Protec
Fire and Security Group

Aspirating Detection System

Protec Aspirating Detection System
Cold Store Design Guide

ADDRESSING SAFETY SYSTEMS WITH INTELLIGENCE

Document Revision Details

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Introduction

This Design Guide has been produced by Protec Fire & Security Group to assist when designing Protec Fire & Smoke Aspirating Detection Systems for Cold Storage (also known as Freezer) applications.

The aim of the Design Guide is to provide a basic design concept to enable the designer to provide a considered, compliant and correctly functioning detection system using Protec Aspirating Systems solutions.

Cold Storage buildings come in many varying dimensions and heights and with sometimes varying temperatures, therefore each cold store needs to be designed specifically for its own layout, operation and risk.

Cold stores may contain different combustible materials and generate differing amounts of fire and smoke particles. Therefore, it is important to select the correct detection technology for the risk.

Common features within the majority of cold stores include forced airflow from fan chiller units, high level in-rack storage systems and dry combustible products.

All aspirating system designers should be fully qualified, competent and conversant with the technical operation and differences of the various aspirating technologies and detectors. Designers should also familiarize themselves with all aspects of local applicable codes and standards.

The following pages offer guidance to the designers and installers of these systems in order to achieve a successful Cold Store Aspirating Detection System.

This design Guide should not be used for Blast Freezer applications.

Please Note:

The information provided within this Design Guide should be used in conjunction with your Local Standards and Fire Codes. Local regional industry practices where relevant should also be observed.

Table of Contents

Definition of a Protec Aspirating Detection System

Aspirating detectors provide an 'active' detection system that sample air from a given area or fire zone to detect the presence of combustion particles or smoke.

These combustion and/or smoke 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/smoke particle levels this information is presented as a number of staged alarms via the detector display and outputs and is often integrated into the main building fire alarm system.

Aspirating **SMOKE** Detection utilising ProPointPlus 'Optical & CO' Aspirating Smoke Detectors

Protec ProPointPlus aspirating smoke detectors utilise 'optical' LED Scatter Chamber Detectors (SCD's) within each of the four detector sampling ports. Each SCD can be individually pre-set to Class A - high sensitivity (3 holes per pipe), Class B - enhanced sensitivity (5 holes per pipe), Class C - normal sensitivity (8 or 12 holes per pipe) and Prison Cell mode settings. The SCD smoke sensor identifies the visible smoke particles generated as material over-heats. All ProPointPlus aspirating smoke detectors are fully compliant with EN54 Part 20.

Protec ProPointPlus aspirating smoke detectors utilise 'optical' LED Scatter Chamber Detectors (SCD's) within each of up to four detector sampling ports. Each SCD can be individually pre-set to Class A - high sensitivity (3 holes per pipe), Class B - enhanced sensitivity (5 holes per pipe), Class C - normal sensitivity (8 or 12 holes per pipe). The SCD smoke sensor identifies the visible smoke particles generated as material over-heats. All ProPointPlus aspirating smoke detectors are fully compliant with EN54 Part 20.

ProPointPlus Smoke Detection

Maximum area of detection allowed:	2000m^2 or a single zone or fire compartment
Maximum total length of sampling pipe:	Approx. 200m (subject to calculation program)
Maximum number of pipes:	4
Maximum number of sampling holes:	EN54 Class A – 3 holes per pipe EN54 Class B – 5 holes per pipe EN54 Class C – 8 holes per pipe All designs subject to calculation program verification
Sampling pipe I/D:	15mm – 25mm
Supply Voltage:	20 – 29 volts DC
Current consumption:	Fan speed dependant
Dimensions:	W – 380mm, H – 250mm, D – 137mm

Aspirating **FIRE & SMOKE** Detection utilising Cirrus HYBRID Aspirating Fire & Smoke Detectors

Protec Cirrus HYBRID aspirating detector contains two separate detection elements to detect two different phenomenon associated with fire (fire particles and smoke particles). The Cirrus HYBRID detector includes as its primary sensor, a 'Cloud Chamber' fire detector. This is supplemented by high sensitivity 'Optical' detectors provided within each of the four detector sampling ports.

Fire detection – The Cloud Chamber detector identifies invisible sub-micron particles generated during the combustion process when an over-heat condition occurs. The cloud chamber measurement scale is in particles per cm^3 (PCM^3) and provides the 'Fire' detection element of the Cirrus HYBRID detector.

Smoke detection – Optical smoke sensors identify visible smoke particles generated as material continues to over-heat. The optical measurement scale is percent obscuration per meter (%Obs/m) and provides the 'Smoke' detection element of the Cirrus HYBRID detector.

Combined Fire and Smoke Scale – Cirrus HYBRID detectors indicate these two separate detection element scales (PCM^3 & %Obs/m) individually, however as its primary display these two scales are combined and integrated on a bespoke scale known as Combined Fire and Smoke (CFS). All Cirrus HYBRID aspirating fire and smoke detectors are fully compliant with EN54 Part 20.

Cirrus HYBRID Fire & Smoke Detection

Maximum area of detection allowed:	$2000m^2$ or a single zone or fire compartment
Maximum total length of sampling pipe:	260m (subject to calculation program)
Maximum number of pipes:	4
Maximum number of sampling holes:	EN54 Class A – 36 holes @ 200 CFS EN54 Class B – 44 holes @ 400 CFS EN54 Class C – 44 holes @ 600 CFS All designs subject to calculation program verification
Sampling pipe I/D:	15mm – 25mm
Supply Voltage:	20 – 29 volts DC
Current consumption:	Fan speed dependant
Dimensions:	W – 380mm, H – 250mm, D – 137mm

Important Note:

The above details reflect the general parameters where an EN 54 approved ProPointPlus or Cirrus HYBRID detector is required. All aspirating detection system designs are subject to the local area/country design, installation and performance codes/requirements. Additionally ALL system designs must be verified using Protec 'ProFlow' sampling pipe calculation program.

'ProFlow' sampling pipe calculations confirm acceptability of operational parameters such as type of detector, lengths of sampling pipes, quantity and diameter of sampling holes or capillary sampling points.

Protec Aspirating Detector Power Supply Units

9300/EN/18 **9300/EN/24** **9800/EN/38** **9800/EN/65**

The system designers should ensure a suitable and compatible power supply is used for each aspirating detector. Protec Series 9000 3Amp & 8Amp power supplies are a self-contained supply designed to power Protec aspirating detectors and charge the associated batteries simultaneously.

The charger uses power factor correction to ensure a near unity power factor, and switch-mode technology to provide a lightweight and efficient unit.

The designer should ensure the power supply is sized correctly to suit the alarm load, the quiescent load and alarm standby periods. The following table provides quiescent and alarm power consumption figures for Protec ProPointPlus, Cirrus Pro and Cirrus HYBRID aspirating detectors.

