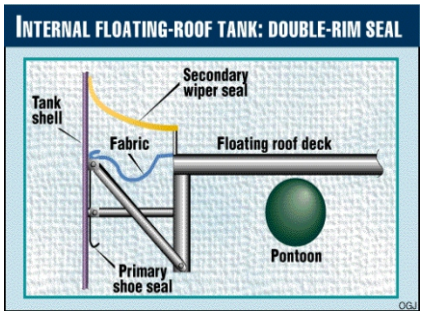
The roof floats on the surface of the liquid product and rises or falls as product is added or withdrawn from the tank. Large groups of these storage tanks are commonly called tank farms.

Tank Farm

These tanks are constructed of an open or closed topped steel cylindrical shell with a pontoon type floating roof. The roof deck floats on the liquid to form a seal and reduce the amount of vapor in the tank.



Tank and Rim Seal



The edge of the floating roof deck usually has a dual seal all the way around. There is a primary seal which is designed to keep the vapors in the tank while the secondary seal is designed to keep rain and other contaminants out of the tank. It is important to keep the seal intact to avoid a build up of vapors and combustion in an explosive environment.

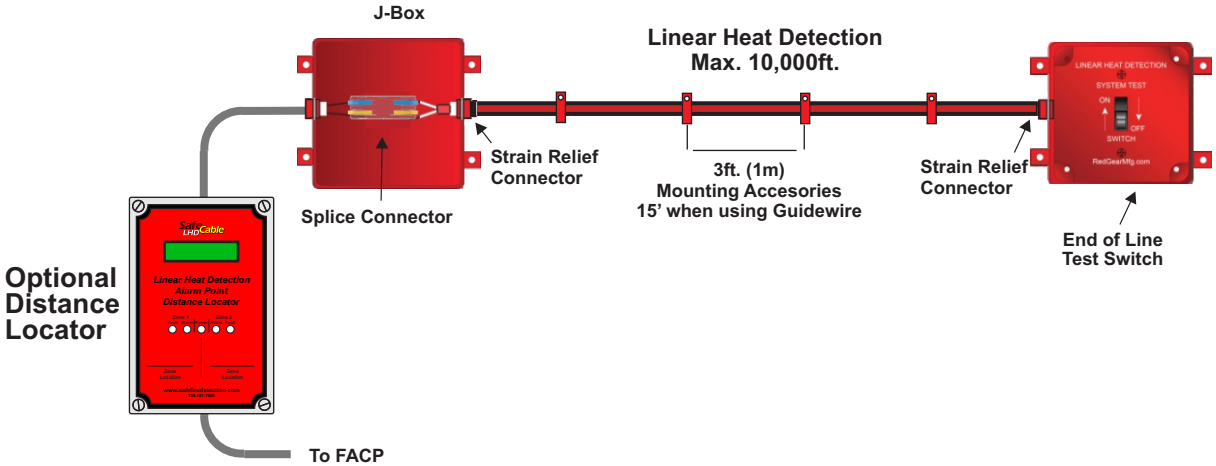
Fire Detection

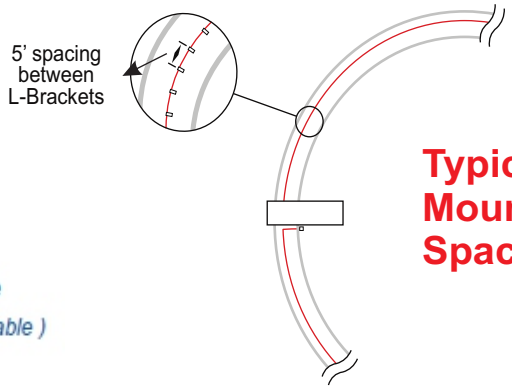
Linear Heat Detection (LHD)is used to detect rim-seal fires, the most common fire in floating roof tanks. These fires are primarily caused by lightning strikes and have a good rate of being extinguished if equipped with linear heat detection and a foam suppression system.

Floating Roof Tank Fire

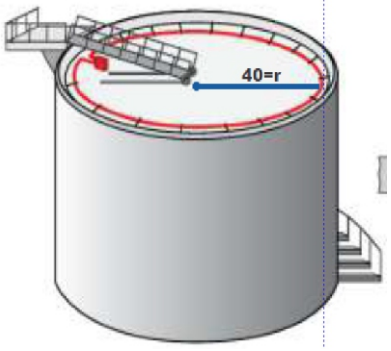
Fuel Tank Application

Below you will find examples of how linear heat detection is used to detect fires on floating roof tanks. The linear heat detection (LHD) cable temperature for cable trays is normally 190° degrees (88°C) and has a nylon secondary coating for additional heavy duty protection. Typically the linear heat detection (LHD) is installed between the primary and secondary seals at 5ft. spacing and usually requires an intrinsic safety barrier for hazardous areas.





Typical Mount Spacing



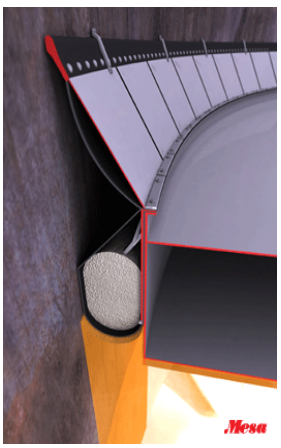
To Determine Cable Amount:

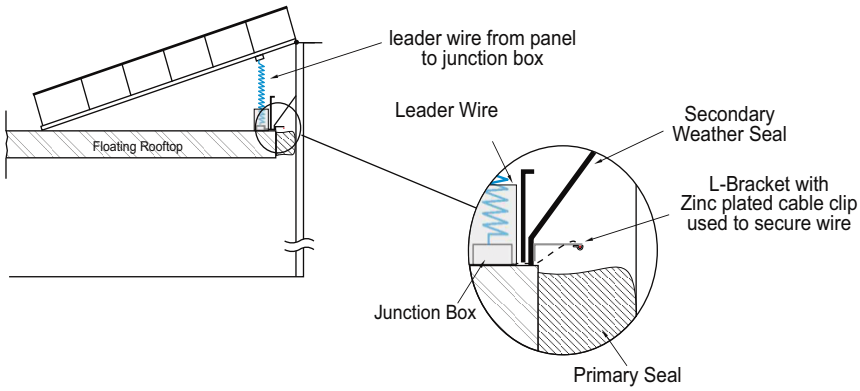
$2\pi r$

$2 \times 3.14 \times r = C$

r=Raduis C=Circumference

Ex. (2 x 3.14 x 40 =252ft of cable)



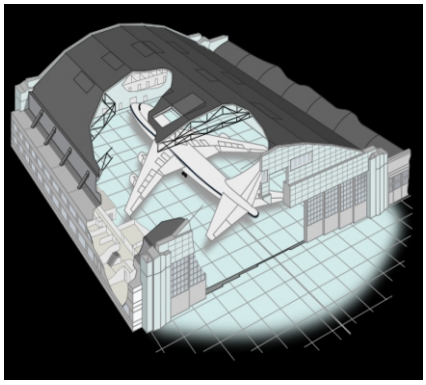


Hangar Application

Hangars are closed structures that house aircraft in protective storage from weather and direct sunlight.

They also offer a protected place for maintenance, repair and manufacturing. They are found at airports, housing developments with air fields and on aircraft carriers or commercial and military ships.

Hangars are usually regulated by building codes by the jurisdictions and airports where they reside.

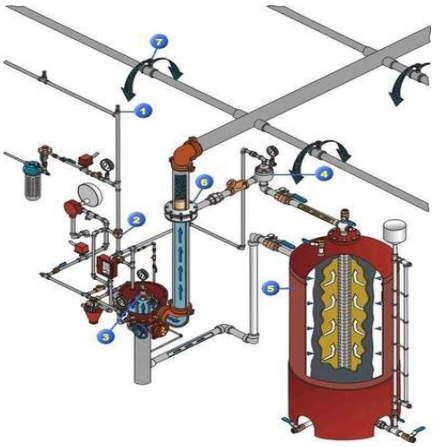


Typical Aircraft Hangar

Aircraft hangars are a challenge to protect from fire due to their large size, many obstacles and variety of combustible materials that reside within. Not to mention the huge amounts of jet fuel.

Foam System Discharge

There are a number of types of fire suppression systems for hangers can include sprinklers, fire pumps and



Typical Foam System

Aircraft Hangar Fire

Aircraft hanger fire protection requirements are covered in the NFPA 409 Standard on Aircraft Hangers and may require protection at the ceiling and in the underwing areas. Please refer to this standard for exact requirements.

Typically the overhead automatic suppression systems are triggered by linear heat detection connected to a fire alarm releasing panel, while flame detectors are usually used for

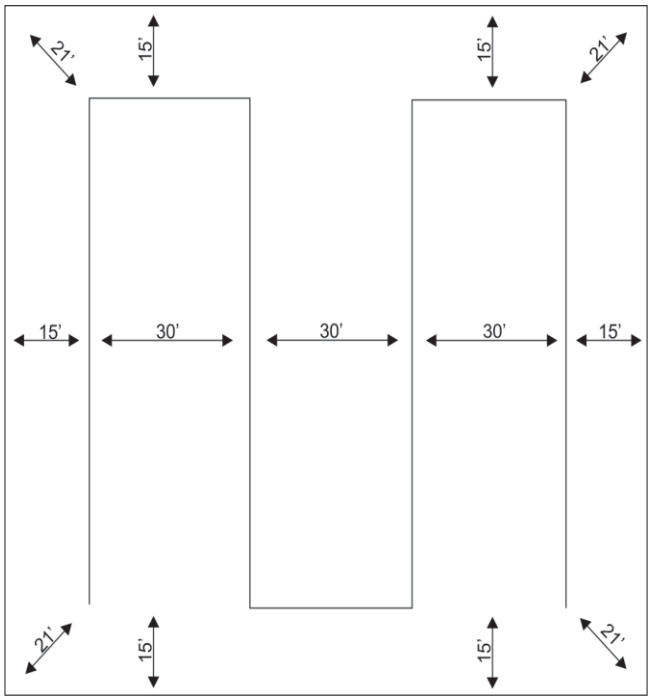
Hangar Application

Below you will find the typical ways linear heat detection is used to protect aircraft hangars. Normally the cable temperature is selected by finding the normal ambient temperature of the environment and then selecting the next cable temperature at least 30° to 50°[F] (17° to 28° C) above ambient. (Refer to Maximum Ambient Temperature Table Below)

In most applications a standard PVC type 155°[F] (68°C) degree temperature cable is used at normal NFPA 72 spacing.

Area Ceiling Detection Spacing:

For use in freezer ceilings, coolers, electrical equipment rooms and ammonia pump rooms



Typical Cable Temperatures

155°F (68°C), 172°F (78°C), 190°F (88°C), 220°F (105°C) 365ºF(185ºC)

Outer Jacket Coatings

(PVC) Standard, for all typical applications
(N) Nylon for conveyors industrial and outdoor aps
(P) Poly for chemical aps
(G) Guidewire applications

Note: If ceiling height is above 30' reduce spacing by 1/2

Maximum Ambient Temperatures

Maximum Ambient Install Temperature	Alarm Temp.	Part Number
Up to 113°F (45°C)	155°F (68°C)	TC155
Up to 122°F (50°C)	172°F (78°C)	TC172
Up to 158°F (70°C)	190°F (88°C)	TC190
Up to 158°F (70°C)	220°F (104°C)	TC220
Up to 305°F (152°C)	365°F (185°C)	TC365N

Cable Length Calculation

Hazard Cable Length
+
10% Cable Sag
+
10% Waste
Total Length

Tunnel Application

Tunnels

A tunnel is an underground passageway, dug through the surrounding earth or under water and enclosed except for an entrance and exit at each end.

A tunnel may be for automobile road traffic, freight or subway trains. Utility tunnels under cities and factories are used for routing steam, chilled water, electrical power, fiber optic or telecommunication cables, as well as connecting buildings for safe passage of people and equipment.

Utility Tunnel

Cable Tunnels

Cable and utility tunnels are used to interconnect communications and utilities between plants, areas and buildings for easier service, maintenance and expansion.

Tunnel Venting

Proper operation of a ventilation system plays a key role in tunnel safety. The ventilation system provides acceptable air quality for the safe passage of tunnel users.

Further, it provides an environment to allow rescue of people during a smoke or fire event by controlling the smoke and spread of the fire.

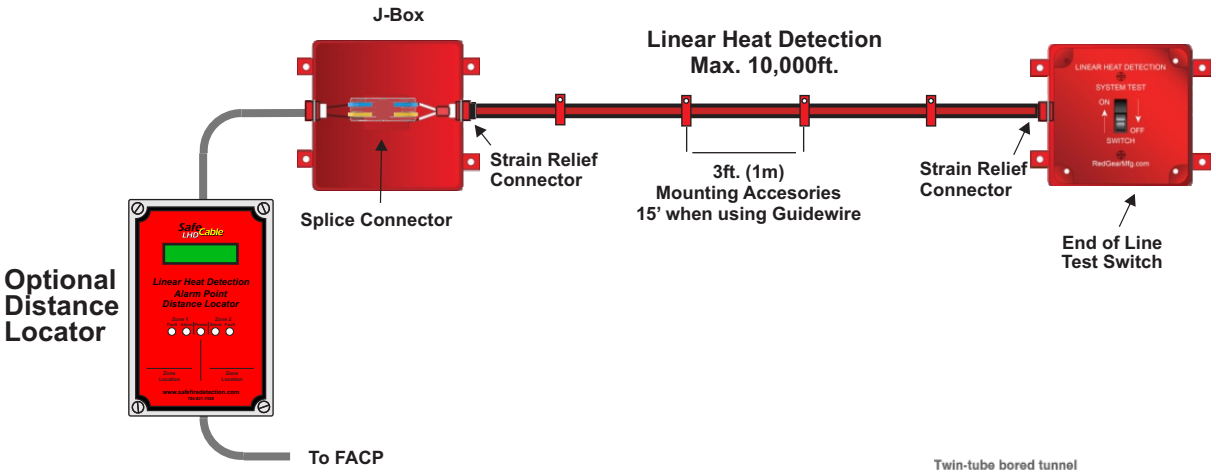
Fire Detection

Linear Heat Detection (LHD)is used to detect tunnel fires in conjunction with a fire alarm and ventilation system. The LHD is separated into zones equal to the ventilation systems to create an environment where the fire can be detected and a tenable area created quickly.

Car Fire in Tunnel

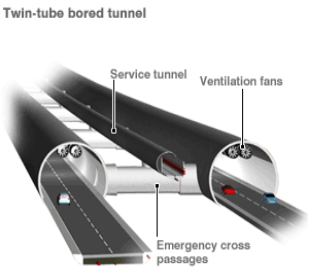
Tunnel Application

Below you will find examples of how linear heat detection is used to detect fires in tunnels. The fire alarm panel is usually installed in the control room area. The linear heat detection (LHD) cable temperature for tunnels is normally 190° degrees (88°C). Typically the linear heat detection (LHD) is installed at the top of the tunnel or over the center of each lane for automobile tunnels and over each track on railroad tunnels. Maps are printed showing the cable route, and distance locators indicate, in feet or meters, where the fire is detected.

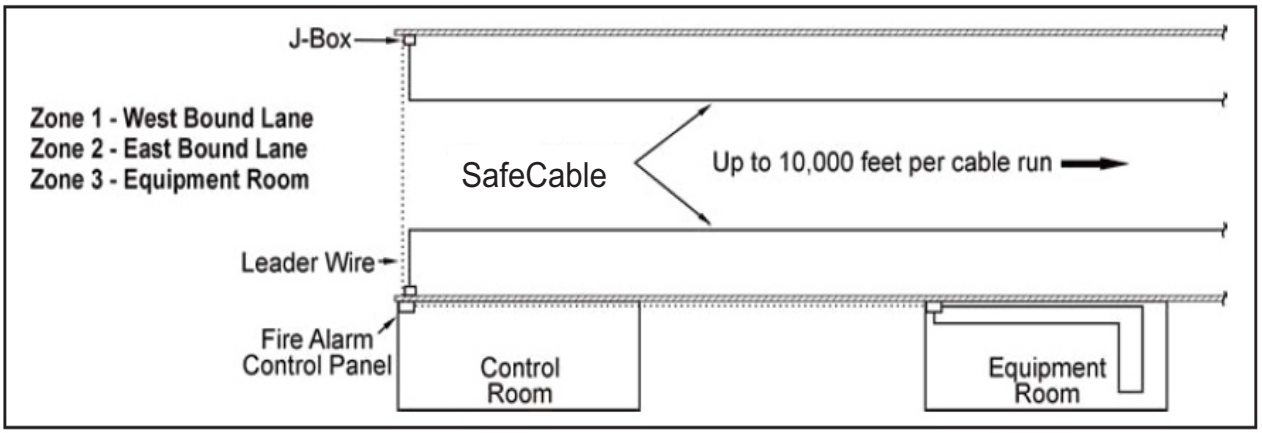


Determining Cable Length:
Measure the length of the tunnel and add 10% for sag and loss. Mount every 3' or 1m

LHD Alarm Temperature:
Typically 190 degrees F (88C)



Road Tunnel



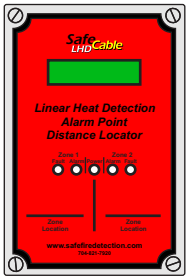
System Components

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

System Components

LHD Accessories

In Application Bulletins 1-6 we have looked at some of the different applications that can be protected using LHD. This month's Bulletin will look at a few of the Accessories that can be used in conjunction with LHD.

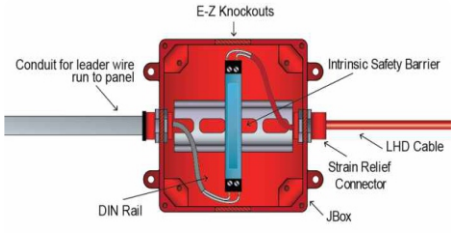


Distance Locator

Your alarm panel shows that there is a fire in your Linear Heat Detection Zone. Now What? With an optional Distance Locator you can easily determine the distance from the panel to the fire. Providing the easiest way ever to find the fire.

Intrinsic Safety Barriers

Many of the applications that LHD can protect are considered explosion proof areas. For these types of applciations we offer Instrinsic Safety Barriers. Our Intrinsic Safety barriers provide protection for electrical signals going through hazardous areas.



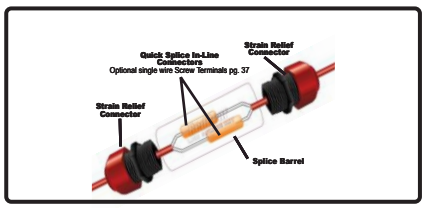
End of Line Test Switch

The traditional way to test Linear Heat Detection involved scrap wire and the danger of heat. However, with an End of Line Test Wwitch any system can be test easily, quickly, and from the ground. There is no need for scrap wire or to apply heat to any part of the system.

