WAREHOUSE DESIGN GUIDE



June 2020
Doc. No. 10885_03

Disclaimer

The contents of this document is provided on an "as is" basis. No representation or warranty (either express or implied) is made as to the completeness, accuracy or reliability of the contents of this document. The manufacturer reserves the right to change designs or specifications without obligation and without further notice. Except as otherwise provided, all warranties, express or implied, including without limitation any implied warranties of merchantability and fitness for a particular purpose are expressly excluded.

Intellectual Property and Copyright

This document includes registered and unregistered trademarks. All trademarks displayed are the trademarks of their respective owners. Your use of this document does not constitute or create a licence or any other right to use the name and/or trademark and/or label. This document is subject to copyright owned by Xtralis. You agree not to copy, communicate to the public, adapt, distribute, transfer, sell, modify or publish any contents of this document without the express prior written consent of Xtralis.

General Warning

This product must only be installed, configured and used strictly in accordance with the General Terms and Conditions, User Manual and product documents available from Xtralis. All proper health and safety precautions must be taken during the installation, commissioning and maintenance of the product. The system should not be connected to a power source until all the components have been installed. Proper safety precautions must be taken during tests and maintenance of the products when these are still connected to the power source. Failure to do so or tampering with the electronics inside the products can result in an electric shock causing injury or death and may cause equipment damage. Xtralis is not responsible and cannot be held accountable for any liability that may arise due to improper use of the equipment and/or failure to take proper precautions. Only persons trained through an Xtralis accredited training course can install, test and maintain the system.

Liability

You agree to install, configure and use the products strictly in accordance with the User Manual and product documents available from Xtralis.

Xtralis is not liable to you or any other person for incidental, indirect, or consequential loss, expense or damages of any kind including without limitation, loss of business, loss of profits or loss of data arising out of your use of the products. Without limiting this general disclaimer the following specific warnings and disclaimers also apply:

Fitness for Purpose

You agree that you have been provided with a reasonable opportunity to appraise the products and have made your own independent assessment of the fitness or suitability of the products for your purpose. You acknowledge that you have not relied on any oral or written information, representation or advice given by or on behalf of Xtralis or its representatives.

Total Liability

To the fullest extent permitted by law that any limitation or exclusion cannot apply, the total liability of Xtralis in relation to the products is limited to:
(i) in the case of services, the cost of having the services supplied again; or
(ii) in the case of goods, the lowest cost of replacing the goods, acquiring equivalent goods or having the goods repaired.

Indemnification

You agree to fully indemnify and hold Xtralis harmless for any claim, cost, demand or damage (including legal costs on a full indemnity basis) incurred or which may be incurred arising from your use of the products.

Miscellaneous

If any provision outlined above is found to be invalid or unenforceable by a court of law, such invalidity or unenforceability will not affect the remainder which will continue in full force and effect. All rights not expressly granted are reserved.

Document Conventions

The following typographic conventions are used in this document.

Convention	Description
Bold	Used to denote: emphasis Used for names of menus, menu options, toolbar buttons
Italics	Used to denote: references to other parts of this document or other documents. Used for the result of an action

The following icons conventions are used in this document.

Convention	Description
	Caution: This icon is used to indicate that there is a danger to equipment. The danger could be loss of data, physical damage, or permanent corruption of configuration details.
	Warning: This icon is used to indicate that there is a danger of electric shock. This may lead to death or permanent injury.
	Warning: This icon is used to indicate that there is a danger of inhaling dangerous substances. This may lead to death or permanent injury.

Contact Us

UK and Europe +44 1442 242 330 **The Americas** +1 800 229 4434

Middle East +962 6 588 **5622** **Asia** +86 10 56697101 **Australia and New Zealand** +61 3 9936 7000

www.xtralis.com

Preface

This Design Guide outlines the design principles for effective smoke detection in warehouses taking into consideration the building structure, environmental and operational parameters. The design principles would also apply to other buildings exhibiting similar traits to warehouses, such as:

- Refrigerated storage facilities (refer to Doc No. 11723)
- Aircraft hangers (refer to Doc No. 13305)
- Manufacturing facilities
- Large retail spaces
- Indoor sports facilities
- Theatres



Note!

The information contained in this Design Guide should be used in conjunction with local fire codes and standards and the guidelines provided in the detectors Product Manuals. Where applicable, regional industry practices should also be adhered to.