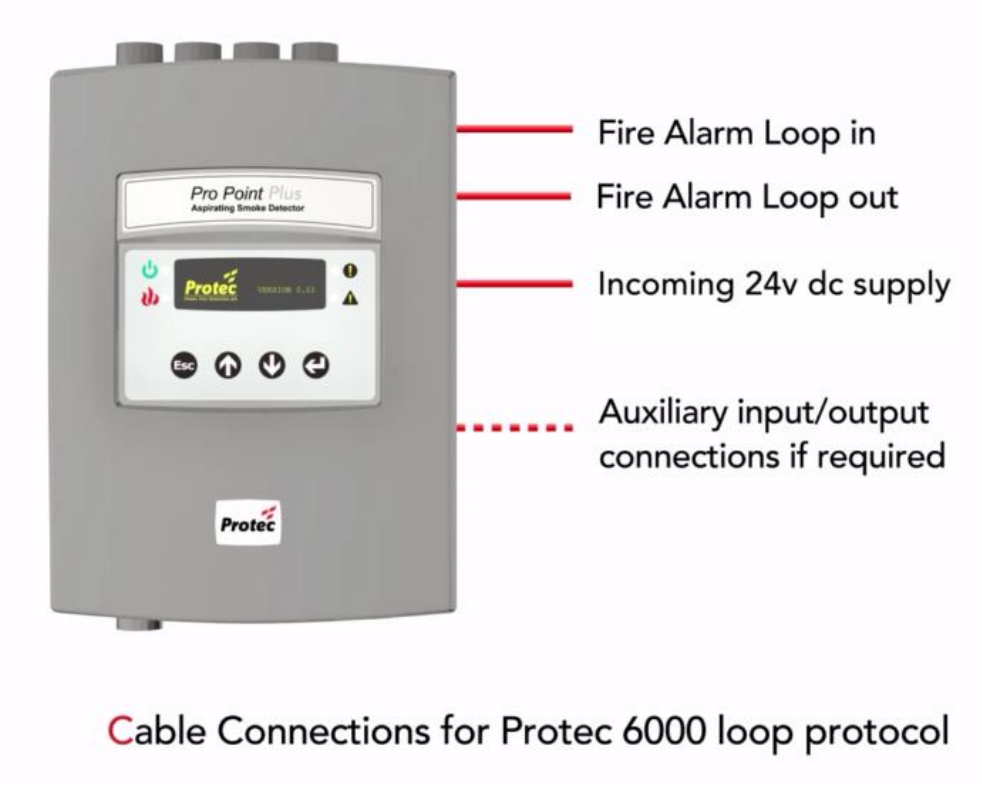
ProPointPlus Detector Power Consumption.

	ProPoint Plus							
Blower Speed (%)	Quiescent				Alarm			
	SCD 1x	*SCD 2x*	*SCD 3x*	*SCD 4x*	*SCD 1x*	*SCD 2x*	*SCD 3x*	*SCD 4x*
100	360	400	425	455	410	450	475	505
95	347	387	411	440	397	437	461	490
90	334	374	397	425	384	424	447	475
85	321	361	383	410	371	411	433	460
80	308	348	369	395	358	398	419	445
75	295	335	355	380	345	385	405	430
70	282	322	341	365	332	372	391	415
65	269	309	327	350	319	359	377	400
60	256	296	313	335	306	346	363	385
55	243	283	299	320	293	333	349	370
50	230	270	285	305	280	320	335	355
45	220	259	274	293	270	309	324	343
40	210	248	263	281	260	298	313	331
35	200	237	252	269	250	287	302	319
30	190	226	241	257	240	276	291	307
25	180	215	230	245	230	265	280	295
20	170	204	219	233	220	254	269	283
15	160	193	208	221	210	243	258	271
10	150	182	197	209	200	232	247	259
5	140	171	186	197	190	221	236	247

Cirrus HYBRID Detector Power Consumption

	CirrusHYBRID							
Blower Speed (%)	Quiescent				Alarm			
	SCD 1x	*SCD 2x*	*SCD 3x*	*SCD 4x*	*SCD 1x*	*SCD 2x*	*SCD 3x*	*SCD 4x*
100	522	590	626	685	622	690	726	785
95	504	572	608	649	604	672	708	749
90	485	558	595	640	585	658	695	740
85	463	545	572	604	563	645	672	704
80	449	531	554	590	549	631	654	690
75	431	495	535	567	531	595	635	667
70	417	481	522	549	517	581	622	649
65	404	467	504	535	504	567	604	635
60	390	454	485	517	490	554	585	617
55	376	440	472	504	476	540	572	604
50	372	417	454	485	472	517	554	585
45	363	408	445	472	463	508	545	572
40	349	395	431	458	449	495	531	558
35	335	381	417	445	435	481	517	545
30	322	367	422	435	422	467	522	535
25	317	363	395	417	417	463	495	517
20	308	354	372	395	408	454	472	495
15	299	345	358	381	399	445	458	481
10	295	335	345	367	395	435	445	467
5	290	317	331	358	390	417	431	458

Typical Electrical Connections for a Protec Aspirating Detector.



Cable Connections for Protec 6000 loop protocol

Fire alarm loop connections

The fire alarm loop connections shown above are for integration into a Protec 6000 protocol main building fire alarm system. Each ProPointPlus detector is manufactured with a 1 – 4 address 6000 protocol interface. This allows up to four address (four pipes), from the ProPointPlus detector, to be individually identified at the Protec 6000 protocol main building fire alarm panel. Cirrus HYBRID non-scanning detectors contain a single address 6000 protocol interface, Cirrus HYBRID scanning detectors contain 1 - 4 address 6000 protocol interface, this allows up to four address (four pipes), from the ProPointPlus detector, to be individually identified at the Protec 6000 protocol main building fire alarm panel.

24vDC Power supply

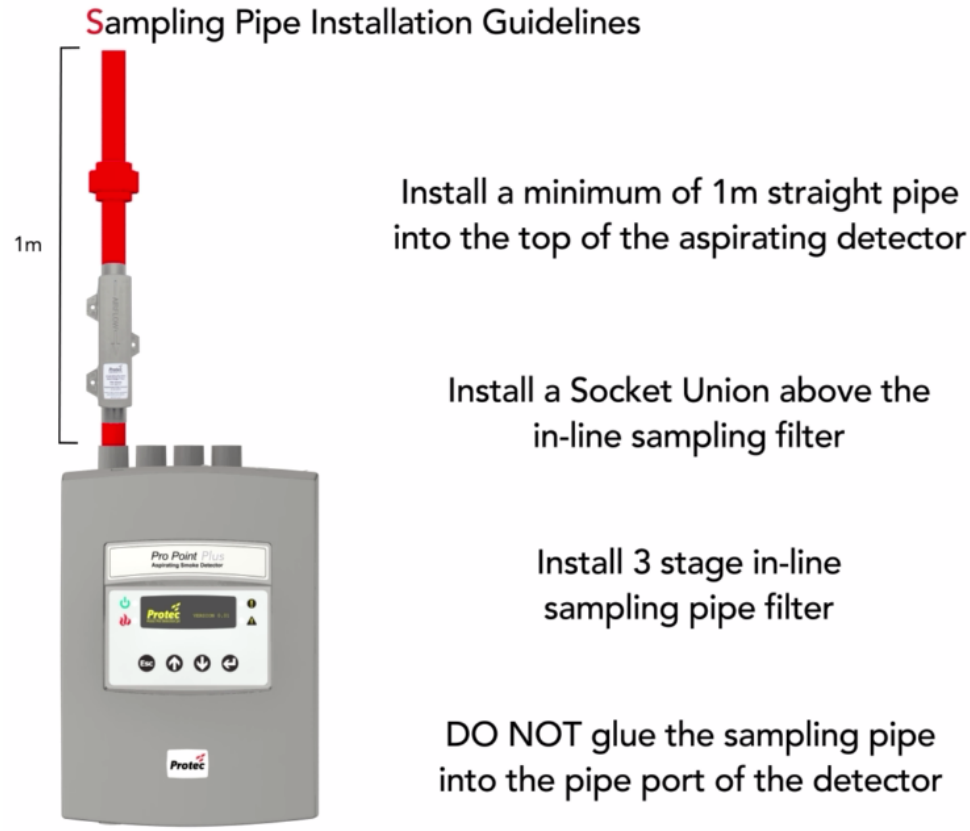
ProPointPlus detectors can be configured to monitor the incoming 24vdc standby power supply and report this directly to a Protec 6000 protocol main building fire alarm panel. Examples of compatible Protec power supply units have been given on page 6.

Programmable Input/Outputs

ProPointPlus/Cirrus HYBRID aspirating detectors have 3no. programmable 'Input' connections for remote Isolate, Silence, Reset, Mains Fault and Battery Fault monitoring.

ProPointPlus/Cirrus HYBRID aspirating detectors have 5no. programmable 'Output' connections for common Fault, common Pre-Alarm, common Fire, Pipe 1 Fire, Pipe 2 Fire, Pipe 3 Fire, Pipe 4 Fire and Double Knock signals., usually used to connect to non Protec main building fire alarm panels.