Outside View

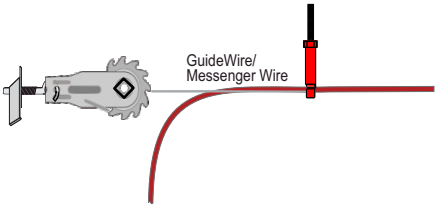
TEXT IMPRINTED BOX COVER

NOTE: Text on product is not White



Splicing Kits

You no longer need to worry about J-Boxes, Electrical Tape, and hole saws. The new Redgear splicing kit makes splicing easy and affordable.



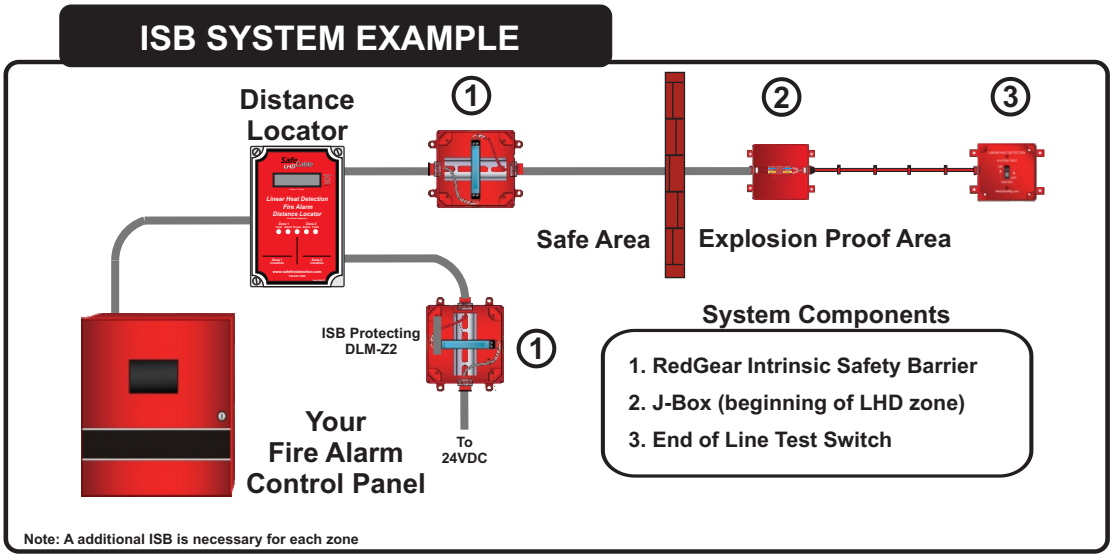
GuideWire/ Messenger Wire

GuideWire and Messenger wire are two different names for a small wire that is wrapped around the LHD. This wire helps to retain rigidity and allows for longer lengths between mounts. While most LHD manufacturers say to use 3ft. mounting spacing, with GuideWire or Messenger wire that number can go up to 15ft.

System Components

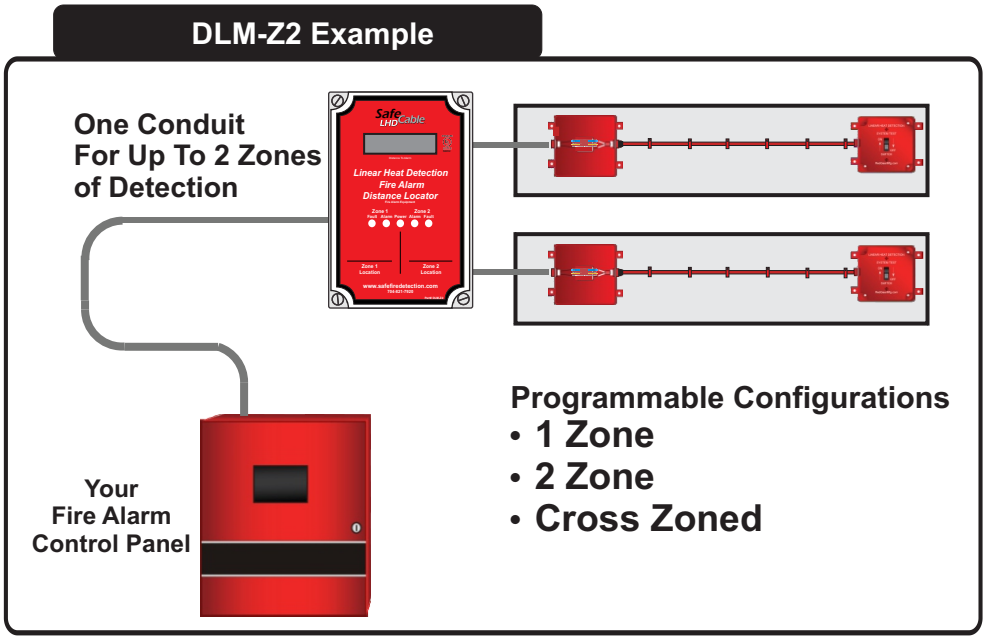
Accessory: Intrinsic Safety Barrier

Intrinsic Safety Barriers are a protection technique for safe separation of linear heat detection equipment in hazardous areas. These barriers are energy limiting and utilize zener diodes which direct voltage spikes to ground. Each barrier contains a non-replaceable 160mA fuse which protects the barrier from pole reversal and voltage spikes at the input side. Grounding wires are run in conduit or raceways separate from any non-intrinsically safe wiring. One barrier is required for each zone of detection.



Accessory: Distance Locator

The DLM-Z2 can identify where along the length of detection cable the overheating condition is occurring. Distances are shown in both feet and meters from the distance locating module. The DLM-Z2 Distance Locating Module is FM approved for indoor use, and may be used with both addressable and conventional linear heat detection systems.

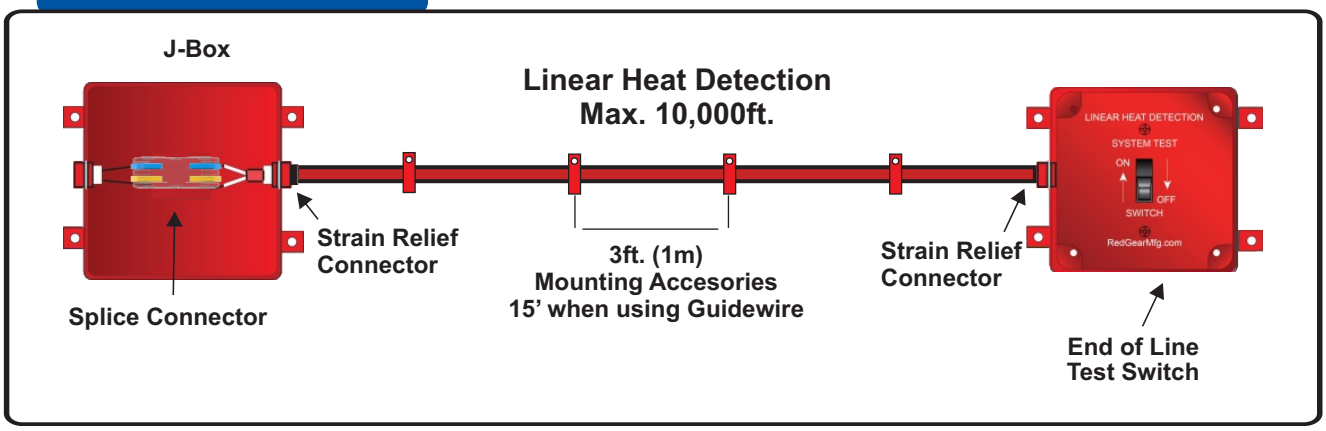


System Components

Accessory: Test Switch

Test Switches can be placed at the end of a Linear Heat Detection Cable zone and are to be used for commissioning, system inspections, and testing of the system. The RedGear Test Box is a heavy duty nonmetallic NEMA 4 (IP66) termination box. A foam-in-place gasketed lid attaches with stainless steel screws. All junction and termination boxes must use a Strain Relief Connector (Part #: RG11 10) for LHD Cable penetrations made in the test box. No hole saws are required to install the Strain Relief Connector which secures and prevents damage to the LHD Cable, and seals the penetration from moisture and dirt helping prevent corrosion.

TEST SWITCH EXAMPLE



Accessory: Splicing Kit

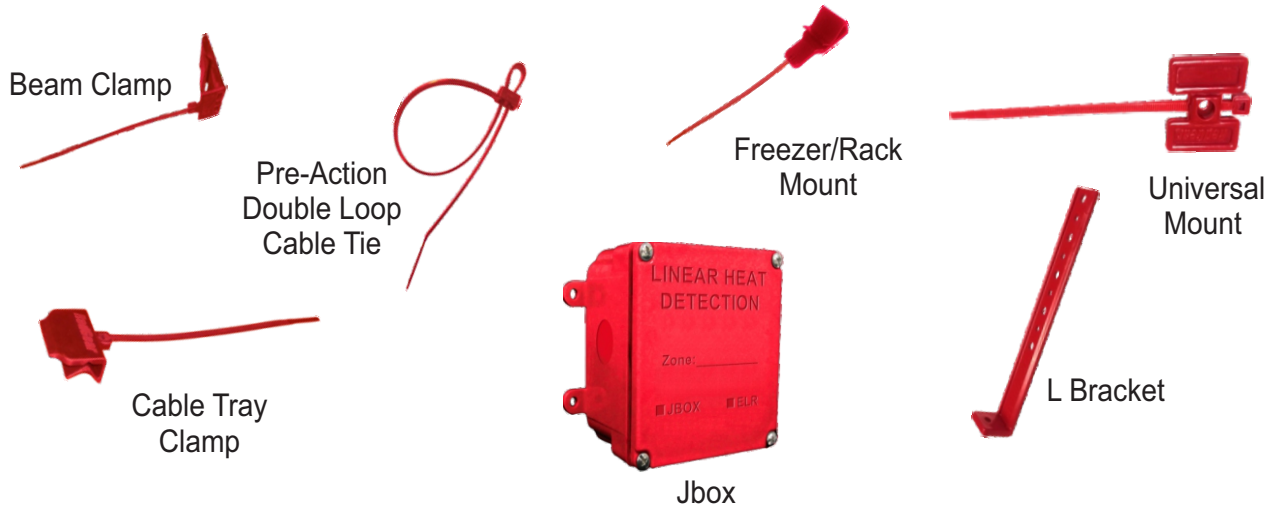
Splices have traditionally needed to be in J-Boxes and are held together by electrical tape. This creates the possibility of a non-weatherproof splice. With the new RedGear Splicing Kit there is a weather-proof seal on every splice. In addition it can be used without a Junction box. This makes it not only a better performing option to traditional splices, but also a less expensive option.

SPLICE KIT EXAMPLE

System Components

Accessory: Installation Materials

There are a wide variety of methods of mounting and installing Linear Heat Detection. However, RedGear Manufacturing has created a line of products specifically designed for the installation of LHD. These products include junction boxes, double and single loop cable ties, surface mounts, tap on beam clamps with built in cable ties, L-brackets, and more. Please consult your manufacturers installation guide to determine which installation accessories are right for your application.



Accessory: GuideWire/Messenger Wire

For most applications that use Linear Heat Detection it is recommended that you use 3ft. spacing between mounts. But what if you are in an area where the mounts are farther apart? For these types of applications there is Guidewire/Messenger Wire. This option allows you to go up to 250ft. with 15ft. spacing between mounting. This allows you to cover areas that might otherwise not be suitable for linear heat detection.

Typical Configuration of Linear Heat Detection Cable with Support Cable:

System Design

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

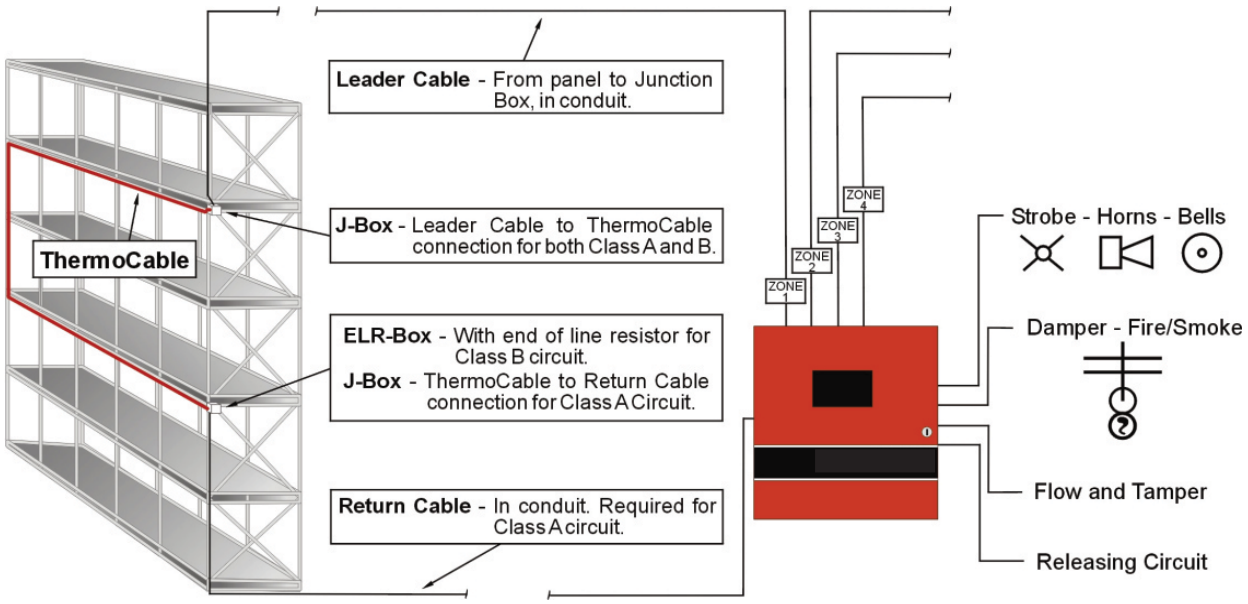
Linear Heat Detection Design Guide

1. Introduction

1.1 Linear Heat Detection

SafeCable digital linear heat detection wire is a combination of advanced polymer and digital technologies that can detect heat anywhere along its entire length.

SafeCable consists of a twisted pair of extremely low resistance (.05 ohm/ft. of twisted pair) tri-metallic conductors, sheathed in new advanced thermal polymers. These polymers are chemically engineered to breakdown at specific fixed temperatures allowing the twisted conductors to make contact and initiate an alarm at the control panel without any calibration for changes in ambient temperatures. The distance locating option allows the control panel to identify and display the exact location, in feet or meters from the control panel, where the heat source interacted with the detection wire. RedGear installation materials are specifically deigned and approved for use with linear heat detection systems for an easy installation.



Typical Pre-Action System
Figure 1

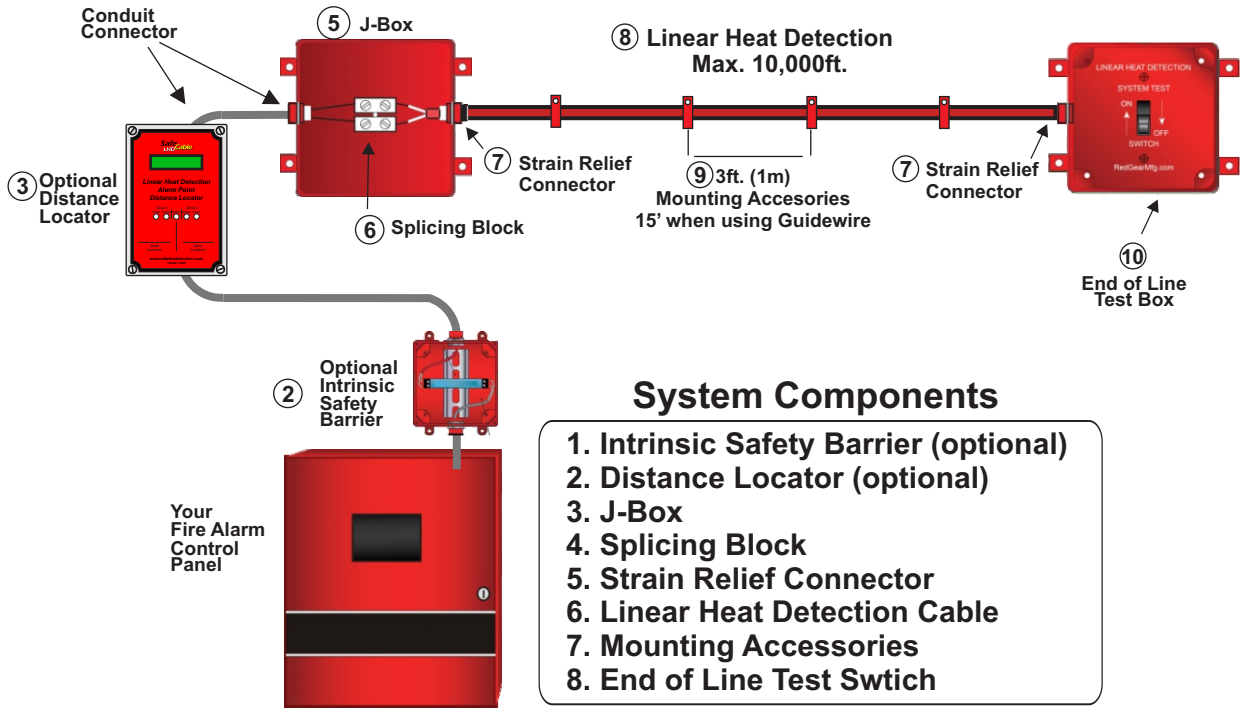
Typical System

SafeCable is easy to design, install, operate and maintain. Up to 15,000 feet (4,571m) of SafeCable can be used on every zone of any approved conventional panel, and every contact monitor module of any approved addressable panel.

Figure 2 illustrates a typical system, which highlights the easy to use SafeCable components. You can connect to any approved conventional panel or any approved addressable contact monitor module. You may add an optional distance locating module using leader wires in a conduit to the beginning of the hazard zone, or you can connect SafeCable directly to the distance locating module.

The Redgear NEMA 4 Jbox is the beginning of each zone where you connect your leader wires (if used) to a screw terminal. You exit the junction box using a moisture proof strain relief connector that seals the box as the zone begins. OPTION: A 6 inch (15cm) loop can be put in the cable to allow for expansion and contraction. Next a Redgear mounting device (www.redgearmfg.com) is placed every 3 ft. (1 m). Redgear mounting hardware comes in a series of different styles and types specifically designed to meet every type of hazard. SafeCable is spaced every 35 feet (10.7 meters), and can be strapped directly to the sprinkler piping if it is an integral part of a pre-action sprinkler system. As you approach the end of each zone you will terminate the SafeCable zone in an ELR box with the end of line resistor supplied by your panel manufacturer.

It is that easy. SafeCable does not require you purchase any expensive proprietary panels that require additional maintenance and cost. Simply add to your existing conventional system or add a contact monitor module to your already existing addressable system.