Copyright ©2020 Xtralis AG

Contents

1 Background Information 1

1.1 Fire Safety Considerations in Warehouses 1
1.2 Performance-Based Design 1
1.3 Key Design Considerations 1
1.4 Smoke Detection Challenges in Warehouses 2
1.5 Why Use VESDA Smoke Detection? 2

2 Designing for Effective Fire Protection 3

2.1 Areas To Be Protected 3
2.2 Environmental Considerations 3
2.3 Stratification 3
2.4 Sampling Pipe Considerations 3
2.5 Sensitivity 4
2.6 Accessories 4
2.6.1 Maintenance Test Point 4
2.6.2 Sampling Hole Clips 4

3 VESDA System Design 5

3.1 Sampling Pipe Network Configuration Options 5
3.2 Sampling Holes Spacing / Location 6
3.3 On Ceiling Detection 7
3.4 High-Low Alternating Detection 7
3.5 Multi-Level Detection 7
3.6 In-Rack Detection 8

4 Protecting Other Areas 10

4.1 Plant Room Protection 10
4.2 Ceiling Void Protection 10
4.3 Office and Control Area Protection 10
4.4 Loading Bay 10

5 Commissioning, Service and Maintenance 11

5.1 Commissioning 11
5.2 Service and Maintenance 11

References 12

Disclaimer On The Provision Of General System Design Recommendations 13

1 Background Information

1.1 Fire Safety Considerations in Warehouses

Major fire risks in Warehouses arise as a result of the following:

- Electrical and mechanical equipment failures
- Lighting faults
- Smoking
- Heating equipment
- Maintenance activities (i.e. welding, cutting)
- High fuel density in the form of vertically stored goods and packing materials
- Arson

1.2 Performance-Based Design

Warehouses' unique environment (size, geometry, ventilation, stratification, etc.) present a challenge to early and reliable fire detection. The implementation of a Performance-Based Design (PBD) will allow the fire detection system to be tailored to the specific build and environmental characteristics of warehouses. For example, VESDA detection locations can depart from prescriptive codes / standards under a PBD approach to achieve performance objective specific to the risks in the warehouse.

PBD is a widely-used approach incorporating empirical validation to justify divergence from prescriptive requirements, particularly in cases where there are practical limitations or a need for improved fire safety. Examples of codes / standards providing guidelines for PBD and risk management are listed below:

- International Fire Engineering Guidelines[1].
- British Standard BS 7974[2].
- NFPA 72 National Fire Alarm and Signal Code[3].
- SFPE Engineering Guide to Performance-Based Fire Protection[4].
- ISO 31000 Risk Management – Principles and Guidelines[5].
- SFPE Handbook of Fire Protection Engineering[6].

1.3 Key Design Considerations

The following should be considered when designing a VESDA system for a Warehouse:

1. What do local prescriptive codes and standards require?
2. What level of protection is required and how will fire events be managed?
3. What aspects of building geometry (particularly ceiling height) will affect smoke detection?
4. What are the types of stored goods and are they susceptible to damage by smoke, heat or water?
5. How are storage racks arranged and how can this affect smoke movement? Should targeted detection, i.e. in-rack detection, and reduced alarm annunciation zones be adopted?
6. Is the area ventilated?
7. Is solar loading and/or internal heating likely to cause stratification of smoke?
8. Are there features (i.e. catwalks, mezzanines) that will interfere with the smoke plume development?
9. How do background ambient smoke levels fluctuate throughout the day?
10. What is the occupant density? Is early fire detection required for timely evacuation and fire brigade callout?
11. How long are the escape routes? Is early fire detection required to ensure safe evacuation?
12. What are the maintenance and serviceability requirements of the facility?
13. What methods are used to store and retrieve goods and will they interfere with smoke movement?
14. Is fire suppression required and are there requirements on activation, i.e. NFPA 13 [7]?
15. What do Performance-Based Design codes recommend?

1.4 Smoke Detection Challenges in Warehouses

- Large volume areas and high ceilings will significantly dilute the concentration of a rising smoke plume. Ceiling point (spot) type smoke detectors that provide only localized detection, and beam-type detectors that lack high sensitivity may not be able to respond to diluted smoke.
- Air movement from ventilation, will dilute, cool and divert the smoke plume away from ceiling mounted detection systems.
- Small fires might not possess sufficient thermal energy to rise to the ceiling.
- Poor thermal insulation, incident solar radiation and lack of ventilation will create a warm layer of air preventing smoke rising to the ceiling; known as “smoke stratification”.
- Ceiling mounted smoke detectors can be subject to extreme temperatures in warehouses outside their recommended range, leading to compromised performance and/or false alarms.
- Building movement from wind loads and thermal expansion/contraction could misalign traditional beam-type detectors, resulting in sensitivity loss or malfunction.
- Maintenance of smoke detectors mounted in hard to reach or awkward places will be a time consuming and resource intensive task.