Typical Mechanical Connections for a Protec Aspirating Detector.



Do not glue the sampling pipes directly to the ProPointPlus detector inlet ports

Each sampling pipe port utilises a reducing diameter pipe entry designed for 25mm o/d sampling pipe. The installer should ensure the sampling pipe is cut squarely and pushed firmly into the pipe port until held securely within the port. If the above is installed correctly there should be no requirement for the sampling pipe to be glued into the sampling pipe port, thereby allowing removal for future servicing requirements if necessary.

In-line Filters

All optical based aspirating detectors can provide unwanted (false) alarms from dust. Protec would therefore recommend an in-line sampling pipe dust filter for all lift shaft applications. The Protec 3 stage in-line dust filter contains a fine particle filter (greater than 5 micron), a medium particle filter (greater than 10 micron) and a course particle filter (greater than 16 micron). The Protec 3 stage in-line filter (part code 61-986-F01), should be suitable for most lift shaft applications.

Socket Unions

Protec would recommend the installation of a socket union pipe accessory on each sampling pipe above the in-line sampling pipe filter. This allows removal of the complete filter for cleaning should this be required during system servicing.

1m straight pipe at entry to aspirating detector.

Protec would recommend a 1m straight length of sampling pipe at the point of entry to the aspirating detector to assist with linear airflow being provided to the airflow monitoring components.

Protec Aspirating System Sampling Pipe and Accessories

37-550-68
3 Metre Length 25mm o/d
Red ABS Sampling Pipe

37-550-68-SR
50m Length of 25mm o/d
Flexible Red Sampling Pipe

37-552-70
25mm Red ABS 90°. Long Radius Bend

37-555-73
25mm Red ABS 45 deg. Elbow

37-554-72
25mm Red ABS 'Tee' Piece

37-553-71
25mm Red ABS End Cap

37-559-77
25mm Red ABS Socket Union

37-558-76
Red ABS Pipe Clips

37-551-69
25mm Red ABS Jointing Socket

37-560-70
Conical Head Capillary Sampling point
2mtrs of 10mm sampling tube

37-561-71
Flush Disc Capillary Sampling point
2mtrs of 10mm sampling tube

37-562-72
Discrete Capillary Sampling point
2mtrs of 10mm sampling tube

37-563-73
T piece for use with 10mm Capillary
Sampling tube

37-564-74
30mtr coil RED 10mm Capillary
Sampling Tube

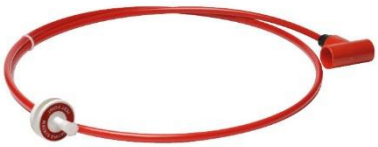
37-564-74W
30mtr coil OPAQUE 10mm Capillary
Sampling Tube

37-566-76
Conical Head Capillary Sampling Point

37-567-77
Flush Disc Capillary Sampling Point

37-568-78
Discrete Capillary Sampling Point

37-585-15
25mm Red ABS End Cap 'Test Point'



37-586-16
Flush Disc Capillary 'Test Point' c/w 2mtrs of 10mm sampling tube.

37-545-71
1m x 25mm o/d Flexible Expansion Loop

37-556-74
S250ml Tin Solvent Cement

23-039-37
Sample Hole Warning Labels. Roll of 100
1no Label required per Sampling Point

37-534-68 - 2.0mm Purple
37-535-69 - 2.5mm Grey
37-536-70 - 3.0mm Yellow
37-537-71 - 3.5mm Blue
37-538-72 - 4.0mm Green
37-539-73 - 4.5mm Black
37-540-74 - 5.0mm W hite
37-541-75 - 6.0mm Brown

Hole Identification Tags
(See Datasheet - MED2123)

61-986-F01 - 25mm In-line Pipe Filter
61-986-28 - 3 Stage Replacement Filter Mesh (See Datasheet - MED2125)

45-023-04
Heavy Duty Dust & Humidity Filter
(See Datasheet - MED2124)

45-023-07 - Heavy Duty Dust & Humidity Filter c/w Self Drain Flexible Loop
(See Datasheet - MED2124)

37-584-14-BIS
Condensation Trap

37-599-29
Flush Disc Capillary Test Point

37-590-20
Pipe Cutter

Detector Sensitivity Settings often referred to as 'Detector Class'

The sensitivity setting of the aspirating detector is primarily determined by the fire risk of the cold store. To this extent, most cold stores can be considered a high risk, as cold stores generally have a very dry atmosphere due to the extreme cold temperatures.

Local country design codes should be referenced for clarification on detector sensitivity and expected performance. For UK projects generally a 'Class B' detection system is considered appropriate for cold stores. In high ceiling spaces above 25m a 'Class A' detection should be considered.

Class A Detection System
Definition:- Aspirating smoke detector providing very high sensitivity. These systems are often employed in areas so that evasive measures can be initiated before any significant damage is incurred to areas containing mission critical or high value artefacts or operations.

Class B Detection System
Definition:- Aspirating smoke detector providing enhanced sensitivity. These systems are often employed in areas where fire and smoke particles are difficult to detect. This would include areas where there is dilution from high airflow movements or where there are high ceiling spaces.

Class C Detection System
Definition:- Aspirating smoke detector providing normal sensitivity. These systems are often employed as an alternative to point type smoke detectors or beam detectors for reasons such as building deflection or where perhaps servicing is made easier using aspirating system pipe installations.

Note:
Where the cold store 'background particle levels' will not allow the aspirating detector to be set to one of the above categories, it is important to introduce an extended 'soak test period', where the background pollutant variations can be determined. Having logged this information for an appropriate time period the alarm thresholds can then be configured to avoid unwanted alarms.

Having established the ambient background environment and detector alarm thresholds, a suitable 'performance test' is recommended. Any tests should be agreed by all concerned parties and appropriate health and safety procedures should be adhered to. See Note below on 'Requirement for Aspirating Detection System Performance Testing.'

Protec Aspirating Detector Choice for Cold Store Applications

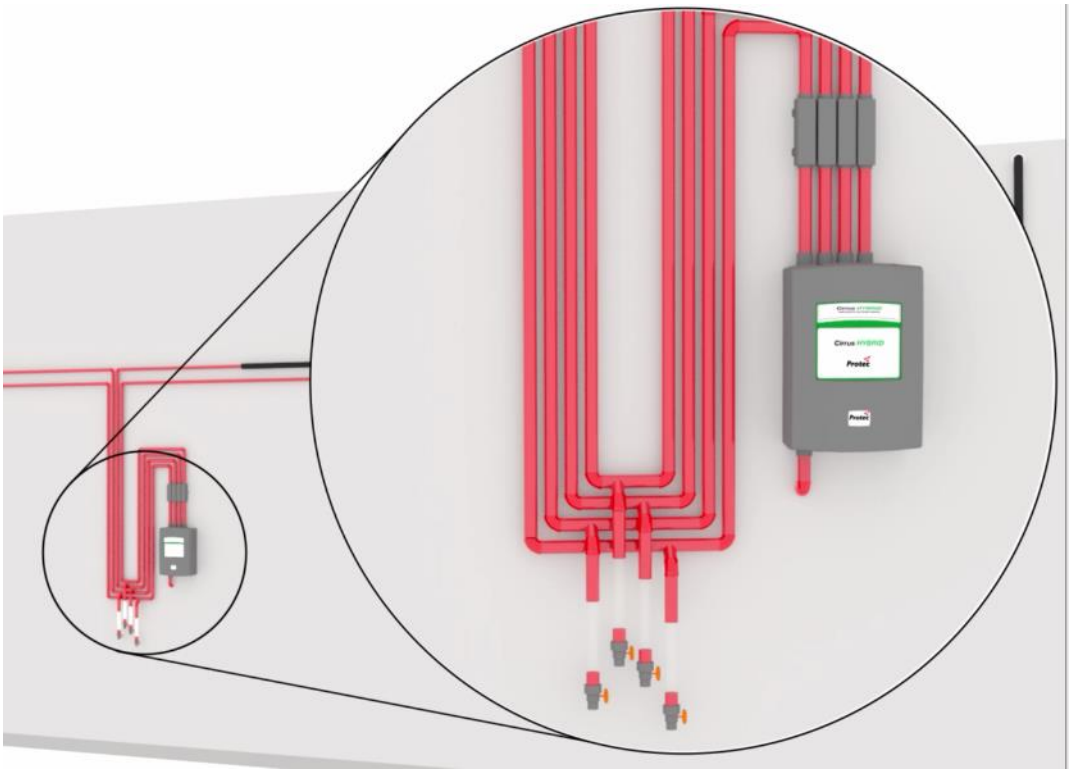
Protec ProPointPlus and Cirrus HYBRID aspirating detectors are both suitable aspirating detectors for cold store applications, however the following points should be noted.