System Components

1. Intrinsic Safety Barrier (optional)
2. Distance Locator (optional)
3. J-Box
4. Splicing Block
5. Strain Relief Connector
6. Linear Heat Detection Cable
7. Mounting Accessories
8. End of Line Test Swtich

3. Designing a SafeCable System

SafeCable Linear Heat Detector wire can be installed in a manner similar to that of spot type heat detectors at the ceiling level, which provides for broad or wide area detection. When designing a system, it is recommended to include an additional 10% length of SafeCable for sag and scrap.

3.1 Area Detection

For area detection, SafeCable should be installed on the ceiling, or sidewalls of the hazard within 20 inches (51cm) of the ceiling. Installations involving beam or joist construction will be addressed in the following sections. Figure 3 lists spacing for the appropriate listing agency.

Temperature Rating (SafeCable)	UL/ULC	FM
155°F (68°C)	35' (10.7 m)	30' (9.1 m)
172°F (78°C)	35' (10.7 m)	30' (9.1 m)
190°F (88°C)	35' (10.7 m)	30' (9.1 m)
220°F (105°C)	35' (10.7 m)	25' (7.6 m)

Figure 3

3.2 Smooth Ceiling Spacing

The maximum spacing for smooth ceiling installations shall not be greater than the listed spacing between parallel detection wire runs and within half the listed spacing of any walls or partitions which rise to within 18 inches (46cm) of the ceiling. Figure 4 is an example of a smooth ceiling design using 35 foot (10.7m) spacing.

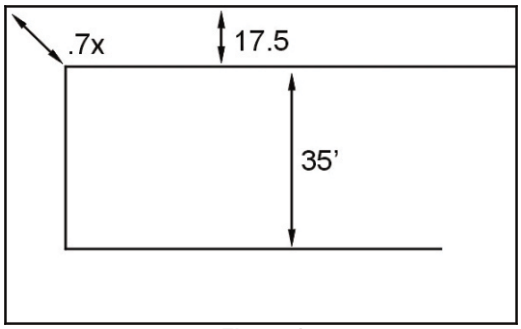


Figure 4

For ceiling heights up to 30 feet (9.1m), SafeCable may be spaced on 35 foot (10.7m) centers. For installations higher than 30 feet (9.1m), the spacing is reduced to half the listed spacing, 17' 6" (5.3m) as shown in Figure 5.

Ceiling Heights		Multiply
Min.	Max.	Listed Spacing by
0	30' (9.1m)	1.00
30'+ (9.1m+)		.5

Figure 5

NOTE: For beam construction installations, please refer to NFPA 72 for additional details.

3.3 Typical Ceiling Detection Layout

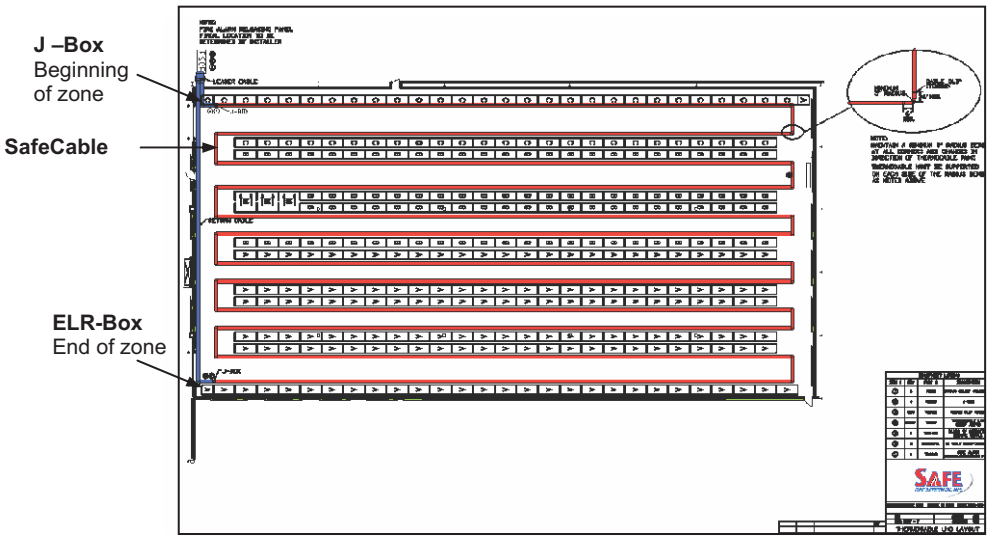


Figure 6

3.4 Open Rack Storage without Sprinklers

When installing the SafeCable in open rack system without a sprinkler system, the number of detection wire runs is based on the height of the rack. As a general rule, there should be one detection wire run for every 10 feet (3m) of rack height. The detection wire should be attached to the load beam and run in the transverse flue space. Refer to NFPA 72 for more details. RedGear manufactures a rack clip for easy installation of the cable.

- For example, an 18' (5.5m) rack should be given two wire runs while a 40' (12m) rack system should have four wire runs.

3.5 Open Rack Storage with Sprinkler Protection

In the case of signal or double row racks, one run of SafeCable is needed for each sprinkler level as shown in Figures 7 and 8. The detection wire should be attached to the load beam at the sprinkler level and run in the transverse flue space. For multiple row racks, each sprinkler line would require a corresponding run of detection wire installed with a RedGear double loop cable ties.

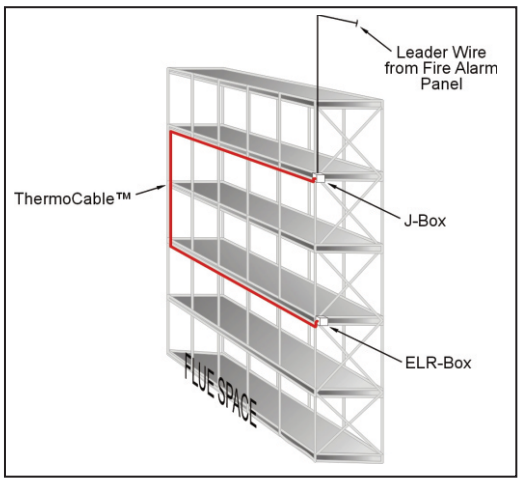


Figure 7

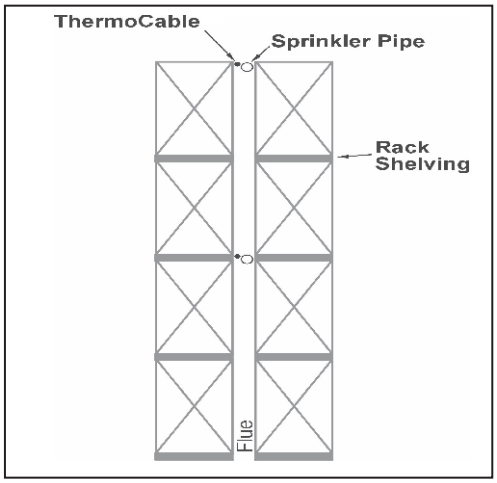


Figure 8

3.6 Cable Trays

A sine wave pattern, as shown below in Figures 9 and 10, should be used when installing SafeCable in a cable tray application.

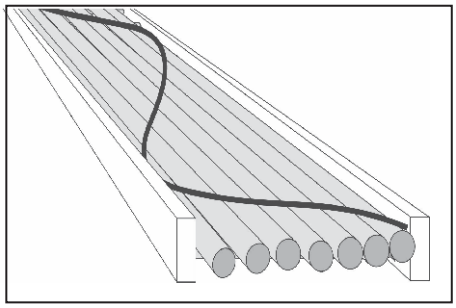


Figure 9

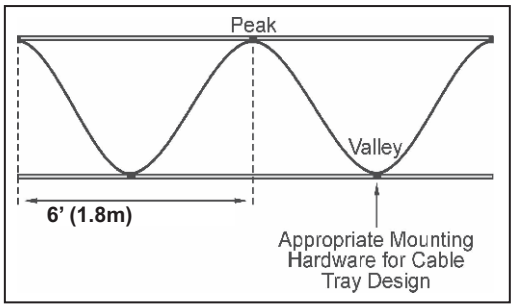


Figure 10

Estimating SafeCable Length for Cable Trays

Recommended installation requires that the SafeCable be run in a sine wave pattern, it may be difficult to estimate the total length of SafeCable needed for a particular run. The following calculation will help determine the approximate amount of SafeCable needed for a cable tray installation (Figure 11).

To determine the number of mounting point along the cable tray, divide the length of the cable tray by 3 and add 1.

Cable Tray Length divided by Width Coefficient = Total Length of SafeCable

Cable Tray Width	Width Coefficient
1'6" (.5m)	.87
2' (.6m)	.78
3' (.9m)	.65
4' (1.2m)	.57

Figure 11

3.7 Conveyors

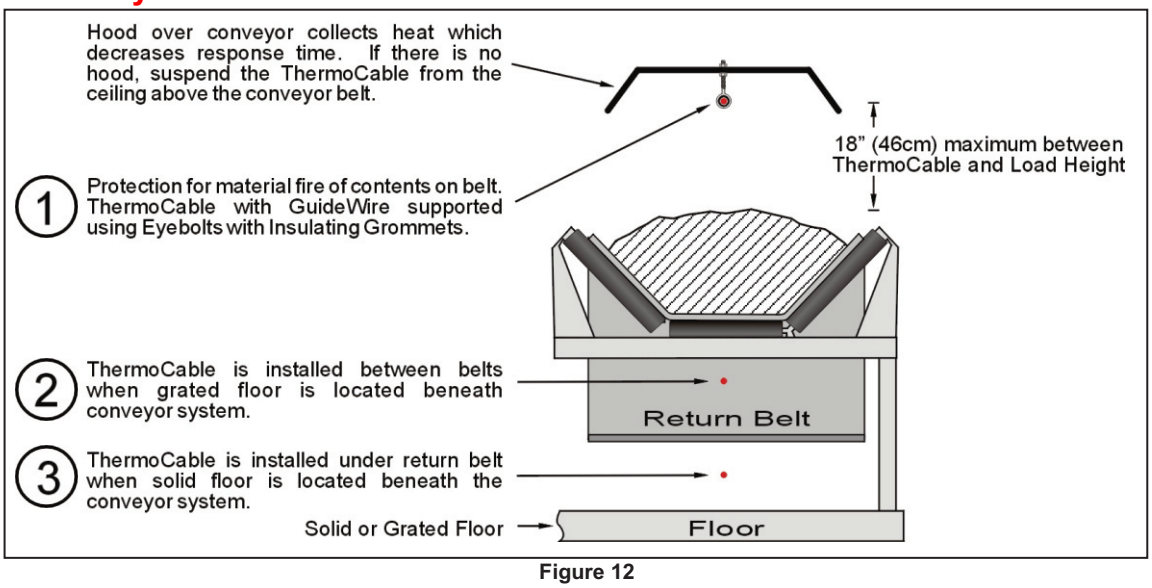


Figure 12

3.8 Floating Rooftop Tanks

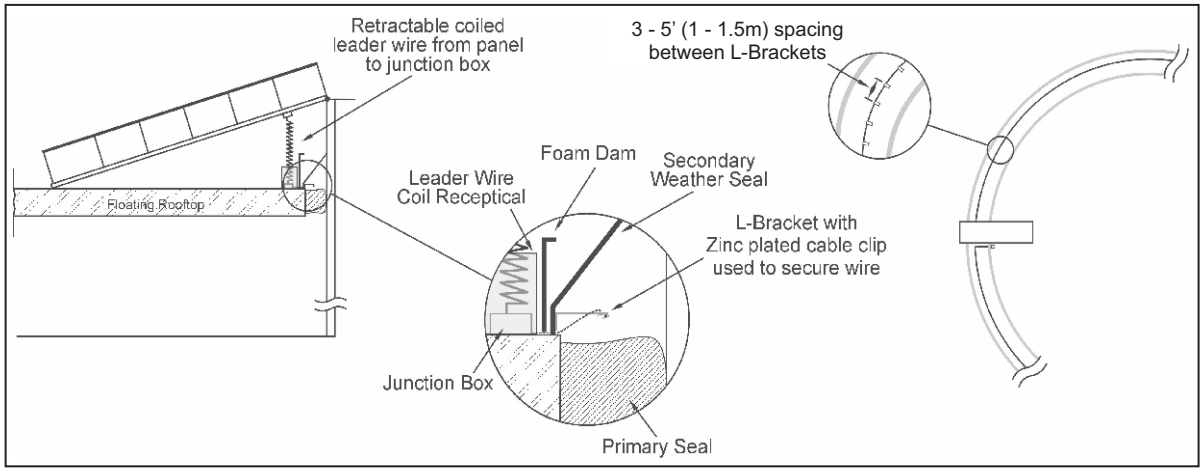


Figure 13

3.9 Tunnels / Subways

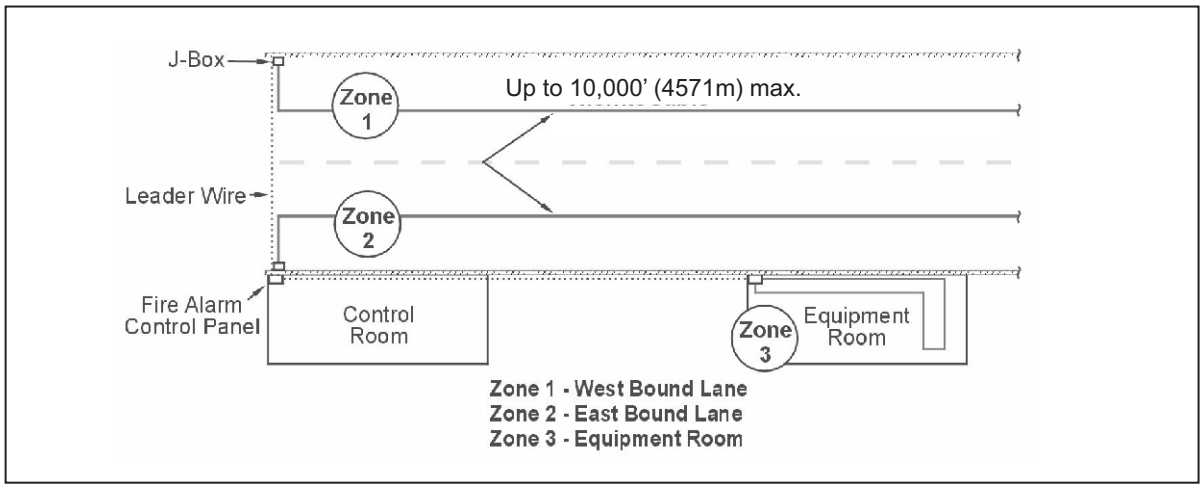


Figure 14

3.10 Proximity Detection – Equipment and In-Cabinet

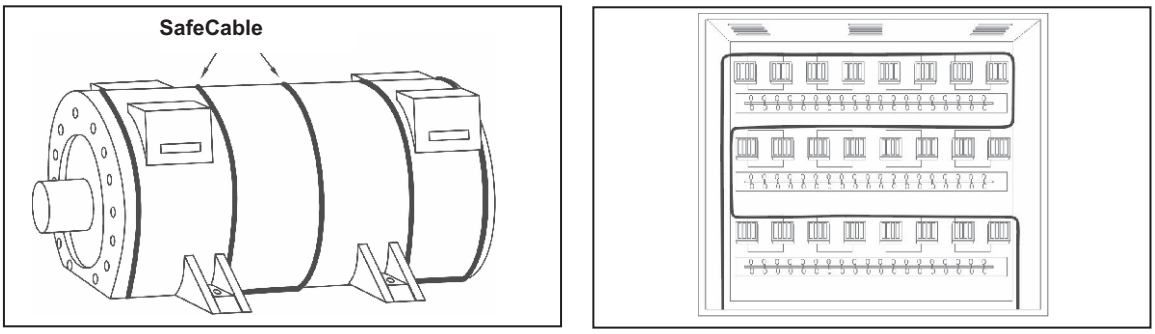


Figure 15

4. DESIGN COMPONENTS

Once the type (outer jacket) and length of detection wire required for a hazard is calculated, the appropriate number of accessories must be determined. The following guidelines will help identify each of the accessories needed to complete the system.

4.1 RedGear Installation Accessories:

Standard and Heavy Duty J/ELR-Boxes - Used to house the connection of the leader cable to the SafeCable portion of the circuit, and at the end of each SafeCable wire run. Two are required for each SafeCable run. A Strain Relief Connector and Screw Terminal are required for each J/ELR-Box installation.

Strain Relief Connectors – Required for all SafeCable penetrations in to, or out of a standard or heavy duty J/ELR-Box. One required per enclosure. Two required for each SafeCable splice made in a J/ELR-Box.

Screw Terminal – Required for each SafeCable connection made in a standard or heavy duty J/ELR-Box. One required per enclosure or splice.

4.2 RedGear Mounting Accessories:

A variety of mounting accessories are available depending on the type of installation. SafeCable must be mounted at 3 to 5 foot intervals using approved fasteners.

Cable Clip Ties

Cable Ties – (Double Loop) Various lengths for fastening to piping or other anchors.

Cable Ties – (Small Single Loop) For mounting using cable tie mounts and adhesive.
(Large Single Loop) For 4 to 6 inch diameter pipe. Use with Small Single Loop for mounting wire

Beam Clamps

Freezer/Rack Clips

Cable Tray Clips

L-Bracket – Typically used in mounting for floating rooftop applications.

4.3 Splicing Kit:

If SafeCable is activated or broken, a replacement piece can easily be spliced in its place.

4.4 Sample Design Worksheet:

DESIGN WORKSHEET

DATE:_____ PAGE ____OF____

CUSTOMER:_____

ADDRESS:_____

CITY:_____STATE:_____ZIP:_____

PHONE:_____CONTACT:_____

HAZARD:_____

CEILING HEIGHT:_____

WIDTH
_____

LENGTH
_____

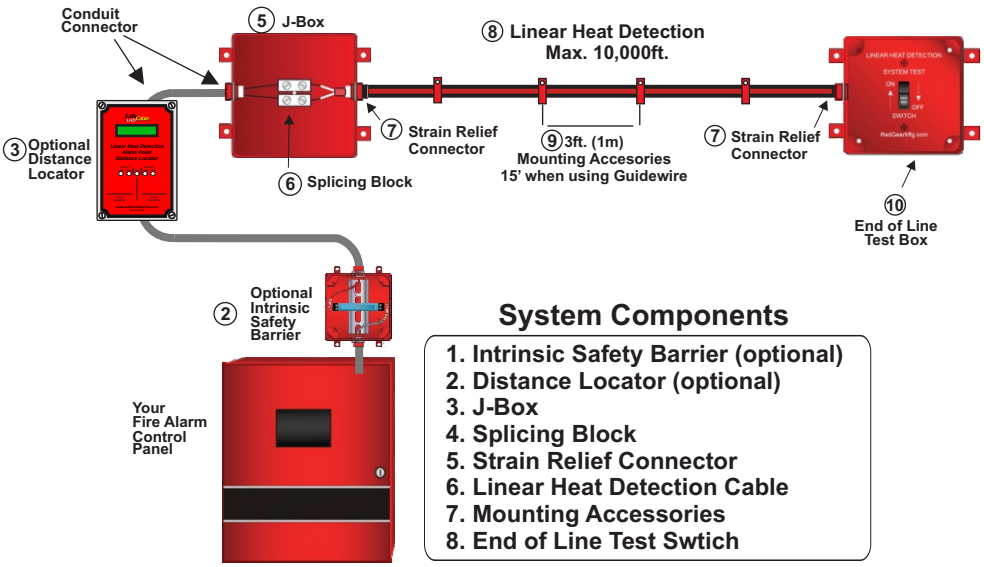
scale____:____

Installation

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Installation

Below you will find a typical linear heat detection zone. Standard components for a typical zone consist of the LHD wire or optional leaders wires that connect directly to the fire alarm panel or addressable module and the items below.