The forced air movement from the fan chiller units within the cold store room will create dilution of the smoke from an overheat condition. The cloud chamber technology within Cirrus HYBRID aspirating detectors has been shown to be more resilient to the effects of dilution than optical only aspirating detection systems.

When smoke is produced from an overheat condition, this smoke can appear very lethargic in movement, as there may be little thermal lift of these particles due to the very low temperatures within cold store room,. However the more energetic invisible sub-micron fire particles detected by the cloud chamber technology in the Cirrus HYBRID aspirating detector, are in much greater quantity and generally have more buoyancy, resulting in earlier detection than optical only aspirating detectors.

General Design Guidelines for Cold Store Applications

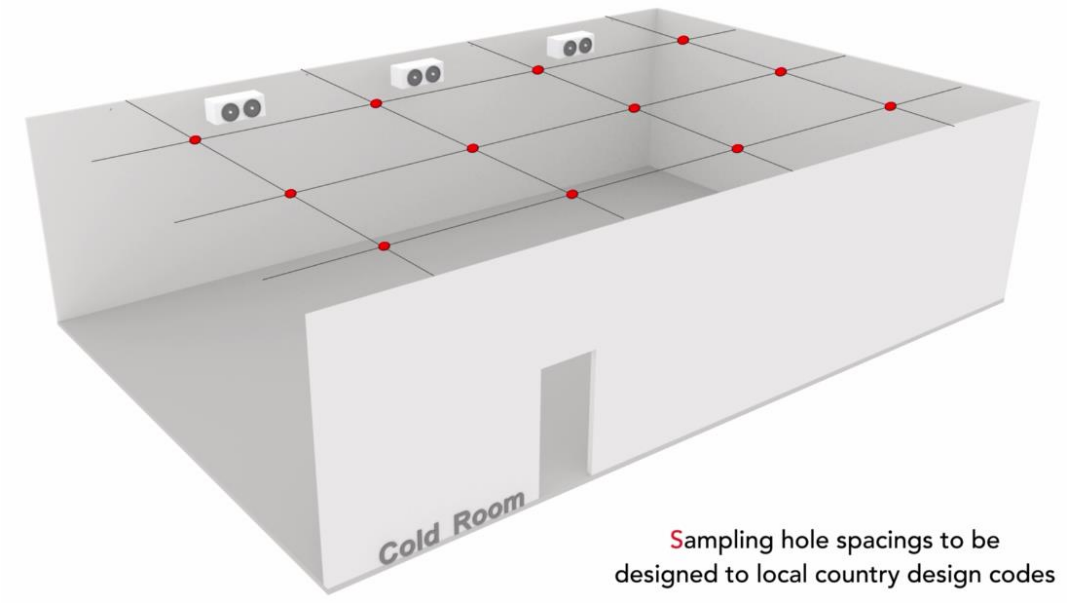
Protec aspirating detectors must only be installed OUTSIDE of the cold store room in a 'normal temeperature' ambient area typically +5^{0}C to +25^{0}C. Additionally there should be easy and safe access for future service engineer visits.



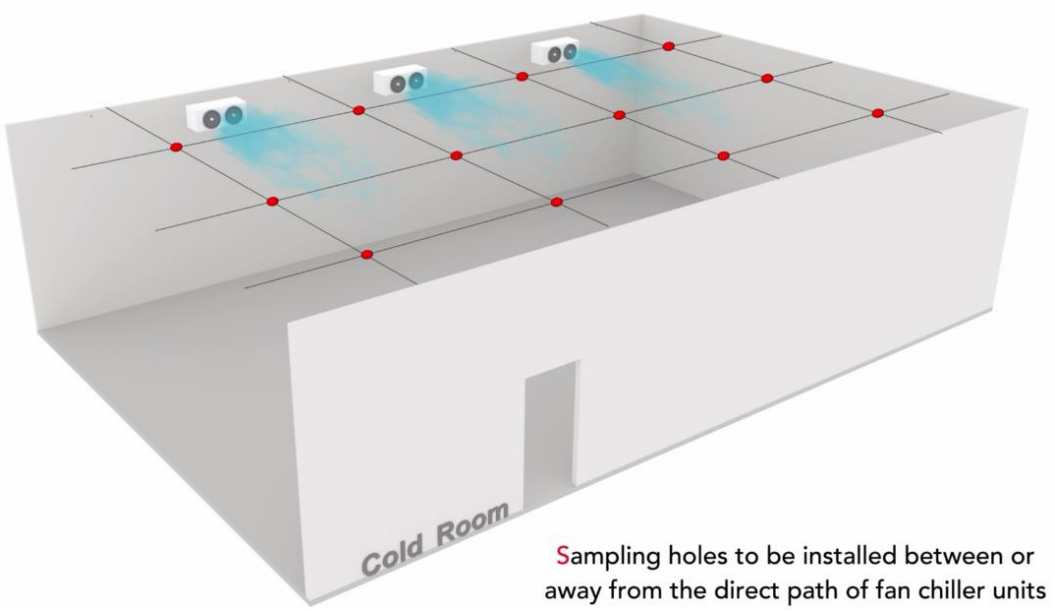
(Typical sampling pipe condensation trap layout - for illustration purposes only)

For cold store applications Protec would recommend the installation of sampling pipe condensation traps on EACH sampling pipe. These should be designed in a manner similar to the above, where any moisture within the sampling pipe would be directed to the condensation trap through gravity, as the trap is located at the lowest point of the sampling pipe installation.

These and other designs of condensation traps should allow the removal of excess condensation manually or automatically, however these should remain airtight in normal operation.

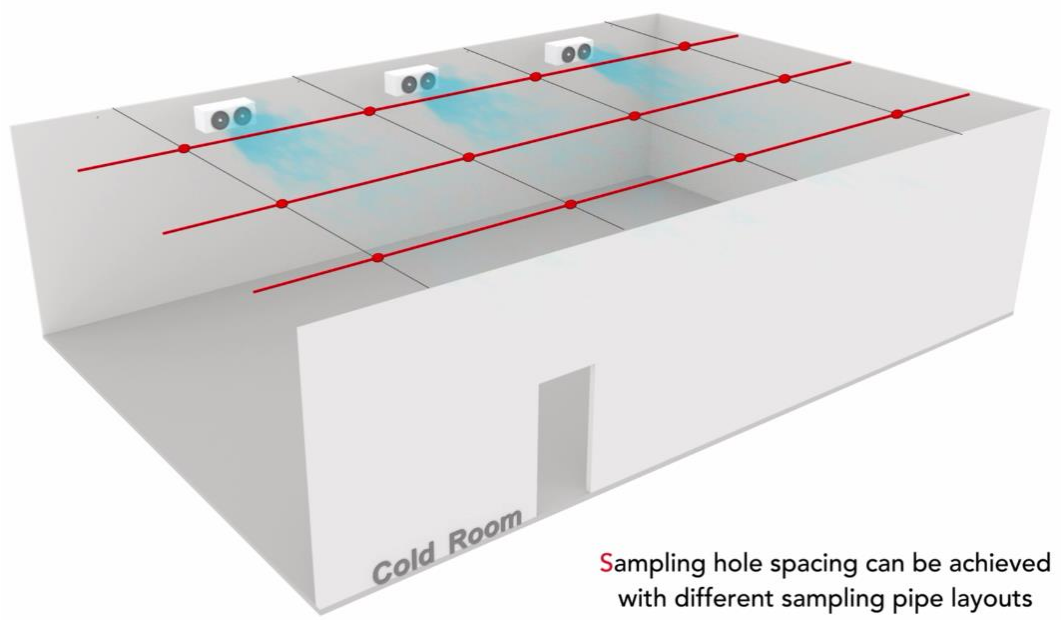


The designer should arrange the sampling pipe and sampling hole array in accordance with the local country design code with specific reference to the area of coverage per sampling point and the room height.



The designer MUST ensure that no sampling hole locations are configured in the direct line of the supply air from the fan chiller units. The air temperature in the areas around the fan chiller units can be around 20^0C cooler than the general room temperature and the forced air cooling can restrict the aspirating detection system performance.

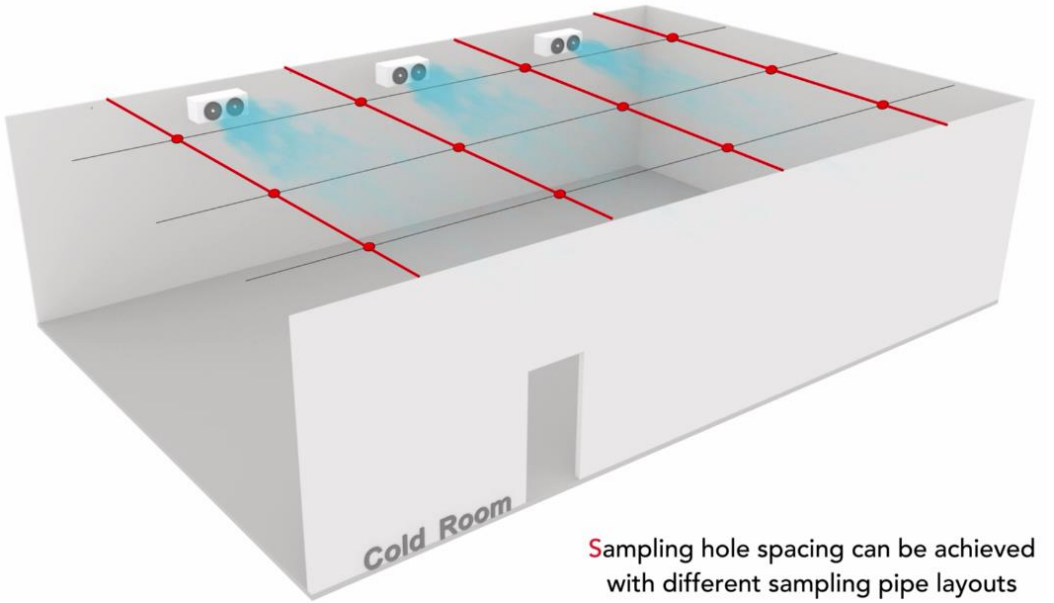
Likewise, no sampling holes must be designed close to an access door where air of different temperatures, from an adjoining area, could enter the cold store. These areas are prone to ice build-up on the ceiling and are areas where sampling holes could become restricted or blocked.



Sampling hole spacing can be achieved with different sampling pipe layouts

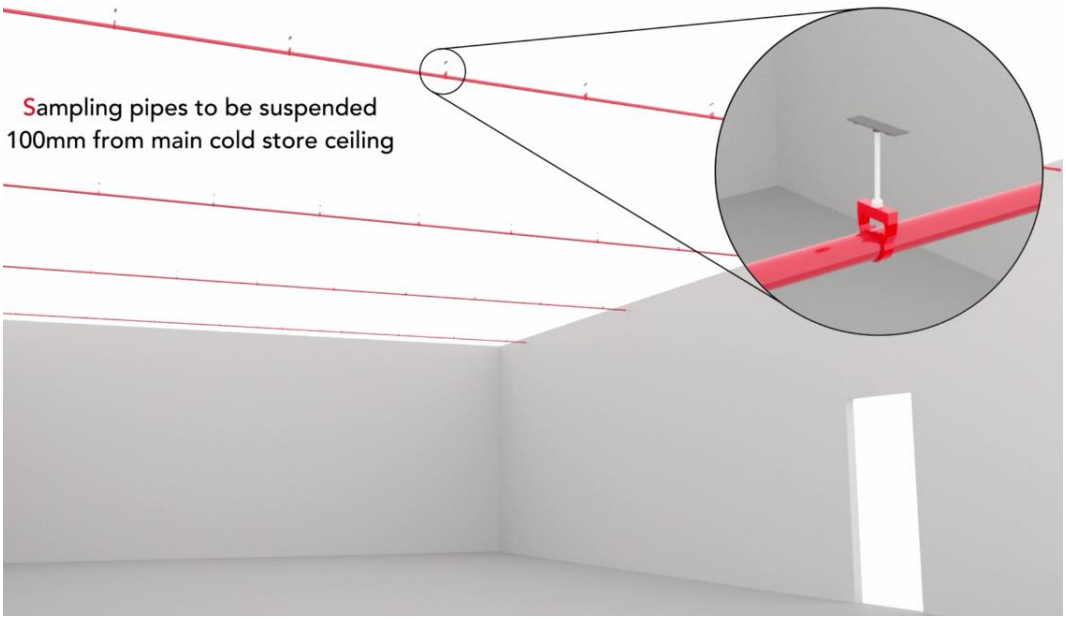
Pipe runs may be configured in a number of orientations with regards to the room layout, as per the details shown above and below. These pipe configurations must however all comply with the restrictions highlighted on the previous pages, with regards to the sampling hole locations.

The designer should be aware of and make provision for the quantity, location and functionality of the fan chiller units (including de-frost cycles).