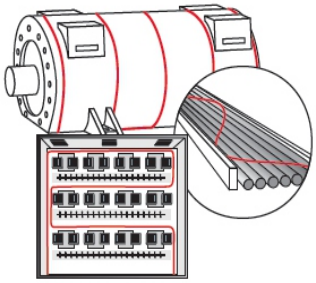
System Components

1. Intrinsic Safety Barrier (optional)
2. Distance Locator (optional)
3. J-Box
4. Splicing Block
5. Strain Relief Connector
6. Linear Heat Detection Cable
7. Mounting Accessories
8. End of Line Test Swtich

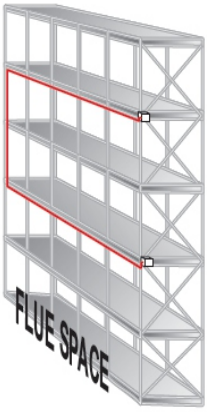
Cable Length Calculation

Hazard Length
+
10% Sag
+
10% Waste
Total Length

Equipment/Proximity



In-Rack



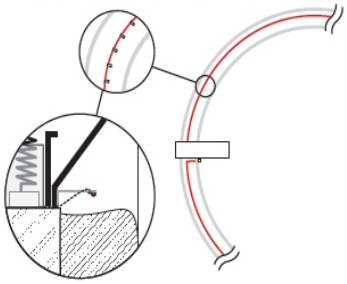
Typical Cable Temperatures

155°F (68°C), 172°F (78°C),
190°F (88°C), 220°F (105°C)
365ºF(185ºC)

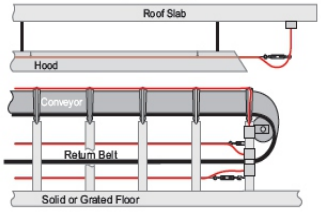
Outer Jacket Coatings

(PVC) Standard, for all typical applications
(N) Nylon for conveyors industrial and outdoor aps
(P) Poly for chemical aps
(G) Guidewire applications

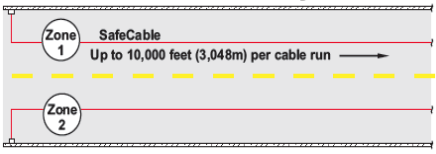
Floating Rooftop Tanks



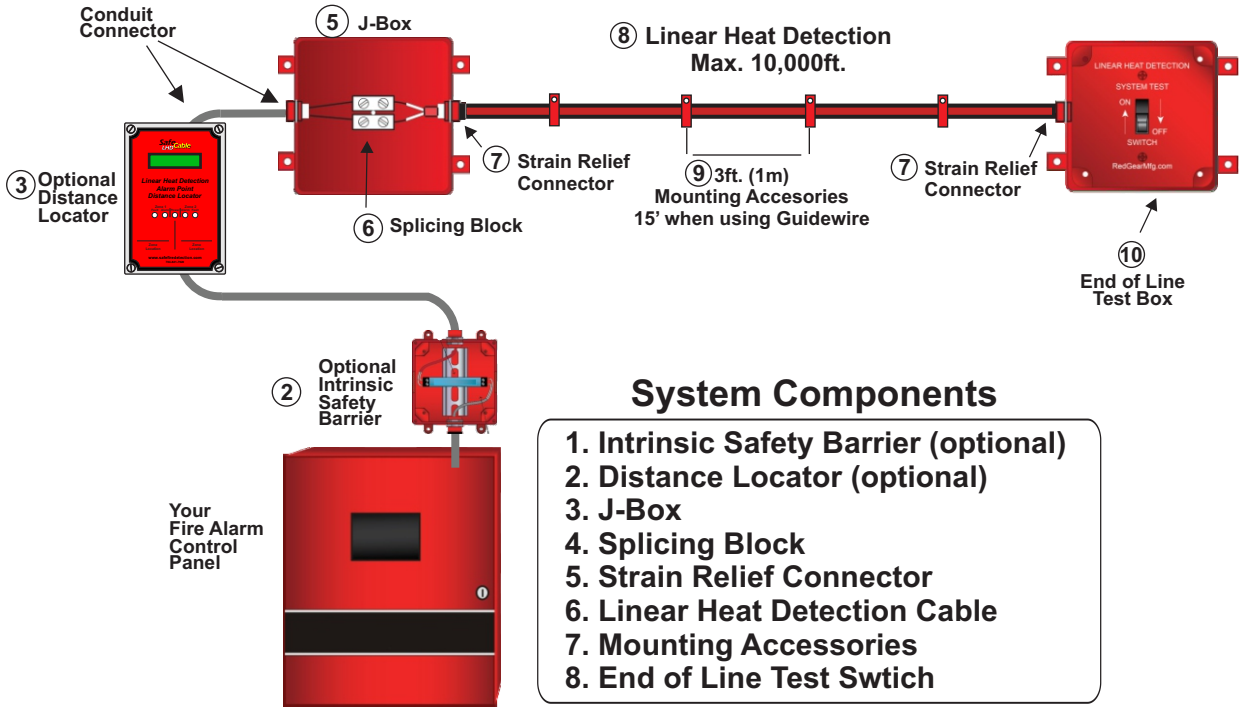
Conveyor Systems



Tunnels / Subways



Fire Alarm Panel Interface



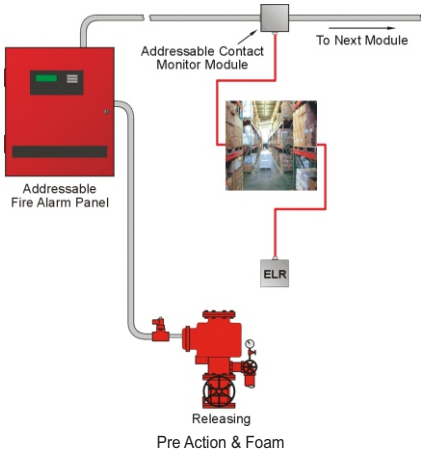
System Components

1. Intrinsic Safety Barrier (optional)
2. Distance Locator (optional)
3. J-Box
4. Splicing Block
5. Strain Relief Connector
6. Linear Heat Detection Cable
7. Mounting Accessories
8. End of Line Test Swtich

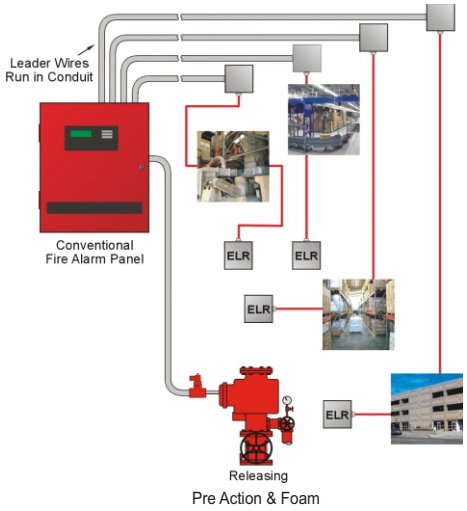
Fire Alarm, Foam & Pre Action Panels

Linear heat detection can be connected directly to conventional and addressable fire alarm panels or addressable modules

ADDRESSABLE SYSTEM CONFIGURATION



CONVENTIONAL SYSTEM CONFIGURATION



Additional Resources are available in the Service and Maintenance Section of this Manual

NOTE: End of Line Resistor Supplied with Fire Alarm Panel

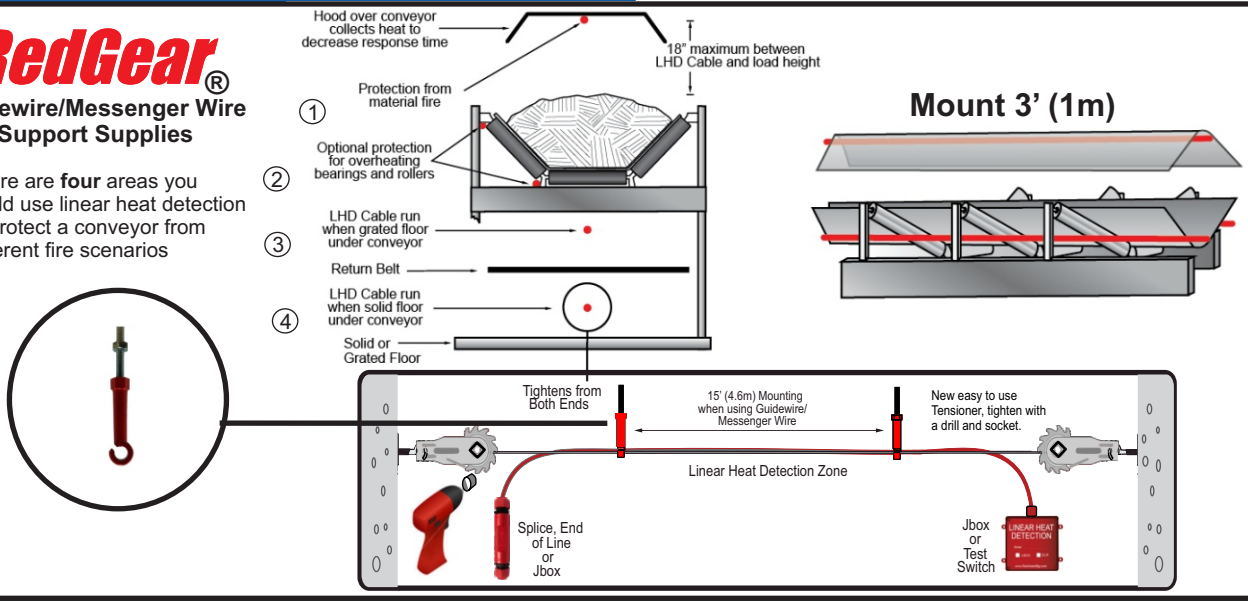
Examples

CONVEYORS

RedGear®

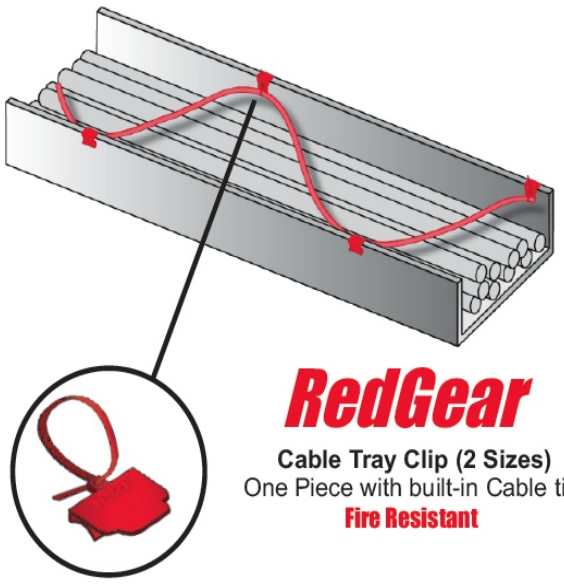
Guidewire/Messenger Wire Support Supplies

There are **four** areas you could use linear heat detection to protect a conveyor from different fire scenarios



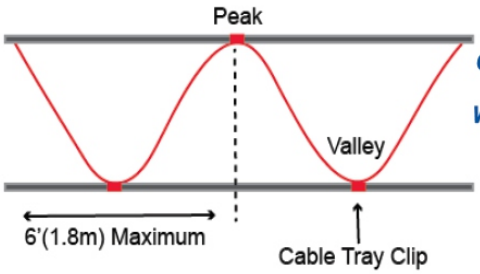
CABLE TRAYS

MADE IN THE USA



RedGear

Cable Tray Clip (2 Sizes)
One Piece with built-in Cable tie
Fire Resistant



Cable Tray Length divided by Width Coefficient = Total Length of LHD Cable

Determine the number of clips you need by dividing the length of the cable tray by 3, then add 1.

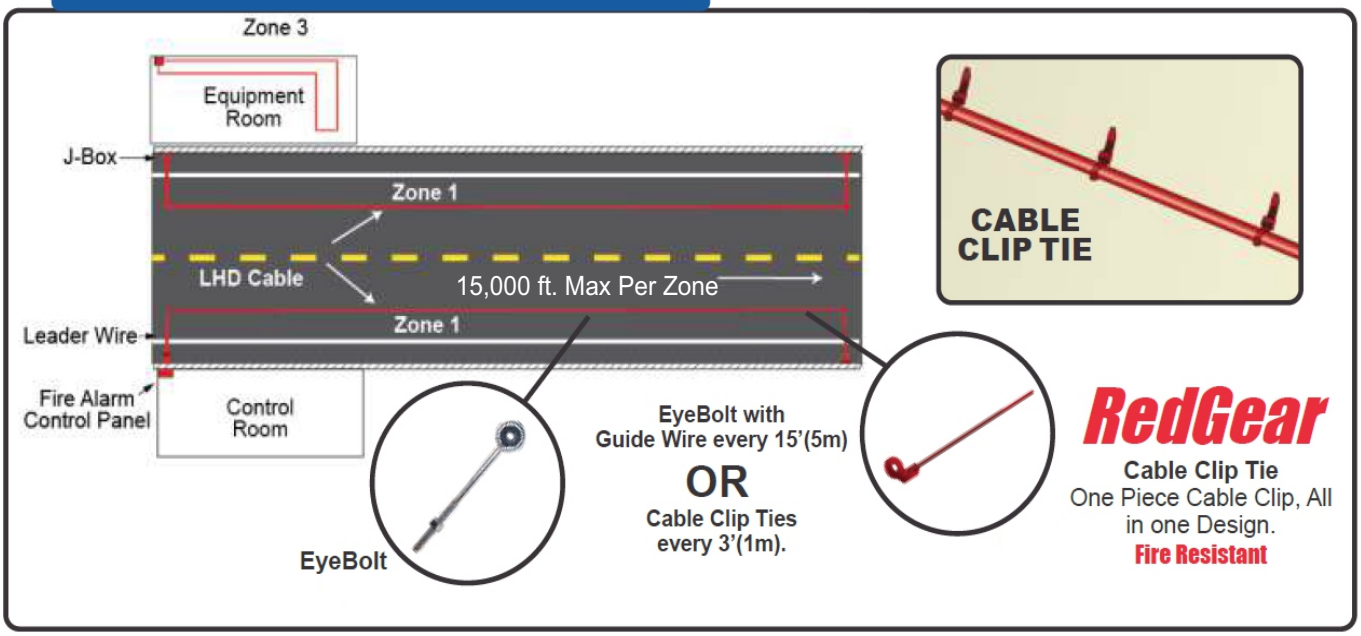
Cable Tray Width	Width Coefficient
1'6"(.5m)	.87
2'(.6m)	.78
3'(.9m)	.65
4'(1.2m)	.57

Sine Wave Calculation for Cable Tray to determine amount of cable required

Examples

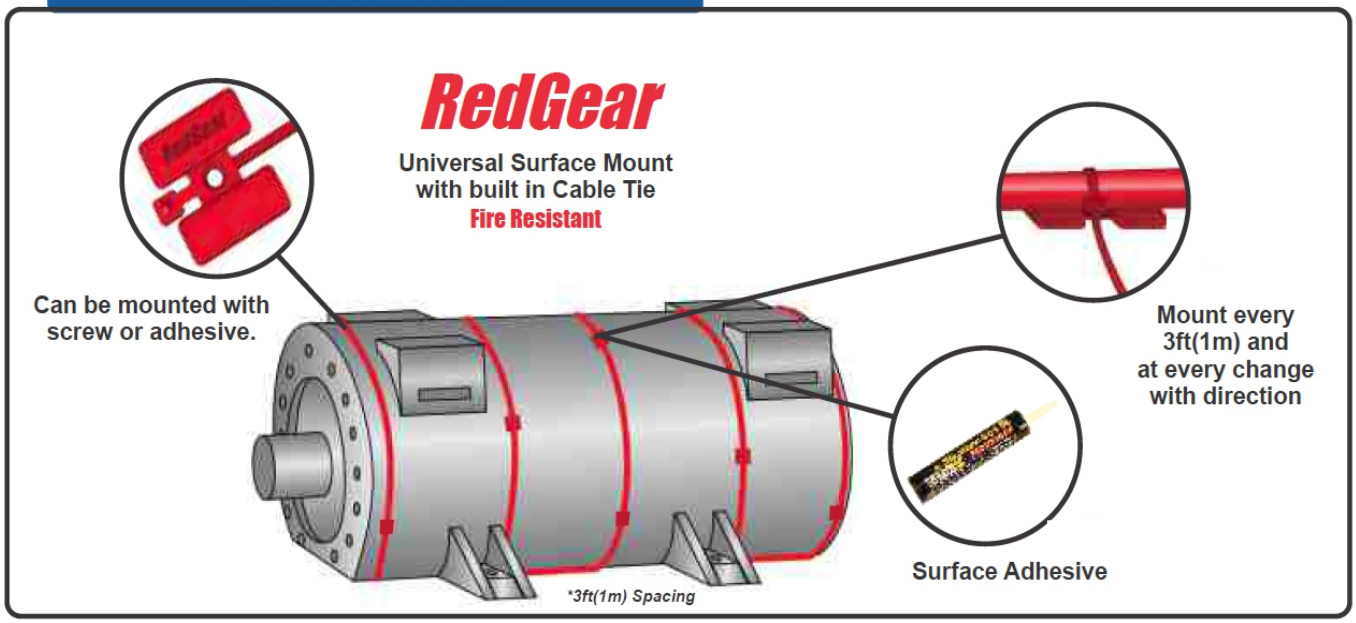
TUNNELS

RedGear
Made In America



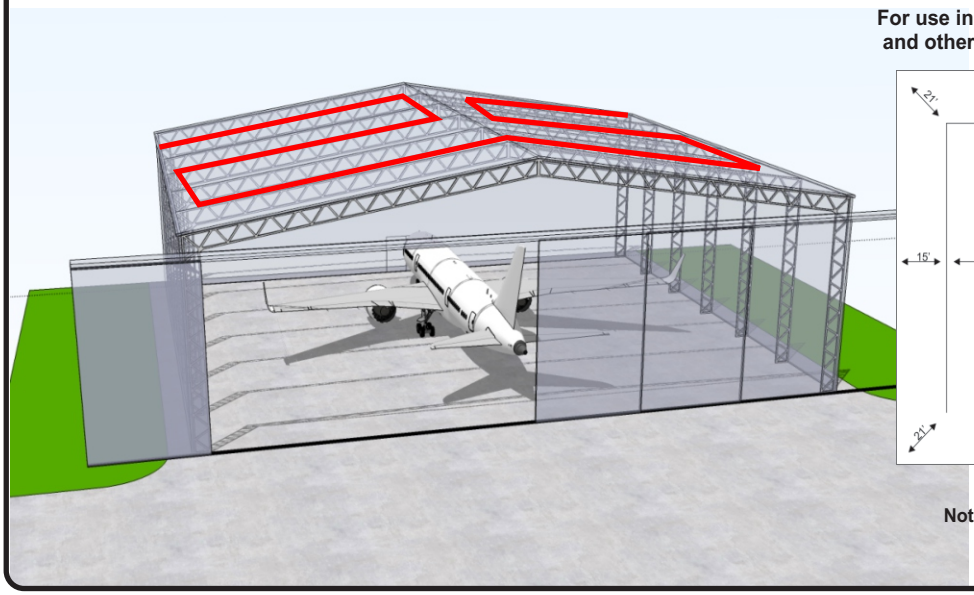
GENERATORS

MADE IN THE USA



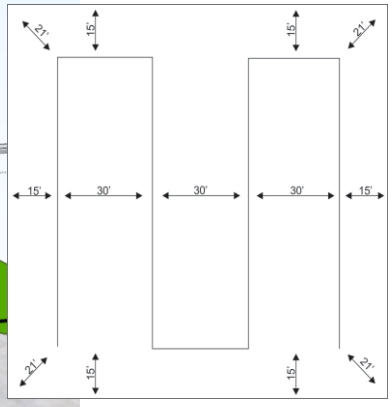
Examples

AIRCRAFT HANGAR



Area Ceiling Detection Spacing:

For use in hangars, ceilings, electrical rooms and other rooms using ceiling area spacing



Note: If ceiling height is above 30' reduce spacing by 1/2

FLOATING ROOF TOP TANKS

RedGear
Made In America

To Determine Cable Amount:

2πr

2 x 3.14 x r =C

r=Raduis C=Circumference

Ex. (2 x 3.14 x 40 =252ft of cable)

RedGear

L-Bracket

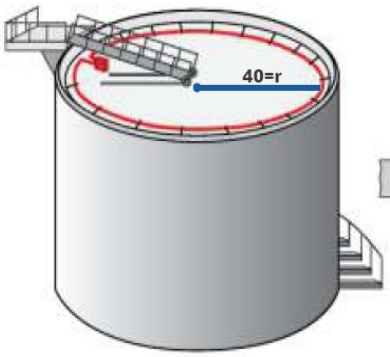
Fire Resistant

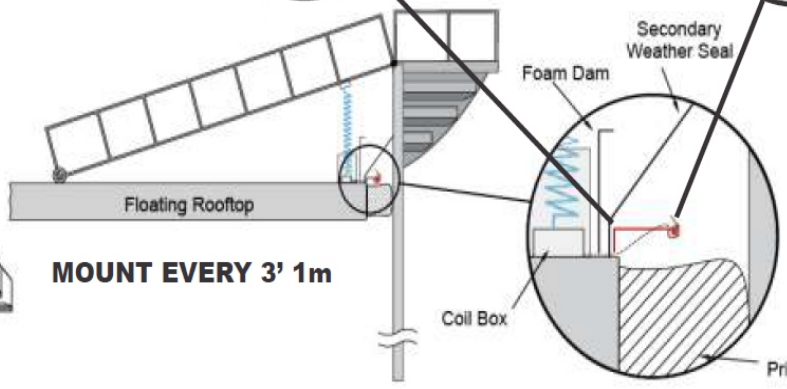
L-Bracket and Cable Tie used to secure LHD Cable

RedGear

Cable Tie

Fire Resistant





Service and Maintenance

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

SAFE LHD Cable™

Reference Guide

SAFE LHD Cable™

Reference Guide

Table of Contents:

Note:
Any repairs performed outside the scope of this SafeCable Installation, Service, and Maintenance Guide are the sole responsibility of the distributor and technician. Safe Fire Detection does not authorize sub-component repairs of any kind.

Signature of Authorized Technician

Safe Fire Detection, Inc. • 5915 Stockbridge Dr. • Monroe, NC 28110
Tel.: 704-821-7920 • Fax: 704-821-4327 • Email: staff@safefiredetection.com

1. Using this Guide

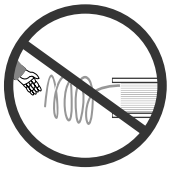
Please read before continuing

This Installation, Service, and Maintenance Guide, along with the appropriate manual, and completion of the SafeCable Training Module, will provide you with all the information needed to install, commission, service, and maintain a SafeCable Linear Heat Detection system.

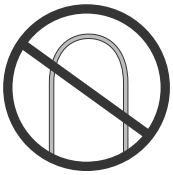
- SafeCable Linear Heat Detection systems must be installed and tested to meet all NFPA, Federal, State, and Local regulations and requirements.
- This guide may only be used by those individuals who have successfully completed the SafeCable Training Module, and have passed the certification test.
- Technical phone assistance will only be given to those individuals who have a current and valid training certificate number from Safe Fire Detection, Inc.
- Any repairs, maintenance or testing performed outside the scope of this Guide are the sole responsibility of the distributor and technician. Safe Fire Detection, Inc. neither authorizes, nor supplies parts for use in any servicing or repair by unauthorized distributors.
- Possession of this Guide does not constitute certification from Safe Fire Detection, Inc.
- Information in this guide may change without notice.

1.1 Important Precautions

As with any linear heat detection cable, certain precautions must be taken before, during, and after the installation. Please note the following precautions prior to installation.

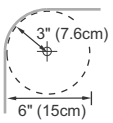


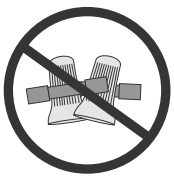
Releasing either end of unspooled wire may cause it to recoil.



Do not exceed the maximum bend radius of 3" (7.6cm).

3"(7.6cm) Radius Bend

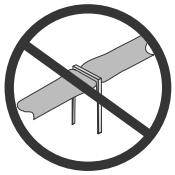




Only use mounting fasteners and connectors that are approved by SAFE Fire Detection.

Important Precautions: (cont.)

Do not store SafeCable in ambient temperatures near the alarm point of the detection wire.



Do not use staples of any kind for securing SafeCable

Do not lay SafeCable on the ground where it may be accidentally damaged.

Do not pull SafeCable across sharp objects or corners. This may damage the outer jacket.

Do not paint SafeCable

Prior to performing any testing, please read the following safety precautions.

- Be sure to get authorization prior to any testing.
- Inform personnel and alarm company prior to any testing.
- Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken.
- Always use every safety procedure. Use caution when igniting materials for system testing and have a fire extinguisher on hand.
- After completing the testing and making sure the system is not in alarm, notify personnel, reactivate the suppression systems, and bring all systems back online.
- The testing procedures contained herein may not be suitable for all installations or hazards.
- SafeCable connected to a suppression system must not have an ELR Test Switch installed.

2. What is SafeLHD?

SAFE LHD Cable™

SafeCable is available in six different temperatures: 155°, 172°, 190°, 220°, 365° and 455°. Each come standard with a PVC coating (365° is Nylon coated) but can also have an additional layer of UV-Resistant Nylon for harsh environments or Polypropylene for difficult chemical environments. In addition to these options all SafeCables can come with an additional stainless steel support "Guidewire" for longer distances.

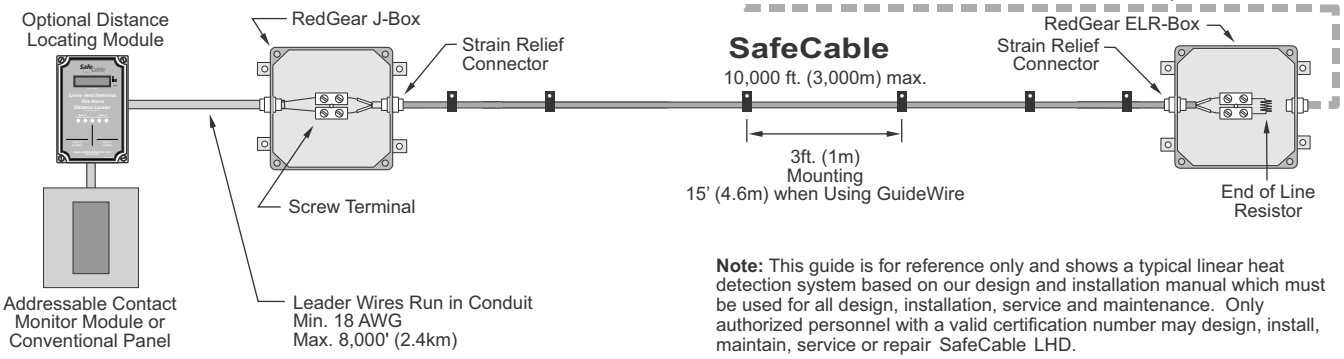
SafeCable is easy to design, install, operate and maintain Linear Heat Detection cable. Up to 15,000 feet (3,000m) of SafeCable can be used on every zone of any approved conventional panel or addressable contact monitor module. And can be used on any existing approved linear heat detection panel.

You begin at any new or existing approved fire alarm control panel. If required, the optional distance locating module may be connected directly to the fire alarm panel. Or as required directly to the addressable contact monitor module near the panel or at another convenient location. If required, leader wires are then connected to the distance locating module and run in conduit to the hazard zone where they are connected to the beginning of the SafeCable zone.

A NEMA 4(IP 65) J-Box is used at the beginning of each zone where the leader wires (if used) are connected to the SafeCable using a Screw Terminal. TheSafeCable exits the J-Box through a moisture proof Strain Relief Connector which seals the enclosure. Mounting hardware which allows the SafeCable to freely expand and contract is used to secure the cable every 3ft. (1m). Several types of mounting hardware is available for various hazards.

SafeCable may be spaced a maximum of 35 feet (10.7 meters) between runs and half the listed spacing from any sidewall. If it is an integral part of a pre-action sprinkler system, it may be strapped to the sprinkler pipe using double loop mounting straps. with the cable located on the bottom of the pipe. At the end of each zone, another optional expansion/contraction loop can be made before entering the ELR-Box through another Strain Relief Connector. The End of Line Resistor, supplied by your panel manufacturer, is then connected to the SafeCable using another Screw Terminal. It's that easy.

3. Typical Installation

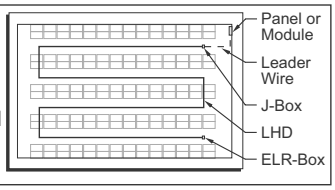


RedGear Installation Materials

Optional 4 Wire (Class "A") Return Wires are run back to panel in conduit. End of Line Resistor is located in the panel.

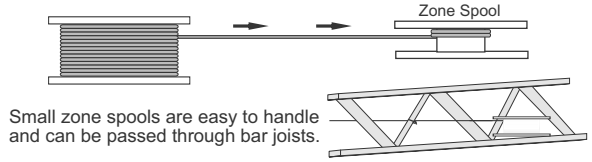
Note: This guide is for reference only and shows a typical linear heat detection system based on our design and installation manual which must be used for all design, installation, service and maintenance. Only authorized personnel with a valid certification number may design, install, maintain, service or repair SafeCable LHD.

1. Review your design to determine the location of the panel or addressable modules, and the length of detection cable needed for each zone and location of J/ELR-Boxes.



2. Check shipment to be sure you have all the needed equipment.

3. Reel off the length of wire needed for a zone, or manageble run for longer zones, onto a smaller zone spool.

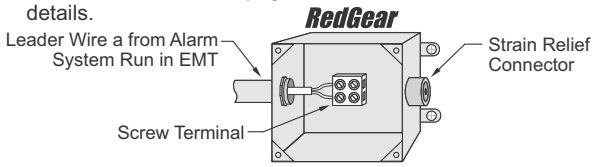


4. **Note:** You may slide mounting accessories onto the SafeCable for an easier installation.

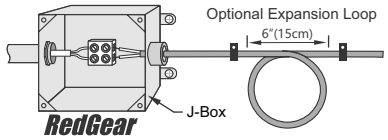
Eyebolts and insulating grommets should be run on the SafeCable prior to installation. See page 10 for GuideWire Installation details.

5. Install Leader Wires (if used) in conduit from the panel or module to the beginning of each zone per your design.

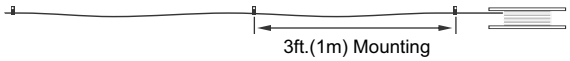
6. Fasten the J-Boxto the Leader Wire conduit. Connect the Leader Wires to the Screw Terminal and install a Strain Relief Connector. See page 8 for J-Box Installation details.



7. At the beginning of the zone, make a 6"(15cm) expansion/contraction loop in the SafeCable before passing it through the Strain Relief Connector of the J-Box. Make the connection between the Leader Wires and SafeCable using a Screw Terminal. Tighten Strain Relief Connector to create a seal.



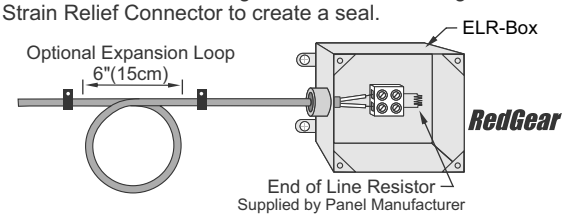
8. Mount SafeCable at 3 foot(1 meter) intervals as it is being unreeled during installation. See page 8 for Installation Sag details.



SafeCable must be able to move freely within all mounting fasteners.

9. For longer zones, it may be necessary to splice multiple sections of SafeCable together. See page 9 for Zone Splicing details.

10. At the end of the zone, make another 6"(15cm) loop in the SafeCable before passing it through the Strain Relief Connector of the ELR-Box. Connect the SafeCable and End of Line Resistor using a Screw Terminal. Tighten the Strain Relief Connector to create a seal.

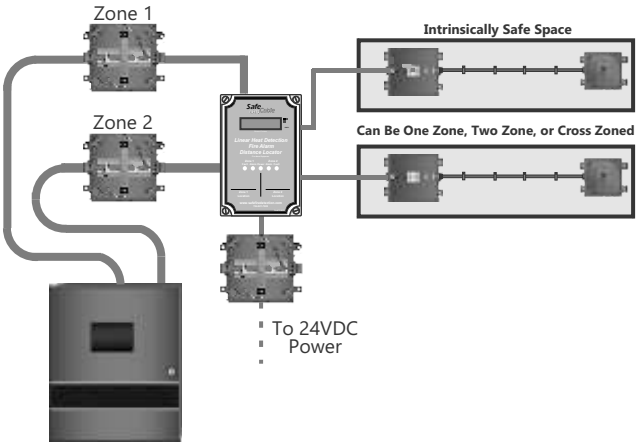


4.1 Intrinsic Safety Barriers

Intrinsic Safety Barriers for both Conventional and Addressable systems. Use the Intrinsic Safety Barriers to run SafeCable through hazardous and explosion proof areas.

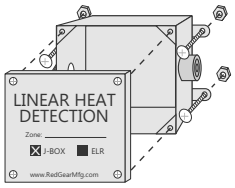
If you are running a two zone or cross zoned system, you will need to protect both zones going back to the panel.

NOTE: The power to the Distance Locating Module must also be intrinsically safe.



4.2 J/ELR-Box Installation

Securely mount the J/ELR-Box using all four mounting holes. After making the connections, tightly secure the cover.



5. Installation Sag Chart

Be aware of the amount of Sag, or Slack, in the detection wire is normal. Refer the sag chart below to determine the proper amount of Sag/Slack for your application.

Installation Temperature Range	Sag / Slack	Mount Spacing
Ambient to 20°F (-7°C)	3/4" (19mm)	3ft.(1m)
20°F (-7°C) to 0°F (-18°C)	7/8" (22mm)	3ft.(1m)
0°F (-18°C) to -20°F (-29°C)	1" (25mm)	3ft.(1m)
-20°F (-29°C) to -40°F (-40°C)	1 1/8" (29mm)	3ft.(1m)

6. Splicing SafeCable

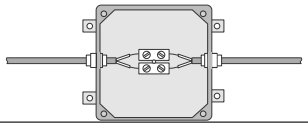
SafeCable may be easily spliced to:

- Obtain the total length needed for a zone.
- Combine multiple temperatures on a single zone.
- Repair damaged or activated sections.

All splices must be done by following one of the procedures detailed below. All outdoor splices must be made using a NEMA 4(IP 65) rated J/-Box.

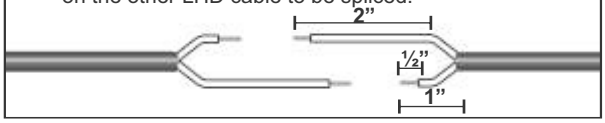
Splicing: Option A

1. All outdoor splices must be made using a J-Box or NEMA 4(IP 65) rated enclosure. See page 8 for J-Box Installation details.

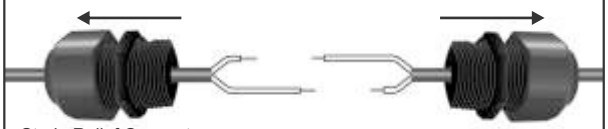


Splicing: Option B

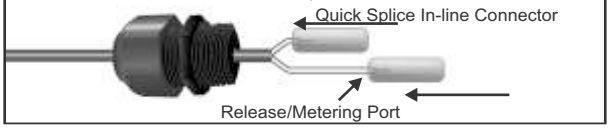
1. Strip outer LHD jacket back 2”on 1st end of LHD to be spliced. Cut one of the inner conductors 1” shorter than the other. Strip the inner conductors back ½”. Repeat on the other LHD cable to be spliced.



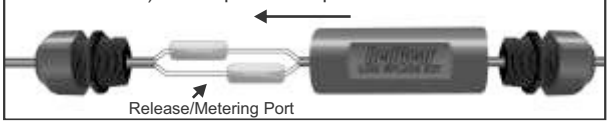
2. Slide a Strain Relief connector on the end of each LHD cable. As illustrated.



3. Push Quick Splice In-Line connectors (or single screw terminals) on two of the inner conductors on one of the LHD cable ends until it stops.



4. Slide the splice barrel onto one of the LHD cable ends. Attach the other LHD cable to the opposite end of the Quick Splice In-line connectors(or single screw terminals) to complete the splice.