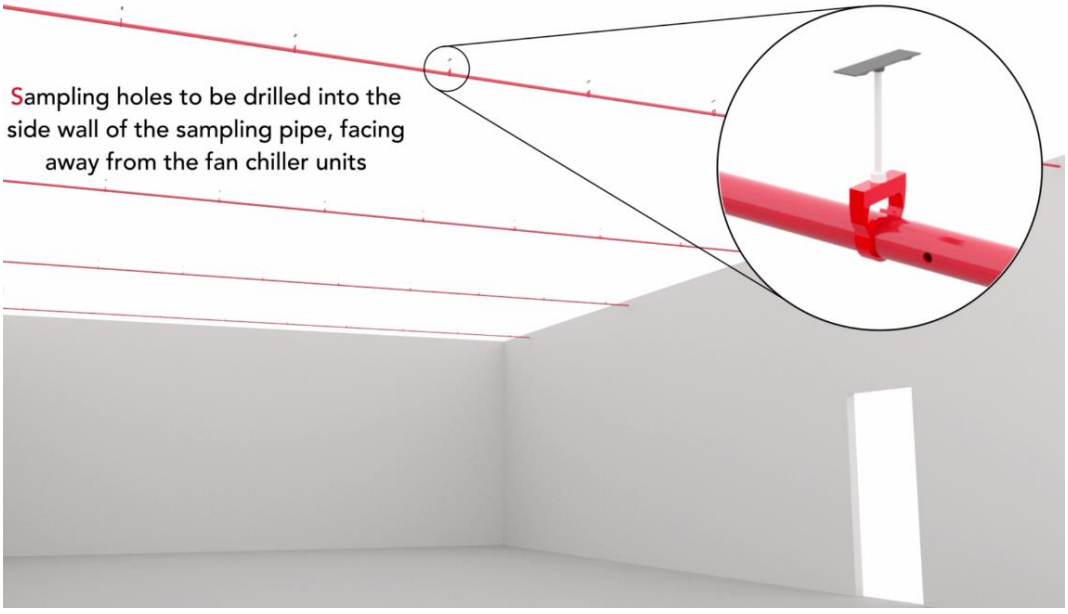


Sampling hole spacing can be achieved with different sampling pipe layouts

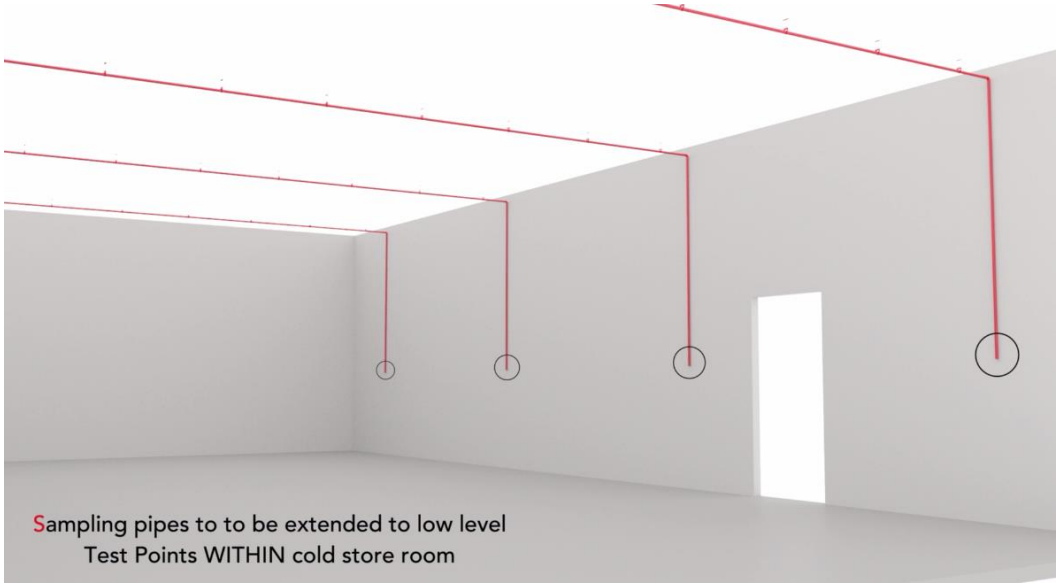
Only sampling pipe suitable for the specified operational temperatures of the cold store should be used. Typically ABS sampling pipe has an operational temperature range of -40^{0}C to + 70^{0}C and is regularly used for cold store aspirating systems applications. A number of metallic pipes are suitable for cold store applications however, it is the designer's responsibility, to confirm suitability of the pipe and any pipe accessories (sockets, bends, tee's etc.) for these applications. All metallic pipe installations should be suitably electrically grounded. PVC and CPVC pipe should not be used for cold store applications.



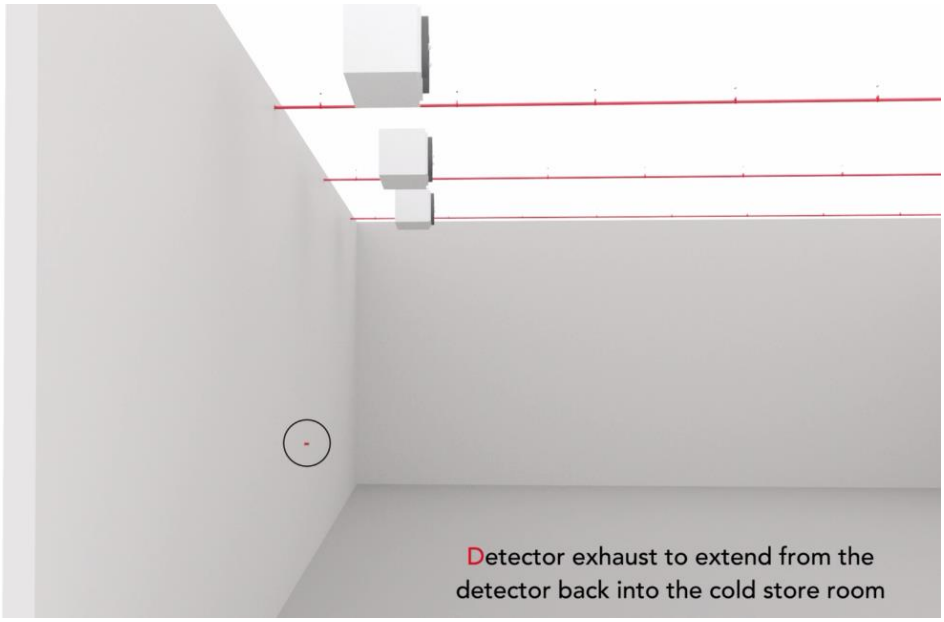
Protec would recommend the complete sampling pipe installation be installed approximately 100mm from the main cold store ceiling. This is to prevent sampling holes becoming restricted or blocked in areas of ice build-up and is usually carried out utilising a system of nylon screwed drop rods or similar. If the pipe installation is carried out prior to the cold store reaching operational temperature, then allowance will need to be made for any contraction of the sampling pipe due to the temperature reduction. This could require the main room sampling pipes be left disconnected from the outside installation, then fully connected and sealed when the cold store is at operating temperature.



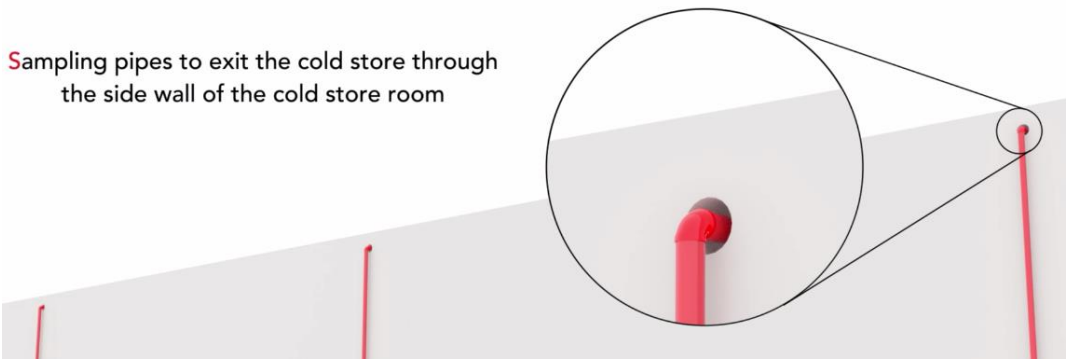
All sampling holes within the cold store room should be drilled on the side wall of the sampling pipe. Should condensation form on the inside the sampling pipe and subsequently freeze, any sampling holes drilled on the underside of the sampling pipe would likely become restricted or blocked.
The designer should be aware of and make provision for, the specific positioning and orientation of sampling holes on the sampling pipes, to ensure these are unaffected by any Venturi Effects that may be created by the operation of fan chiller units.



Sampling pipe Test Points should be installed after the final sampling hole, in a location accessible for service engineers and importantly WITHIN the cold store room. If test points are installed outside of the cold store room ambient air, of a much higher temperature, is likely to enter to the sampling pipe, condense and create ice within the pipe installation.

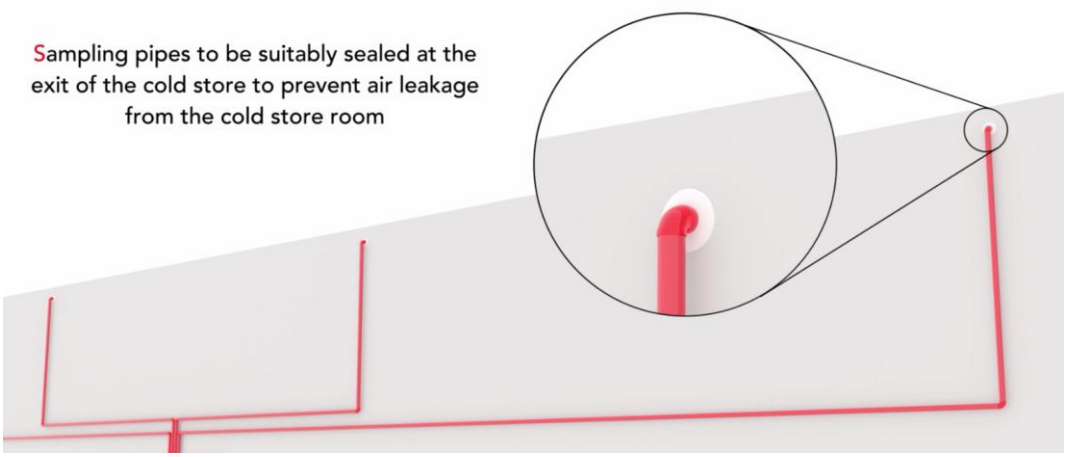


It is a requirement for **ALL** cold storage applications that the aspirating detector exhaust pipe be returned to, and be terminated within, the actual cold store room. This should allow any pressure differentials between the cold store room and the location of the aspirating detector to be equalised.

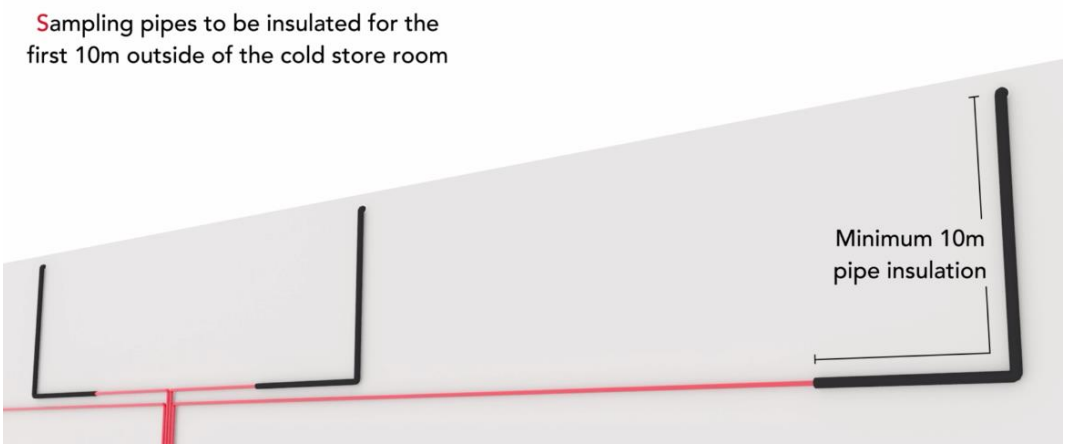


Protec would not recommend sampling pipes be taken through the ceiling of the cold store. This methodology can create locations within the sampling pipes where moist air condenses, falls back towards the ceiling exit point and freezes, thereby potentially restricting or blocking sampling holes.

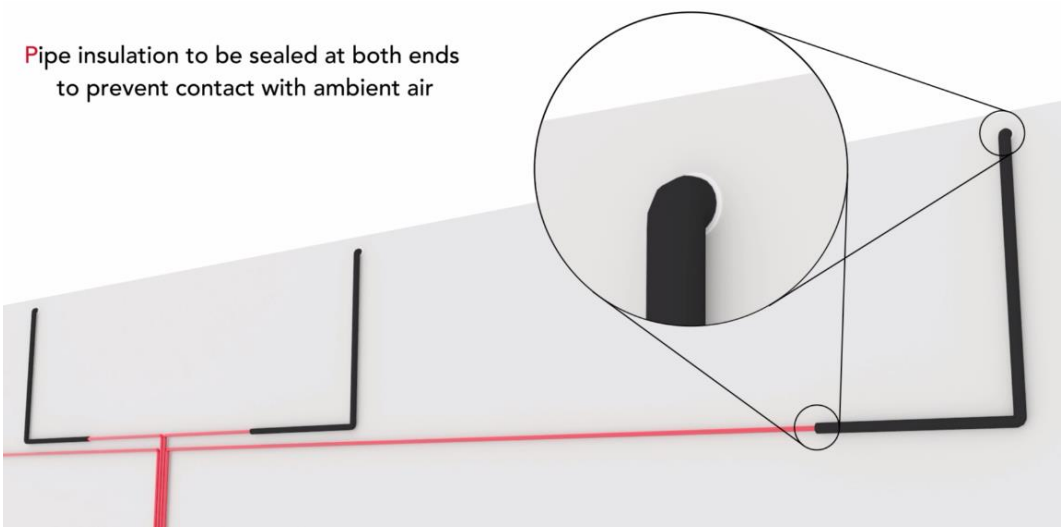
Protec would not recommend the installation of capillary sampling points in cold store applications. Again any condensation created in these smaller diameter capillary tubes are potential locations for the creation of ice and restricting or blocking sampling holes.



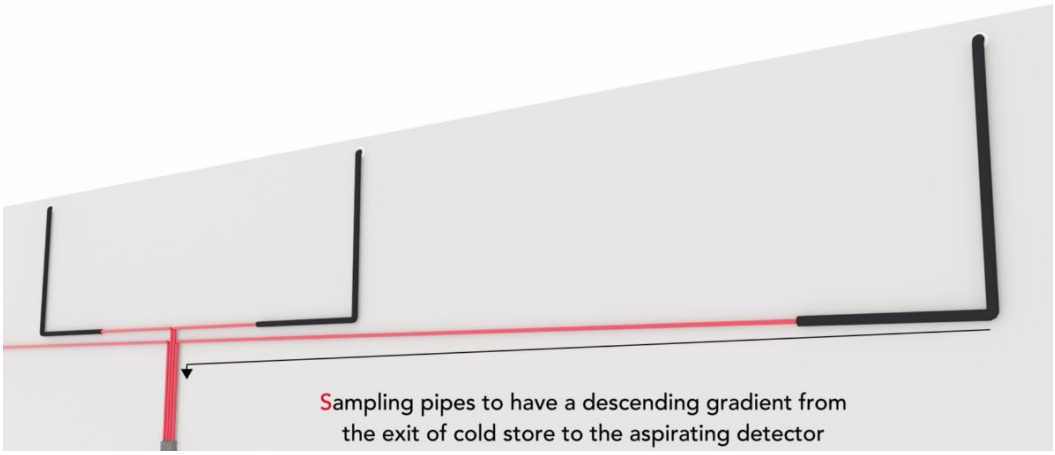
Where sampling pipes exit the cold store fabric wall, all penetrations shall be 'suitably sealed' to prevent any air leakage from the cold store room. Where air from the cold store room is allowed to seep through any unsealed openings, the air will condensate and freeze to create a 'block of ice' around the orifice. As these blocks of ice increase in size through time, they will themselves condense on their exterior surfaces and create many drops of condensation and ultimately pools of water on the area below.



Protec recommend that each sampling pipe is insulated from the pipe exit point of the cold store, for a minimum of 10m. This insulation is not, and does not, assist with heating the sampled air. The insulation is provided to prevent ambient air touching the very cold surface of the sampling pipe, as this will create condensation which will then freeze, resulting in ice build-up around the sampling pipe.



Where this pipe insulation is installed, it is a further requirement, that where the pipe insulation meets the cold store wall and where the pipe insulation stops, that a suitable sealant is provided to prevent ambient air touching any cold surface.



Protec would recommend that each sampling pipe has a descending gradient from the exit of the cold store room to the location of the sampling pipe condensation traps and aspirating detector. This will allow any moisture formed in this part of the pipe installation to fall via gravity to the condensation traps.