6. Screw the two strain relief connectors onto the splice barrel and tighten. You have completed your splice.

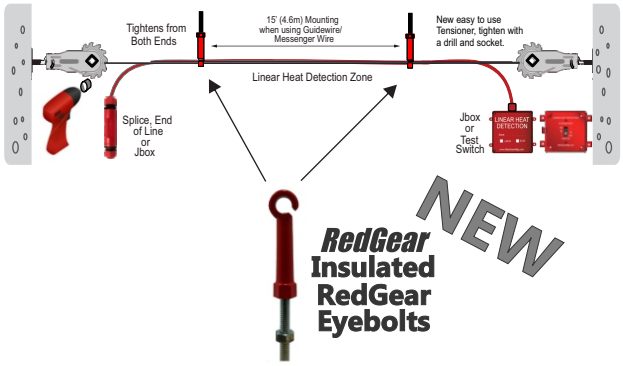
7. Special Installations

Depending on the hazard being protected, several mounting options may be used for an installation. See page 11 for Mounting Accessory detail or visit www.RedGearMFG.com.

Below are installation examples using GuideWire for additional support during long runs, and other types of mounting options.

7.1 Guidewire Tensioner

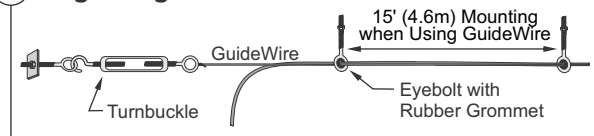
Alternatively, you may choose to use our Tensioner and Redgear eye-bolts in order to install SafeCable with Guidewire. The RedGear eyebolts allow you to easily install guidewaire by hanging your supports first and simply laying your Safecable into the eyebolt, instead of having to feed it through.



7.2 Alt. GuideWire Installation

SafeCable with GuideWire is used for installations where a long span, of up to 250 feet(76m), is required. GuideWire allows the SafeCable to be mounted at 15 foot(4.5m) intervals instead of the standard 3 foot spacing.

1 Beginning of Run

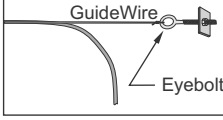


SafeCable with GuideWire may be suspended using different types of mounting accessories. See page 11 for Mounting Accessory details.

2 End of Run Anchoring Options

Option A:

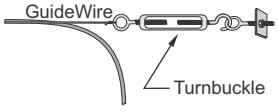
Typical end of run using an Eyebolt for anchoring.



OR

Option B:

A second Turnbuckle may be used for additional tensioning.



8. Mounting Accessories

To prevent damage to the detection cable, only mounting hardware recommended by Safe Fire Detection should be used. A part number ending with the following indicates the quantity per package. X=10, Q=25, L=50, C=100, M=1,000.

	**RedGear Double Loop Mounting Straps** Used for attaching SafeCable to pipe. **3/4" - 2"(2cm-5cm) pipe- Part #: RG1112C or RG1112M** **2 ½"-3 ½"(6cm-8.9cm) pipe- Part#: RG1113C or RG1113M**
	**Large Single Loop Mounting Straps** Use Small Single Loop Mounting Strap to secure SafeCable to Large Single Loop Mounting Strap. **4" - 6" pipe - Part #: TC1029L**
	**RedGear Small Single Loop Mounting Straps** Used with Surface Mounts, or Larger Single Loop Mounting Straps. **Part #: RG1114C or RG1114M**
	**RedGear Universal Mount with Cable Tie** Used with surface mount adhesive or screws. **Part #: RG1123C or RG1123M**
	**RedGear Beam Clamps** Used to secure SafeCable to beams. **1/4", 5/16", 3/8" - Part #: RG1117L or RG1117C** **7/16", 1/2" - Part #: RG1118L or RG1118C**
	**RedGear L-Bracket** Used with Cable Clips and Push Pins for securing SafeCable **Part #: RG1122X**
	**RedGear Cable Tray Clips** Used with Cable Clips and Push Pins for securing SafeCable **For mounting to 1/16"-1/4" material** **Part #: RG1120C or RG1120M**
	RedGear Insulated Eye Bolt Used to secure SafeCable with Guidewire **Part #: RG1130**
	Guidewire Tensioner Used to place tension on GuideWire when running extended runs of SafeCable. **Part #: RG1132**
	**End Of Line Splice Kit** Used when ending a run of SafeCable. Can be secured using the RedGear Pipe Clamp. **Part #: RG1129**

8.2 End Of Line Kit

The Redgear End of Line Kit allows for runs of SafeCable to be safely terminated without the need for a clunky J-Box. This is perfect for applications where space is a major concern. the kit can also be supported by a RedGear Pipe Clamp.

9. Connecting to a Panel

CAUTION:
Only licensed and authorized personnel should make connections to a fire alarm control panel. Completing the SafeCable Training Module does not authorize an individual to make any connections to a Fire Alarm Panel. Be sure to check all Federal, State, and Local codes prior to any fire alarm connections.

NOTE:
SafeCable does not require the use of Leader Wires for installation. SafeCable may be connected directly to any approved panel or addressable module.

9.1 2 Zone Distance Locating

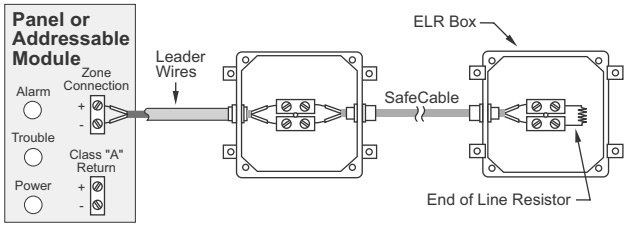
If the SafeCable system includes a Distance Locating Interface Module, please refer to the DLM-Z2 Two Zone Distance Locating Installation and Commissioning Manual.

One Zone Two Zone or Cross-Zone Distance Locating

Displays distance in both feet and meters.

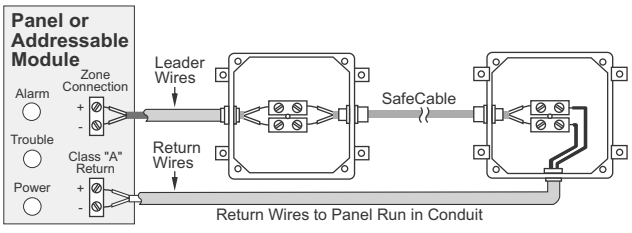
9.2 2 Wire(Class "B")Installation

Connect the Leader Wires to the panel or addressable module. The End of Line Resistor is supplied by the panel or module manufacturer. Place the resistor in the ELR-Box to complete the circuit.



9.3 4 Wire(Class "A")Installation

Connect the Leader Wires to the panel or addressable module. The Class "A" Return Wires must be run in conduit and are connected to the Class "A" return terminal in the panel, or on the addressable module. The End of Line Resistor is built into the panel or addressable module.



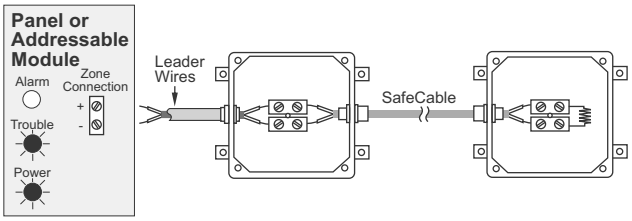
NOTE: End of Line Resistor is mounted in panel.

10. Commissioning / Service

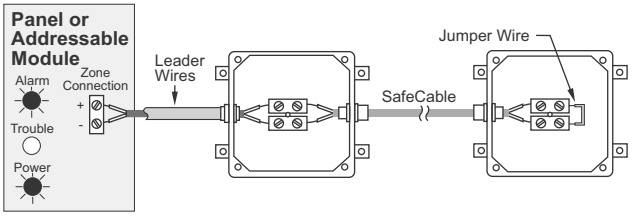
CAUTION:
Always use every safety procedure and have a fire extinguisher on hand. Be sure suppression systems have been deactivated prior to any testing and all safety precautions have been taken. Inform personnel and alarm company prior to any testing. After completing testing, be sure to notify personnel, reactivate suppression systems, and bring all systems back online.

10.1 2 Wire(Class "B")

Disconnect the Leader Wires from the panel or addressable module to place the system in a Trouble state.

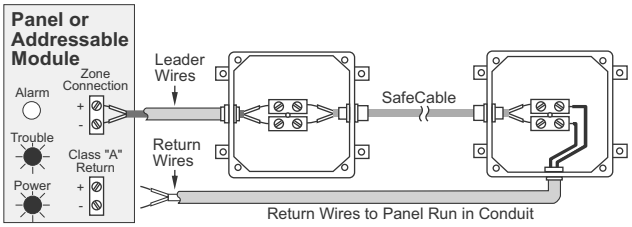


To place the fire alarm panel into Alarm state, replace the End of Line Resistor with a Jumper Wire.



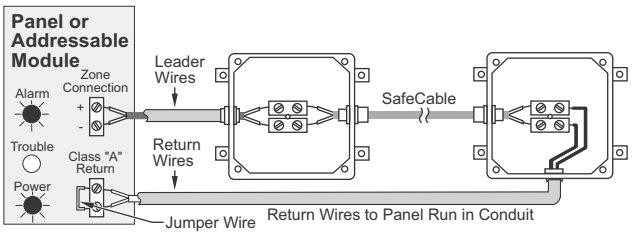
10.2 4 Wire(Class "A")

Disconnect the Class "A" Return Wires of the circuit from the control panel or addressable module terminals as shown below. This will place the panel in a Trouble state. Reconnect the Return Wires to place the circuit back into normal operation.



NOTE: End of Line Resistor is mounted in panel

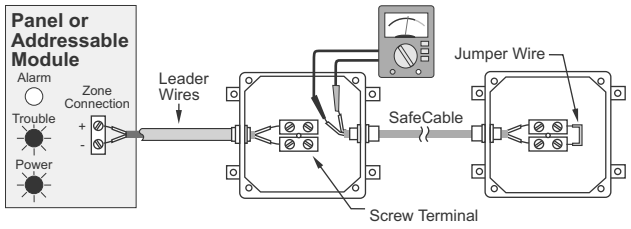
To place the circuit into an Alarm state, place a Jumper Wire across the connected Class "A" Return Wires.



Commissioning / Service: (cont.)

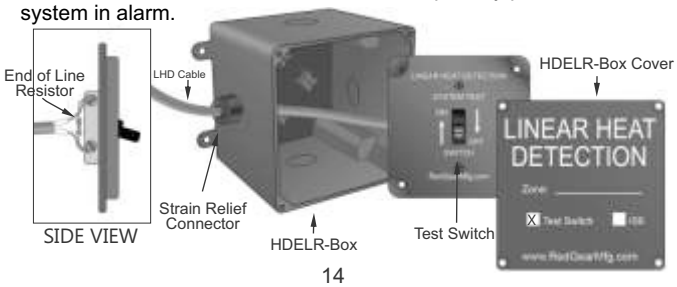
10.3 Recording Loop Resistance

NFPA requires that loop resistance be measured and recorded. To measure the resistance, put the circuit into an Alarm state by placing a Jumper Wire in place of the End of Line Resistor. Next, disconnect the SafeCable from the Screw Terminal and place an ohmmeter across the detection wire. Compare the resistance with previous tests. Any changes in resistance levels must be investigated. Changes may be caused by accidental damage to the SafeCable polymer outer covering, in-line splices, or at wire termination points.



10.4 Optional System Test Switch

Systems not connected to a suppression system may use a Testswitch located in an RedGear HDELR-Box at the end of a SafeCable run. Flick the Test switch to temporarily place the system in alarm.



11. Return Procedures(RMA)

Any Warranty Exchange or Returned Goods not returned to Safe within 30 days of the ship date, will not be credited or refunded.

No RMA's can be processed after 2:00 p.m. EST.

Warranty Exchange andReturned Goods RMA procedure.

1. Call our Customer Service department at 704-821-7920 with the Part, Model, Serial and/or Spool number to submit an RMA request.
2. An RMA will be generated and emailed to you by our Customer Service Department for a Warranty Exchange or Return Goods.
3. Return the part with a copy of the RMA in the box and a note indicating the reason for the return.
4. Our Technical Department will inspect the returned item for physical damage.
5. Pending approval from our Technical Department, one of the following will apply:

   Warranty Exchange:
   A Warranty credit will be applied to the PO if the defective part is returned, in tact, within 30 days of the replacement part ship date. Shipping will not be credited.

   Returned Goods:
   For Returned Goods, a credit memo will be issued for the amount of the part, less the restocking fee of 25% and shipping, if returned within 30 days of the ship date.

Technical
Data Sheets

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

SafeCable LHD™

Linear Heat Detection Cable

- *Addressable or Conventional*
- *Use with Any Listed Panel*

Part Numbers: TC155, TC172 TC190, TC220,TC365N

SAFE LHD Cable

Data Sheet

Features

- **Up to 15,000 linear feet (4,571m) of SafeCable per zone**
- **Approved for up to 35' (10.7m) spacing**
- **.05 ohms/ft (.164 ohms/m) resistance for twisted pair wire, lower than any other type of linear heat detection wire**
- **Lower cost than other types of linear heat detection wire**
- **Compatible with *ALL* Fire Alarm Control/Releasing Panels**
- **For use with addressable contact monitor modules**
- **Multiple alarm Temperatures: 155°F(68°C),172°F(78°C), 190°F(88°C),220°F(105°C) 365ºF(185ºC)**
- **Distance locating available**
- **Can detect anywhere along the entire length of wire**
- **Multiple alarm temperatures can be mixed on the same zone**
- **Total zone length replacement unnecessary after alarm**
- **Longer standard spool lengths means less splicing**
- **Custom lengths available**

Applications

Use where other types of detection are not practical or where the location of an overheating condition must be known. SafeCable is ideal for aircraft hangars, switchgear, in-rack freezer and cooler storage, archive and warehouse storage, elevator shafts, cooling towers, conveyors, cable trays, cable spreading rooms, terminal rooms, in-cabinet, motors, pumps, generators, tunnels, bridges, parking decks and engine bays.

Description

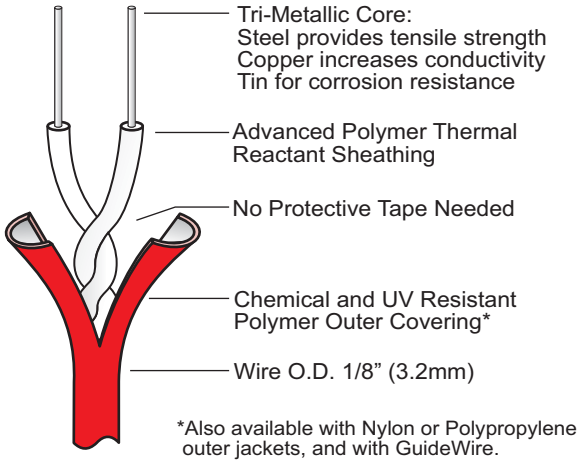
SafeCable digital linear heat detection (LHD) cable is a combination of advanced polymer and digital technologies that can detect heat anywhere along its entire length. SafeCable is also compatible with any listed addressable or conventional panel.

At the core of SafeCable is a twisted pair of extremely low resistance (.05 ohm/ft. [.164 ohms/m] of twisted cable) tri-metallic conductors, sheathed in new advanced thermal polymers. These polymers are chemically engineered to break down at specific fixed temperatures allowing the twisted conductors to make contact and initiate an alarm at the control panel without any calibration for changes in the ambient temperature. The distance locating option allows the control panel to identify and display the location, in feet or meters from the panel, where the heat source interacted with the detection cable.

The polymer used for the protective outer coating of SafeCable is chemically inert and UV protected. This allows for SafeCable to be used in an extremely wide variety of installations and hazards.

The cables TC155, TC172, and TC365 are red. TC190 and TC220 are white. If the cable has a nylon jacket then it is black, except for TC365. Polypropylene jackets are clear. The text on the cable reads: Safe Fire Detection Inc.- (Part#) - "Heat Actuated Device for Special Applications" - UL Listed - C-UL - 27EE - (Temp.) deg. F - UTHV - Date - Do Not Paint.

SafeCable Technology



*Also available with Nylon or Polypropylene outer jackets, and with GuideWire.

APPROVED

CSFM

MEA

ISO 9001 Registered

Maximum Listed Spacing

Temperature Rating	C-UL-US	FM
155°F (68°C)	35 ft. (10.7m)	30 ft. (9m)
172°F (78°C)	35 ft. (10.7m)	30 ft. (9m)
190°F (88°C)	35 ft. (10.7m)	30 ft. (9m)
220°F (104°C)	35 ft. (10.7m)	25 ft. (7.6m)
365°F (185°C)	35 ft. (10.7m)	25 ft. (7.6m)

Maximum Ambient Temperatures

Maximum Ambient Install Temperature	Alarm Temp.	Part Number
Up to 113°F (45°C)	155°F (68°C)	TC155
Up to 122°F (50°C)	172°F (78°C)	TC172
Up to 158°F (70°C)	190°F (88°C)	TC190
Up to 158F (70°C)	220°F (104°C)	TC220
Up to 305F (152°C)	365°F (185°C)	TC365N

Specifications - SafeCable

Diameter:	1/8" (3.2mm)
Weight:	Nominal 15 lbs./1000 ft. (6.8kg/305m)
Bend Radius:	3" (76.2mm)
Max. Voltage Rating:	30 VAC, 42 VDC
Resistance:	.05 ohms/ft. (.164 ohms/m)
Temperature Ratings (°F):	155°, 172°, 190°, 220°, 365°
Temperature Ratings (°C):	68°, 78°, 88°, 105°, 185°
Sheathing Options:	PVC: Corrosive and UV resistant Nylon: Abrasion resistant Polypropylene: Chemical resistant
Optional Guidewire:	Minimal support -15 ft (4.6m) intervals
Operating Temp.:	-75°F(-60°C) to Alarm Temperature

Optional Distance Locating

The Distance Locating option available for SAFE Fire Detection's SafeCable system allows for identifying where the overheating condition occurred anywhere on the total length of cable in a particular zone. Unit displays the distance from the module to the overheating condition in both feet and meters.

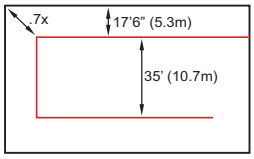
The distance locating option may be used with any listed addressable or conventional system. Any listed 24VDC power source may be used to power the distance locating module.

For additional details, please refer to the SafeCable Distance Locating Module (DLM-Z2) cut sheet.

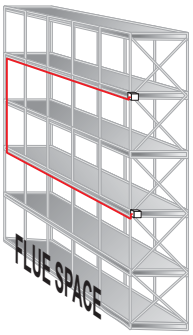
Installation Examples

For more details, please refer to the SafeCable installation manual.

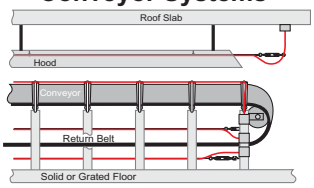
Area Spacing



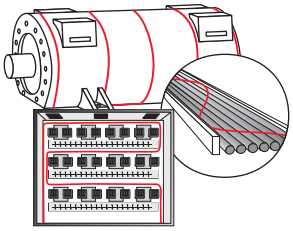
In-Rack



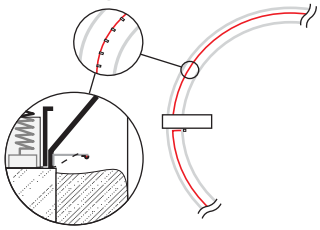
Conveyor Systems



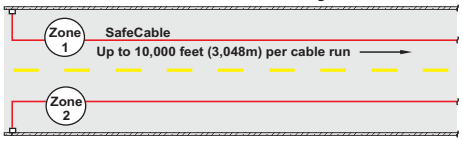
Equipment/Proximity



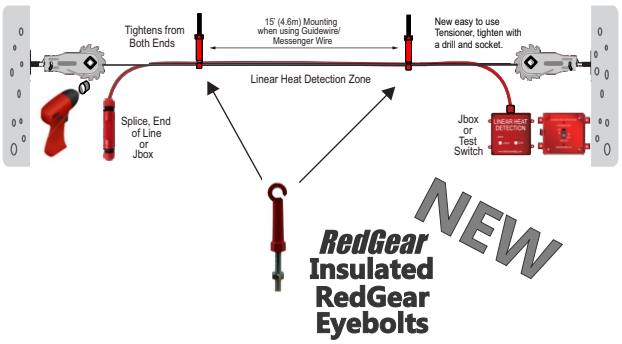
Floating Rooftop Tanks



Tunnels / Subways



SafeCable with GuideWire for Extended Runs Using Minimal Support



Note: Please refer to all federal, state and local codes, and manufacturer's recommendations prior to design or installation.

Safe Fire Detection, Inc.
5915 Stockbridge Drive
Monroe, NC 28110
Phone: 704-821-7920
Fax: 704-821-4327
www.safefiredetection.com

Publication Number: TC1XX

Engineers Specifications

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Linear Heat Detection Engineering Specifications

NOTE: To access an electronic editable version of this specification please visit www.safefiredetection.com/safecable-downloads

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Pub. #0907-2/17

SAFECABLE LINEAR HEAT DETECTOR ENGINEERING SPECIFICATIONS

CSI SECTION [ ]
LINEAR HEAT DETECTION SYSTEM (S)

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes linear heat detection systems
B. Related Sections:
   1. Section 16720 - Fire Alarm and Detection Systems
   2. Section 15300 - Fire Protection Systems

1.02 REFERENCES

A. National Fire Protection Association (NFPA):
   1. NFPA 72 Standard for Protection Signaling Systems
   2. Factory Mutual Insurance (FM) Approval Guide
   3. Underwriters Laboratories Inc. (UL) Fire Protection Equipment Directory
   4. Underwriters Laboratories Canada (c-UL-us) Fire Protection Equipment Directory

B. State and Local Codes.

1.03 SYSTEM DESCRIPTION

A. Design Requirements:
   1. Shall consist of an approved linear heat detector and control/releasing panel that are designed and installed to detect the heat from a fire as it was designed.
   2. The control/releasing panel shall be any approved self-contained, micro-controlled base technology that indicates alarms, faults and system integrity or as approved by the manufacturer. The intent of the panel is to alarm when the linear heat detector senses a fire and either alarm, or alarm and release an extinguishing agent. The panel shall also have 24, 60 or 90 (Choose One) hour battery back up.
   3. Shall be capable of zones up to 15,000ft. long.
   4. The linear heat detection systems spacing shall be determined by NFPA, State Codes, Local Codes and the manufacturer's recommendations.

B. Performance Requirements:
    1. Shall be UL, c-UL-us, FM, MEA and CSFM tested and approved.
    2. Shall be listed for up to 35 foot spacing.
    3. Shall be compatible with any UL listed fire alarm panel.
    4. Must not require proprietary panel.
    5. Shall detect a fire at its approved temperature.
    6. Shall report any equipment related fault through a fault output relays.
    7. Shall be installed to comply with NFPA standards (and the authority having jurisdiction).

1.04 SUBMITTALS

A. Submit product data and shop drawings including isometric and plan view layouts of the system under provisions of section [ ].
B. Supply one copy of the manufacturers Installation & Operation Manuals after completion of installation.
C. Supply one copy of the manufacturers Start-Up forms within 30 days after installed and commissioned.
D. Each bidder must supply their proposed system design for the area(s) to be protected together with a letter certifying that the design strictly complies with the limitations established by the manufacturer.

1.05 QUALITY ASSURANCE

A. Qualifications:
    1. Contractor: The contractor shall have a minimum of 5 years experience in the design and installation of fire detection systems.
    2. Equipment suppliers: The equipment suppliers shall be factory authorized and trained by the manufacturer every other year to design, install and maintain all aspects of the system.
B. Regulatory Requirements:
    1. Codes and approvals: Equipment supplier shall conform to the local code requirements and approvals applicable to this section. Supplier must obtain and pay all necessary permits prior to beginning work in this section.
    2. The system shall be Factory Mutual approved, and listed by Underwriters Laboratories and Underwriters Laboratories Canada.

1.06 PROJECT CONDITIONS

A. Physical/Environmental Requirements:
    1. The cabinet shall be permanently mounted where specified on the shop drawings or in a location to facilitate access and ease of service.
    2. The cabinet must be mounted in an ambient temperature range of 32° to 125° Fahrenheit.
    3. Where the environment is harsh, the releasing control panel shall be fitted with a NEMA 4 or NEMA 12 (Choose One) enclosure.

1.07 SEQUENCING and SCHEDULING

A. Coordinate work performed under this section with work specified in other sections as noted in Section [ ].

1.08 MAINTENANCE

A. Maintenance Service: Shall be provided by a factory authorized and factory trained representative in accordance with the manufacturers, NFPA 72 and local requirements of the authority having jurisdiction.

PART 2 - PRODUCTS

2.01 MANUFACTURER

A. Linear Heat Detection System:
Acceptable Manufacturer: Safe Fire Detection, Inc.
5915 Stockbridge Dr.
Monroe, NC 28110
Ph.: 704-821-7920 Fax: 704-821-4327

B. Detection Method: Linear Heat Detection

2.02 MANUFACTURED PRODUCTS

A. The Linear Heat Detector (choose one):

155 F (68°C) Linear Heat Detector	Model #: TC155
172 F (78°C) Linear Heat Detector	Model #: TC172
190 F (88°C) Linear Heat Detector	Model #: TC190
220 F (105°C) Linear Heat Detector	Model #: TC220
365 F (185°C) Linear Heat Detector	Model #: TC365N

Linear Heat Detection outer jackets and options:
Suffix to part number:
Nylon covering – N
Polypropylene covering – P
GuideWire attached – G

B. Single and Cross Zone Distance Locating module Model #: DLM-Z2

C. RedGear Installation material

2.03 COMPONENTS

A. The Linear Heat Detection System:
1. UL listed Addressable Panel or Conventional panel.
2. The detection principle shall be linear heat type, and be capable of detecting fires as it was designed at a fixed temperature.

2.04 EQUIPMENT

1. The control panel for the linear heat detection releasing system must be a microprocessor-based control capable of protecting multiple hazards in one control panel. It shall be U/L listed under Standard 864 for Local Control Units for Releasing Service. The control must also be approved by FM and be compatible with the requirements of NFPA -72 (Local: A, M, SS service types; NC signaling type) and NFPA –13, NFPA –15, and NFPA –16.
2. The Linear Heat Detector shall be a fixed temperature single line-sensing element consisting of two electrical current carrying wires separated by a heat sensitive coating. The temperature must be clearly printed on the detector.
3. An two zone distance locating module that is capable of both single zone and cross zone detection, and distance locating display. The distance locator must be UL Approved.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The contractor shall install the Linear Heat Detection system in accordance with the manufacturer's installation recommendations, Operational Manual, and use RedGear Installation Materials when installing the system.

3.02 FIELD QUALITY CONTROL

A. Tests and Commissioning:
   1. The contractor shall commission the complete installation in the presence of the end user or their appointed representative.
   2. The contractor shall provide materials all necessary instrumentation, test equipment, labor.
   3. The contractor shall record all test and commissioning requirements and a copy shall be provided to the end user or an authorized representative.
   4. Checks must be made to ensure that all ancillary equipment and warning devices are operational as designed and specified with care taken not to discharge a suppression system.
   5. The contractor shall upon completion of commissioning and testing provide the end user or authorized representative with the isometric as-built drawings as well as the System Start-Up forms, Installation and Operation manuals.
   6. The contractor shall be or be represented by an authorized representative of SAFE Fire Detection, Inc. This person must have successfully completed SAFE’s technical training seminar and show proof of it by means of a valid certificate. The company listed on the certificate at the time of the testing and commissioning must employ, this person who must be present or the certificate is not valid. The certificate is valid for a period of two years from the date on the certificate.

2013 NFPA
Linear Heat Detection
Fire Codes

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

Linear Heat National Fire Codes

Below you will find portions of the NFPA 72®, 2016 National Fire Alarm and Signaling Codes pertinent to Linear Heat detection. Please refer to the specific NFPA Code publication for additional information.

Heat Detection

3.1 General. The definitions contained in this chapter shall apply to the terms used in this Code. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meaning within the contest in which they are used. Merriam Webster's collegiate Dictionary, 11th edition, shall be the source for the ordinarily accepted meaning.

3.3.66.11 Line Type Detector. A device in which detection is continuous along a path. Typical examples are rate of rise pneumatic tubing detectors, projected beam smoke detectors, and heat-sensitive cable. (SIG-IDS)

10.4 Design and Installation.

10.4.1* All systems shall be installed in accordance with the plans, specifications, and standards approved by the authority having jurisdiction.

10.5.3.3 Service Personnel.
Service personnel shall have knowledge and experience of the maintenance and servicing requirements contained in this Code, of the equipment being serviced or maintained, and of the servicing or maintenance methods. That knowledge and experience shall be acceptable to the authority having jurisdiction or meet the requirement of 10.5.3.4.

14.2.2.1 Performance Verification.
To ensure operational integrity, the system shall have an inspection, testing, and maintenance program.

14.2.2.1.1
Inspection, testing, and maintenance programs shall satisfy the requirements of this Code and conform to the equipment manufacturer's published instructions.

Heat Sensing Fire Detectors

17.6.2.2 Marking.

17.6.2.2.1 Color Coding.

Table 17.6.2.1 Temperature Classification and Color Code for Heat-Sensing Fire Detectors

Temperature Classification	Temperature Rating Range °F	Temperature Rating Range °C	Maximum Ceiling Temperature °F	Maximum Ceiling Temperature °C	Color Code
Low*	100–134	39–57	80	28	Uncolored
Ordinary	135–174	58–79	115	47	Uncolored
Intermediate	175–249	80–121	155	69	White
High	250–324	122–162	230	111	Blue
Extra high	325–399	163–204	305	152	Red
Very extra high	400–499	205–259	380	194	Green
Ultra high	500–575	260–302	480	249	Orange

*Intended only for installation in controlled ambient areas. Units shall be marked to indicate maximum ambient installation temperature.

17.6.2.2.1.1
Heat-sensing fire detectors of the fixed-temperature or rate-compensated, spot
type shall be marked with a color code in accordance with Table 17.6.2.1

17.6.3 Location and Spacing.

17.6.3.1 Smooth Ceiling.

17.6.3.1.1* Spacing.
One of the following requirements shall apply:

(1) The distance between detectors shall not exceed their listed spacing, and there shall be detectors within a distance of one-half the listed spacing, measured at right angles from all walls or partitions extending upward to with the top 15 percent of the ceiling height.
(2) All points on the ceiling shall have a detector within a distance equal to or less than 0.7 times the listed spacing (0.7S)

17.6.3.1.2 Irregular Areas.
For irregular shaped areas, the spacing between detectors shall be permitted to be greater than the listed spacing, provided that the maximum spacing from a detector to the farthest point of a sidewall or corner withing its zone of protection is not greater than 0.7 times the listed spacing.

17.6.3.1.3 Location

17.6.3.1.3.1*
Unless otherwise modified by 17.6.3.2.2, 17.6.3.3.2. or 17.6.3.7, spot-type heat-sensing fire detectors shall be located on the ceiling not less than 4 in. (100mm) from the sidewall or on the side-walls between 4 in. and 12 in. (100 mm and 300mm) from the ceiling.

· **17.6.3.1.3.2** Unless otherwise modifies by 17.6.3.2.2, 17.6.3.3.2 or 17.6.3.7, line-type heat detectors shall be located on the ceiling or on the sidewalls not more than 20 in. (510mm) from the ceiling.

· **17.6.3.2* Solid Joist Construction.**

· **17.6.3.2.1 Spacing** The design spacing of heat detectors, where measured at right angles to the solid joists, shall not exceed 50 percent of the listed spacing.

17.6.3.2.2 Location
Detectors shall be mounted at the bottom of the joists.

17.6.3.3* Beam Construction

17.6.3.3.1 Spacing

17.6.3.3.1.1
A ceiling shall be treated as a smooth ceiling if the beams project no more than 4 in. (100mm) below the ceiling.

17.6.3.3.1.2
Where the beams project more than 4 in.(100mm) below the ceiling, the spacing of spot-type heat detectors at right angles to the direction of beam travel shall be not more than two-thirds of the listed spacing.

17.6.3.3.1.3
Where the beams project more than 18 in. (460mm) below the ceiling and are more than 8 ft. (2.4m) on center, each bay formed by the beams shall be treated as a separate area.

17.6.3.3.2 Location.
Where beams are less than 12 in. (300mm) in depth and less than 8 ft. (2.4m) on center, detectors shall be permitted to be installed on the bottom of beams.

17.6.3.4* Sloping Ceilings (Peaked and Shed)

17.6.3.4.1 Spacing

17.6.3.4.1.1
Ceiling Slopes less than 30 degrees. For a ceiling slope of less tan 30 degrees, all detectors shall be spaced using the height at the peak

17.6.3.4.1.2 Ceiling Slopes of 30 Degrees or greater.
All detectors, other than those located in the peak, shall be spaced using the average slope height or the height of the peak.

17.6.3.4.1.3 Spacing shall be measured along a horizontal projection of the ceiling in accordance with the type of ceiling construction.

17.6.3.4.2 Location

17.6.3.4.2.1 A row of detectors shall first be located at or within 36 in. (910mm) of the peak of the ceiling.

17.6.3.4.2.2 Additional detectors shall be located as determined in 17.6.3.4.1

17.6.3.5 High Ceilings.

17.6.3.5.1*
On ceilings 10 ft to 30 ft (3.0m to 9.1m) high, heat detector spacing shall be reduced in accordance with Table 17.6.3.5.1 prior to aby additional reductions for beams, joists, or slope, where

Table 17.6.3.5.1 Heat Detector Spacing Reduction Based on Ceiling Height

Ceiling Height Greater than (>)		Up to and Including		Multiply Listed Spacing by
ft	m	ft	m	
0	0	10	3.0	1.00
10	3.0	12	3.7	0.91
12	3.7	14	4.3	0.84
14	4.3	16	4.9	0.77
16	4.9	18	5.5	0.71
18	5.5	20	6.1	0.64
20	6.1	22	6.7	0.58
22	6.7	24	7.3	0.52
24	7.3	26	7.9	0.46
26	7.9	28	8.5	0.40
28	8.5	30	9.1	0.34

Annex A Explanatory Material.

FIGURE A 17.6.3.1.1 (b) Line-Type Detector - Spacing Layouts, Smooth Ceiling.

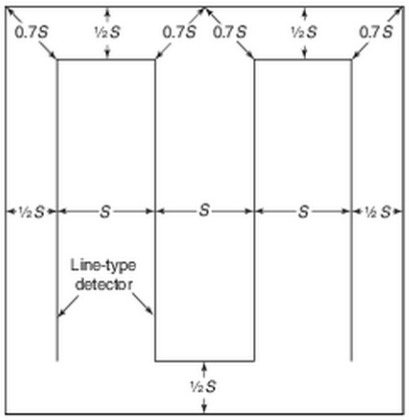

FIGURE A.17.6.3.1.1(b) Line-Type Detectors — Spacing Layouts, Smooth Ceiling.

Linear Heat Detection System Design AutoCAD Example

Always Consult All Local, NFPA and National Codes for specific requirements before you begin your project. Anyone designing, installing, servicing, repairing, or maintaining these systems should be trained and certified by the manufacturer of the equipment.

SAFECABLE LINEAR HEAT DETECTION SYSTEM

CHEMICAL STORAGE ROOM - EXPLOSION HAZARD

CEILING AREA DETECTION

SAFE Fire Detection, Inc.
5915 Stockbridge Dr., Monroe,NC 28110
Tel: 1-704-821-7920 Fax: 1-704-821-4327
www.safefiredetection.com

SAFECABLE LINEAR HEAT DETECTION SYSTEM
CHEMICAL STORAGE ROOM - EXPLOSION HAZARD
CEILING AREA DETECTION
SCOPE OF WORK

SAFECABLE LINEAR HEAT DETECTION SYSTEM FOR CHEMICAL STORAGE ROOM – EXPLOSION HAZARD. THE SYSTEM WILL CONSIST OF LINEAR HEAT DETECTION CABLE SUPPORTED EVERY 3 FEET BY CABLE CLIP TIES MOUNTED DIRECTLY TO THE CEILING.
WHEN THE SAFECABLE REACHES 155°F AT ANY POINT ALONG ITS LENGTH, IT SHALL INITIATE AN ALARM CONDITION AT THE CONTROL PANEL.

THE SAFECABLE HAS BEEN DESIGN TO PROVIDE CEILING AREA DETECTION FOR THE FOLLOWING AREAS:

SAFECABLE ZONE #1: CHEMICAL STORAGE ROOM A
SAFECABLE ZONE #2: CHEMICAL STORAGE ROOM B

ALL DESIGN AND INSTALLATION SHALL BE IN ACCORDANCE WITH CAN/ULC–S537.