Possible Temperature Variations within the Cold Store Room

Generally speaking most cold store rooms are kept at a controlled and constant temperature usually between -18^{0}C and -25^{0}C. The only temperature variation in these types of cold store, is when the fan chiller refrigeration units are operating and when these are in their de-frost mode cycles. This therefore allows little if any moisture to be present within the cold store room and allows a stable environment for the aspirating detection system.

However some cold store applications can, for various reasons, have planned temperature changes. Reasons for this could include seasonal use of the cold store room, different products stored within the cold store rooms at different times and electrical power savings when the cold stores are not being utilised.

These applications can create potential problems within the aspirating detection system and careful thought by the designer should be given to the overall solution provided. Potential problems could include, increased moisture within the air when the cold store temperature is raised, which in-turn can create 'icing' issues when the cold store is taken down to opperational temperature in the future, if fan chiller units are not used for significant time periods this could change the airflow dynamics within the cold store room and possibly lead to airflow faults from the aspirating detector.

The designer should also consider that if the cold store room temperature is likey to change for any of the above reasons, that this may have an adverse affect on the sampling pipe installation with regards to pipe expansion and contraction. One option to allow for these physical changes could be to install expansion joints at regular intervals within the pipe installation.

Dilution Effect on Aspirating System Designs

Dilution can affect aspirating detection systems and therfore this should be considered at design stage. The amount of dilution is affected by the detector sensitivity and the number of sampling holes within the protected area.

When combustion/smoke particles are only drawn through a single sampling hole, these particles are diluted when they reach the detector by the clean air drawn through the remaining holes. Given that this is the case, the more sampling holes used on the design the greater the potential for dillution.

Aspirating systems should be designed (and proven by a sampling pipe calculation program) to ensure a similar amount of airflow is drawn through each sampling hole. Additionally, verification testing of detector response and transport time is required for each sampling hole.

Where Protec EN54 part 20 approved aspirating detectors are used the restrictions on the number of sampling holes has been determined as an integral part of the approval process. See detector specifications.

Venturi Effect around Sampling Holes

The aspirating system designer should consider any natural or forced air movement likely to be prevalent around the areas where the sampling holes are located. One effect of excessive natural or forced air movement could be to create areas where a Venturi Effect would reduce or possibly prevent, air entering the sampling points thus restricting the efficiency of one or more sampling holes.

Some applications such as Cold Storage, Chill Storage and Cooler Storage facilities are particularly vulnerable to this potential problem.

Design Verification

It is a requirement that upon completion of every aspirating system design confirmation of all the design parameters is verified by the use of a compatible sampling pipe design calculation programme.

This programme should confirm the following:

- The model number, type and fan speed of the selected detector
- The relevant approvals of the selected detector
- The minimum and maximum pipe lengths and number of sampling holes proposed
- The airflow rates, parameters and pressures at each part of the installation
- The time taken from all the sampling holes to the detector (transport time).

This programme will confirm the sampling hole dimensions and will indicate if there are any errors with the overall design.

Requirement for 'Commissioning/Function Testing'

Any commissioning or functionality testing required by any design code or local country legislation, should be carried out when the installation works are fully electrically and mechanically complete. Testing should include the individual testing/proving of ALL sampling holes of the aspirating detection system, using only the correct test material and in conjunction with the relevant Protec product manuals. The results of these tests should be recorded on the appropriate commissioning documentation.

The designer should therefore confirm at design stage the possible requirements of any functionality testing with regards to any cause and effects of the installed aspirating detection system, should this be required.

Requirement for 'Performance Testing'

Any performance testing required by any design code or local country legislation should only be carried out when the lift shaft is in its final environmental and operational state, with any air conditioning, pressurisation systems or ventilation systems etc. active.

The designer should therefore confirm with the client at design stage the most suitable 'performance test' for the installed aspirating detection system, should this be required.

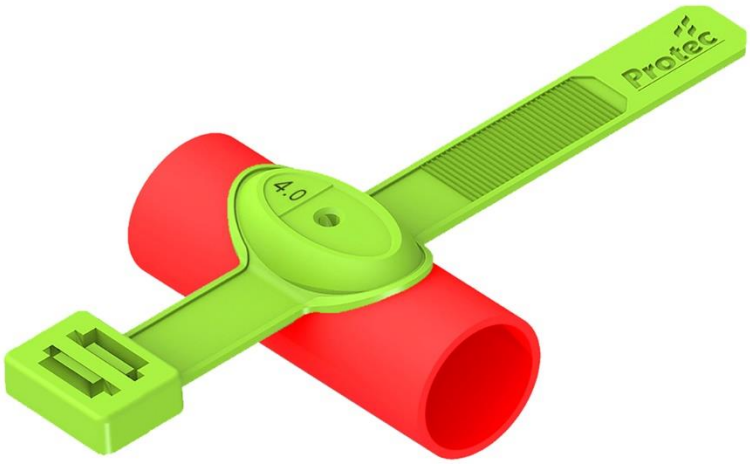
‘HIT’s’ Hole Identification Tags.

Protec would recommend the installation of ‘Hole Identification Tags’ (HIT’s) for cold store applications.

Each HIT is colour coded to identify its specific sampling hole diameter. This colour coding allows accurate identification of the various sampling hole locations and true hole size for the benefit of commissioning & servicing engineers, clients and even project auditors.

Additionally a build-up of debris and dust around a standard drilled sampling hole is can take place in cold store applications. This is due to the friction created by the airflow through the sampling hole. Each HIT incorporates a chamfered hole entry which is proven to significantly reduce this dust loading effect.

To assist the installers a common, 8mm diameter drill is all that is required for every sampling hole location.



HIT Product Codes:

Product Code	Description
37-534-68	2.0mm - Purple HIT
37-535-69	2.5mm - Grey HIT
37-536-70	3.0mm - Yellow HIT
37-537-71	3.5mm - Blue HIT
37-538-72	4.0mm - Green HIT
37-539-73	4.5mm - Black HIT
37-540-74	5.0mm - White HIT
37-541-75	6.0mm - Brown HIT

As previously detailed **all** system designs must be verified using Protec ‘ProFlow’ sampling pipe calculation program.

Cold Store Design Checklist

- Confirm and implement Local Country Design Standards and Fire Codes
- Confirm aspirating detection system detector, sensitivity and performance requirements
- Confirm full dimensions of the area protected by the aspirating detection system
- Confirm Aspirating standby requirement period for correct power supply unit
- Ensure all aspirating detectors are designed to be installed in a safe, clean, ambient temperature area ($+5^0$C. to $+25^0$C)
- Confirm and implement the aspirating design with regards to the location, quantity and operation of any fan chiller units within the cold store
- Confirm and implement the aspirating design with regards to any entry/exit doors and the potential for ice build-up within the cold store ceiling/walls
- Confirm all sampling pipe designs are verified by the appropriate sampling pipe design calculation program and to provide sampling hole dimensions
- Ensure the design allows for the aspirating detector exhaust to be returned to the same cold store room being protected
- Ensure consideration is given to the sampling hole orientation to prevent Venturi Effect issues from the fan chiller units
- Ensure any required Maintenance Test points are installed within the cold store room
- Ensure sampling pipes exit the cold store room through the side walls of the cold store and are suitably sealed at the exit point
- Ensure the sampling pipes are insulated for 10m from the exit of the cold store and are suitably sealed at both ends of the insulation
- Ensure suitable condensation traps are designed/installed into the pipe installation prior to connection to the aspirating detector
- Ensure a pipe gradient is designed into the pipework design/installation from the exit of the cold store to the condensation traps
- Ensure the design information instructs that each sampling point is individually tested for correct operation and tested fully with regards to Local Country Fire Codes

References

1. British Standards BS5839-1:2017
2. FIA Code of Practice Issue 3 February 2012
3. Protec Generic Design & Installation Guide
4. Protec Design Guides & Disclosures (located on www.protec.co.uk)

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Aspirating Detection System

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