EQUIPMENT LIST			
7	3	RG5224	CONVENTIONAL ISB MODULE KITS
6	3	RG1116C	CABLE CLIP TIES
5	2	TC1005X	SCREW TERMINAL
4	9	TC100N	CABLE STRAIN RELIEF CONNECTOR
3	3	RG5223	EOL TEST SWITCH BOX
2	3	RG5222	J/BOX
1	563'	TC155N	SAFECABLE LINEAR HEAT DETECTION CABLE

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TITLE: SCOPE OF WORK

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APPROVED BY:
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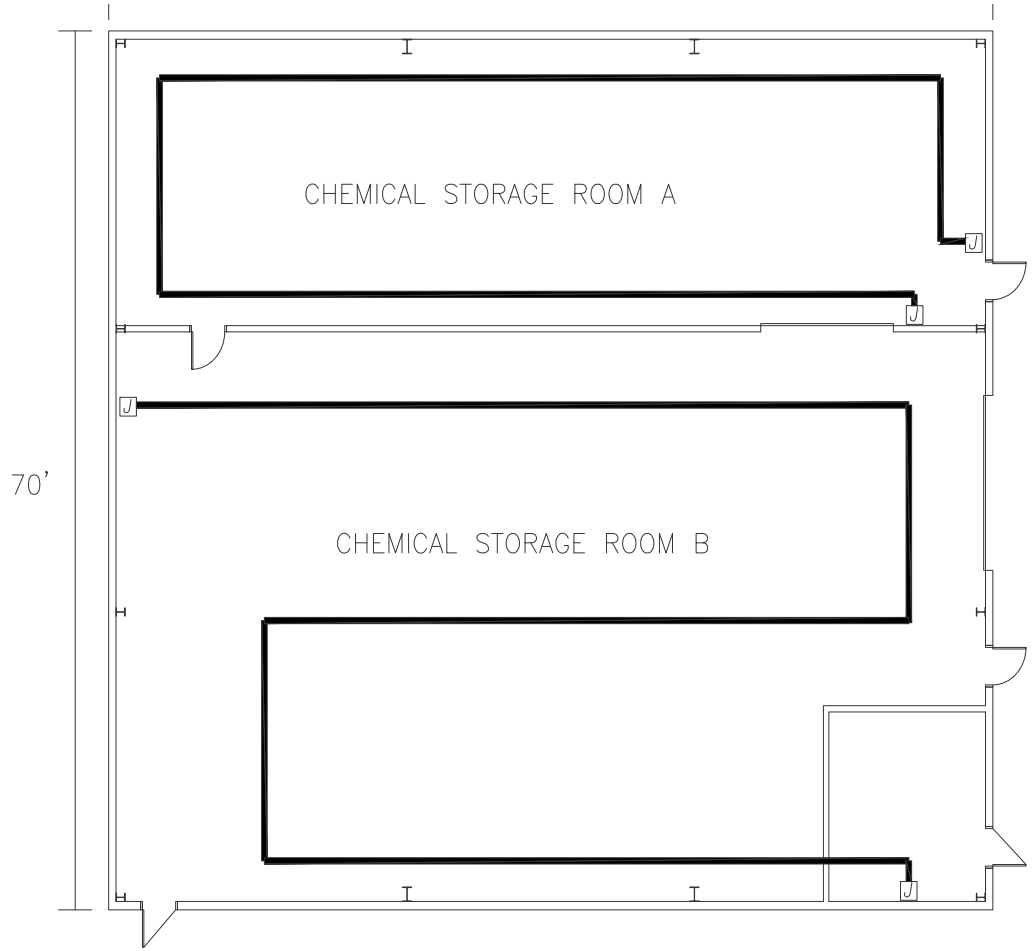
DRAWING NO.

SAFECABLE LINEAR HEAT DETECTION SYSTEM

CHEMICAL STORAGE ROOM - EXPLOSION HAZARD

CEILING AREA DETECTION
PLAN VIEW



NOTE:

1. SUPPORT THE DETECTION CABLE AT 3 FOOT INTERVALS
2. ALLOW THE PROPER AMOUNT OF SAG WHEN INSTALLING THE DETECTION WIRE. REFER TO THE SAG CHART BELOW FOR DETAILED INFORMATION.

TEMPERATURE	SAG	WIRE MOUNT SPACING
20°	3/4"	3'
0°	7/8"	3'
−20°	1"	3'
−40°	1−1/8"	3'

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TITLE: PLAN VIEW

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APPROVED BY:
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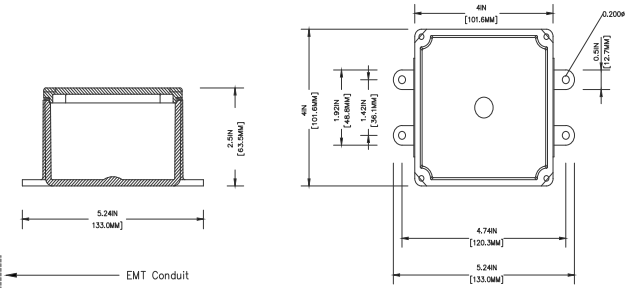
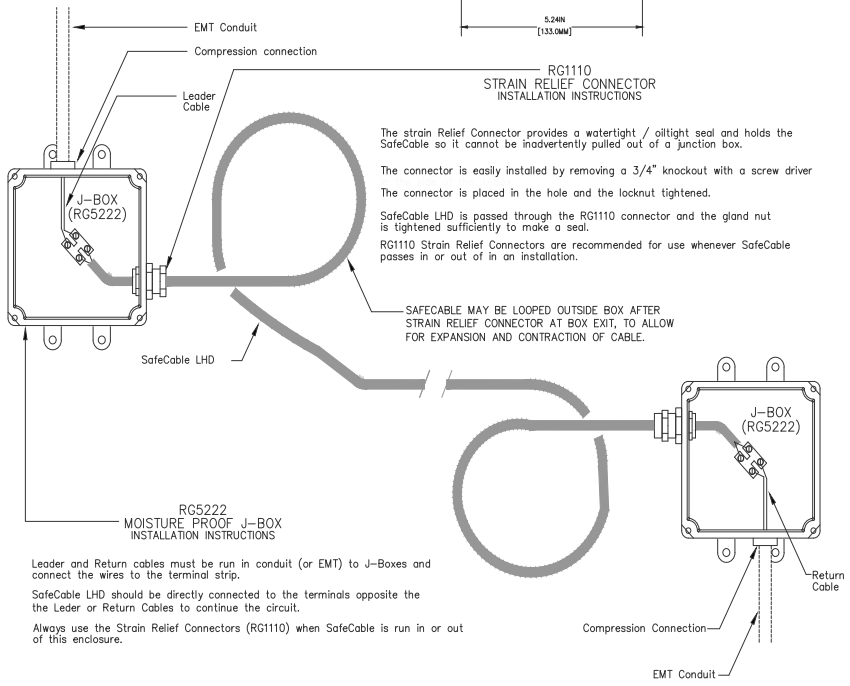
DRAWING NO.

SAFECABLE LINEAR HEAT DETECTION SYSTEM
CHEMICAL STORAGE ROOM - EXPLOSION HAZARD
CEILING AREA DETECTION
MOUNTING DETAILS





The strain Relief Connector provides a watertight / oiltight seal and holds the SafeCable so it cannot be inadvertently pulled out of a junction box.

The connector is easily installed by removing a 3/4" knockout with a screw driver

The connector is placed in the hole and the locknut tightened.

SafeCable LHD is passed through the RG1110 connector and the gland nut is tightened sufficiently to make a seal.

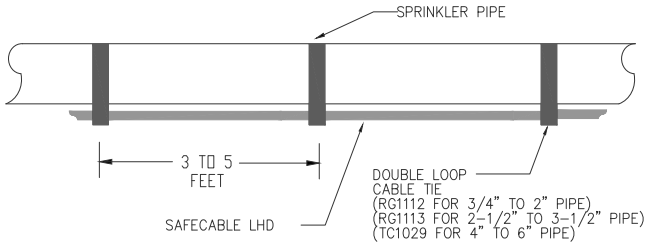
RG1110 Strain Relief Connectors are recommended for use whenever SafeCable passes in or out of in an installation.

Leader and Return cables must be run in conduit (or EMT) to J-Boxes and connect the wires to the terminal strip.

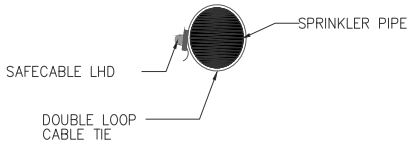
SafeCable LHD should be directly connected to the terminals opposite the the Leder or Return Cables to continue the circuit.

Always use the Strain Relief Connectors (RG1110) when SafeCable is run in or out of this enclosure.

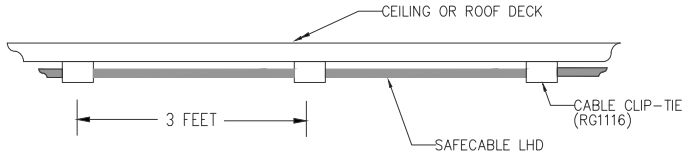
TYPICAL SPRINKLER PIPE MOUNTING DETAILS



Mount SafeCable LHD to Sprinkler pipe with RG1112, RG1113 or TC1029 Double Loop Cable Ties. Cable Ties should be place every 3 to 5 feet.

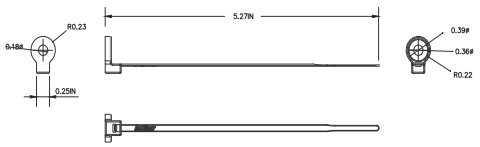


TYPICAL SMOOTH CEILING MOUNTING DETAILS



Mount SafeCable LHD to ceiling or roof deck using RG1116 cable clips. Cable Clips should be place every 3 feet. Use self taping screws to fasten Cable Clip to ceiling or roof deck.

RG1116
CABLE CLIP-TIE DETAIL
N.T.S.



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NO.	DATE	REVISION	BY

DATE:
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APPROVED BY:
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DRAWING NO.

SAFECABLE LINEAR HEAT DETECTION SYSTEM
CHEMICAL STORAGE ROOM - EXPLOSION HAZARD
CEILING AREA DETECTION
MOUNTING DETAILS

INSTALLATION NOTES

1) LEADER CABLE MUST BE RUN IN CONDUIT.

2) LEADER CABLE MST BE MINIMUM 18 AWG. MAXIMUM LENGTH OF LEADER AND RETURN CABLES NOT TO EXCEED 8000 FEET. USE SOLID COPPER CORE WIRE OR WIRE ACCEPTABLE BY NATIONAL AND LOCAL CODES

3) WHEN BENDING SAFECABLE LHD AROUND CORNERS MAINTAIN A MINIMUM OF A 3" RADIUS BEND.

4) WHEN INSTALLING SAFECABLE LHD IN REFRIGERATED STORAGE THE CABLE MUST HAVE SAG OR SLACK IN-BETWEEN EACH MOUNTING POINT. REFER TO SAFECABLE INSTALLATION AND OPERATION MANUAL SECTION 5.4.3 FURTHER INFORMATION.

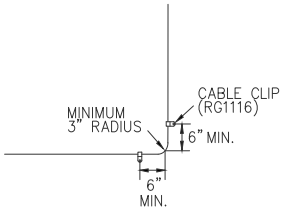
5) SAFECABLE LHD MUST BE SUPPORTED EVERY 3 TO 5 FEET.

6) WHEN INSTALLING CABLE BE SURE TO KEEP TENSION ON CABLE TO PREVENT RECOILING OF CABLE.

7) WHEN PULLING CABLE THROUGH AND AROUND SHARP OBJECTS EXTRA CARE SHOULD BE TAKEN TO AVOID DAMAGING THE CABLE.

8) TO AID IN THE INSTALLATION OF THE CABLE, SMALLER SPOOLS ARE AVAILABLE UPON REQUEST TO RE-SPOOL CABLE.

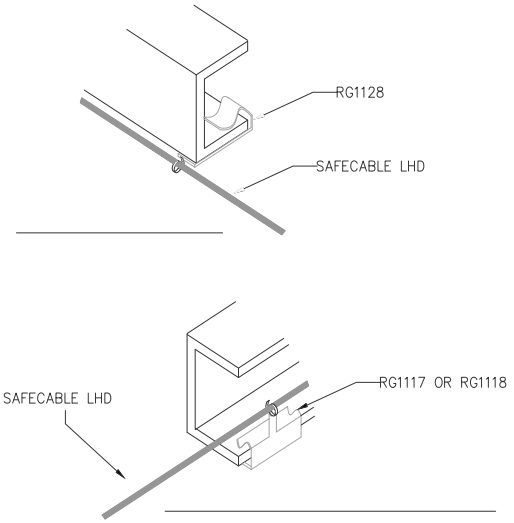
TYPICAL CABLE CLIP MOUNTING DETAIL

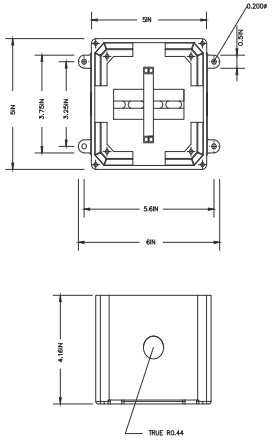


NOTE:
MAINTAIN A MINIMUM 3" RADIUS BEND AT ALL CORNERS AND CHANGES IN DIRECTION OF SAFECABLE RUNS

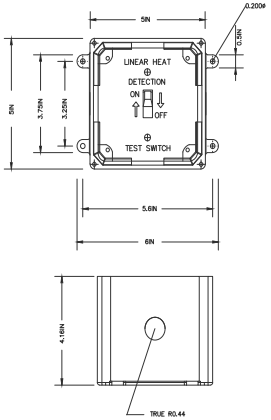
SAFECABLE MUST BE SUPPORTED ON EACH SIDE OF THE RADIUS BENDS AS NOTED ABOVE

TYPICAL SOLID BEAM MOUNTING DETAILS

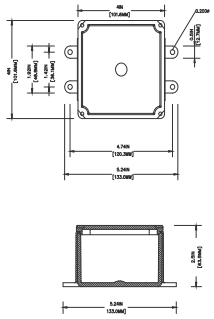




INTRINSIC SAFETY BARRIER

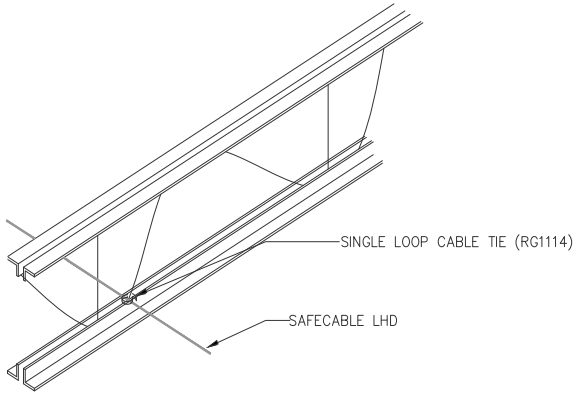


END OF LINE
TEST SWITCH



JUNCTION BOX

TYPICAL OPEN BAR JOIST MONUNTING DETAIL



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DATE:
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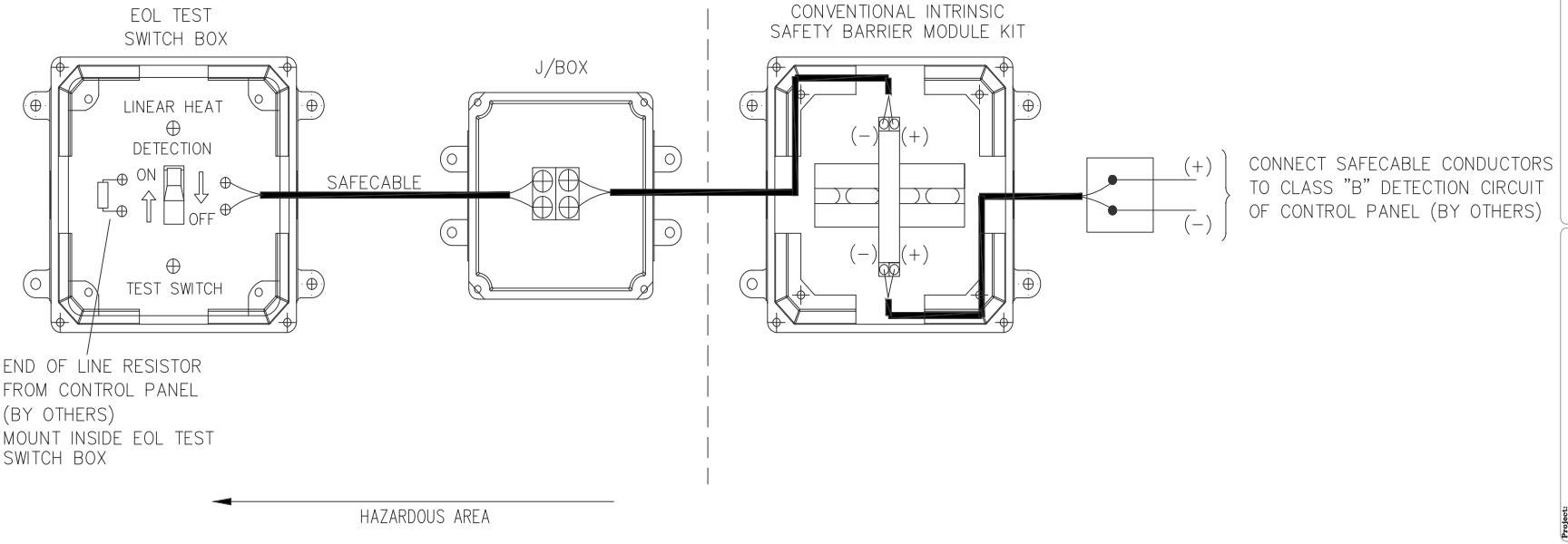
SHEET NO. 5 OF 6
DRAWING NO.

SAFECABLE LINEAR HEAT DETECTION SYSTEM

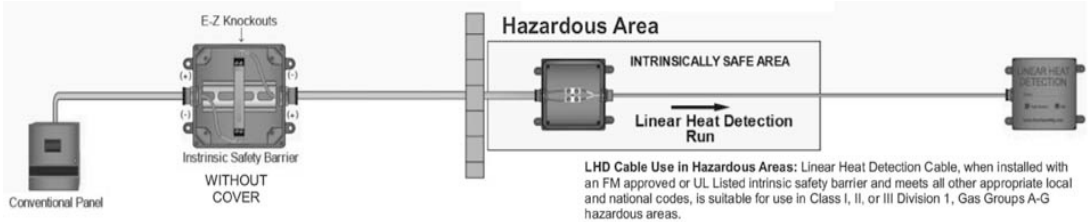
CHEMICAL STORAGE ROOM - EXPLOSION HAZARD

CEILING AREA DETECTION

ELECTRICAL DETAILS



WIRING DIAGRAM
SAFECABLE
N.T.S.



LHD Cable Use in Hazardous Areas: Linear Heat Detection Cable, when installed with an FM approved or UL Listed intrinsic safety barrier and meets all other appropriate local and national codes, is suitable for use in Class I, II, or III Division 1, Gas Groups A-G hazardous areas.

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Consultant:

TITLE: ELECTRICAL DETAILS

NO.	DATE	REVISION	BY

DATE:
SCALE: NTS
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APPROVED BY:
SHEET NO. 6 OF 6
DRAWING NO.