Note!

The delayed activation of conventional fire and smoke detectors such as point (spot) type smoke, heat and beam-type detectors, for the reasons outlined above, will most likely render manual and/or automatic attempts to extinguish/control a fire ineffective.

1.5 Why Use VESDA Smoke Detection?

- A VESDA system that takes samples of air from multiple sampling locations and aggregates them back to a centralized high sensitivity detection chamber is better suited to detect diluted smoke in high ceiling installations.
- A VESDA system can provide earlier notification of a fire that allows staff to take remedial actions before fire escalates to larger size.
- The VESDA detector can be located at ground level while the sampling pipes are located at ceiling level making maintenance and service safe and easy and does not require specialist access equipment.
- Placing the detector at ground level protects it against extreme temperatures and high humidity (condensing).
- A VESDA system actively draws air through its sampling holes, which ensures a consistent detection performance in varying airflow conditions.
- There is a comparatively low incidence of false alarms with a VESDA system due to onboard air filtration; staged alarm levels and advanced dust discrimination software.
- VESDA detectors’ wide sensitivity range can be adjusted to suit varying background smoke levels and the detector’s multiple alarm thresholds allow for a staged response from onsite investigation to activation of suppression measures.

2 Designing for Effective Fire Protection

2.1 Areas To Be Protected

- Storage areas
- Racking
- Loading Room
- Plant Room
- Public Areas, including corridors, offices and control areas

2.2 Environmental Considerations

The following Warehouse conditions should be assessed as part of the VESDA system design:

- Vertical temperature gradient (stratification) – Section 2.3 addresses thermal stratification.
- High humidity/wash down activities – consult Removal of Water Condensate Application Note (Doc No. 17405).
- High ambient background levels:
  - Use of in-line filter (Part No. VSP-850) for the removal of airborne particulates from the sampled airstream – consult the Xtralis In-line Filter Application Note (Doc No. 17785)
  - For the cleaning and maintenance of the pipe network consult the VESDA Pipe Network Back Flush Application Note (Doc No. 20016) on manual and automatic back flush options.
- Ventilation:
  - Consult the VESDA Pipe Network Installation Guide (Doc No. 10255) for return air grill protection.
  - Consult the VESDA Duct Application Note (Doc No. 35424) for duct protection.
- Commodity classification and storage arrangement – Sections 2.5 and 3.6 address high sensitivity settings and targeted (in-rack) fire detection for special commodity classes

2.3 Stratification

To detect a stratified smoke layer, the VESDA pipe network should be arranged to sample from multiple heights. Different techniques are discussed in the next sections. Smoke tests should be used to determine the extent to which stratification is likely to occur in the Warehouse environment.

2.4 Sampling Pipe Considerations

Temperature variations can cause pipes to expand/contract that must be accounted for during pipe installation. The thermal characteristics of commonly used pipe materials are presented in Table 1.

Table 1: Thermal characteristics of pipe materials commonly used in Warehouse applications[8, 9].

Pipe Material	Operating Temperature	Linear Thermal Contraction/Expansion
PVC	-18 to 49 °C (0 to 120 °F)	7.0 mm ± 1 mm per 10 m per 10 °C (0.28 ± 0.04” per 32.8 ft per 18 °F)
ABS	-40 to 80 °C (-40 to 176 °F)	10.1 mm per 10 m Per 10 °C (0.4” per 32.8 ft per 18 °F)
CPVC	-18 to 94 °C (0 to 201 °F)	6.7 mm per 10 m per 10 °C (0.26” per 32.8 ft per 18 °F)

2.5 Sensitivity

Standard fire detection (SFD) or Class C sensitivity (as per ISO 7240-20[10]) is required for staff protection.

Higher sensitivity settings EWFD/VEWFD (Class B / Class A) is recommended where earliest notification of a threatening fire event is required to maintain operational continuity and/or protect stored goods from thermal and smoke damage. This will apply for high density racking and combustibles, areas where automatic storage and retrieval systems are used and where high value goods are stored.

2.6 Accessories

2.6.1 Maintenance Test Point

The *Maintenance Test Point* (air sampling test point) is a hole on each pipe branch beyond the last sampling hole of the pipe network dedicated for the testing of smoke transport time (commissioning, maintenance) and usually located at an easy to access location (Figure 1).

The *Maintenance Test Point* remains blocked during normal operation of the VESDA system and is fitted with an end-vent orifice only for smoke transport time testing. The size of the orifice should ensure the "Flow Balance" is close as possible to the VESDA system during normal operation – see section 5 for further information.

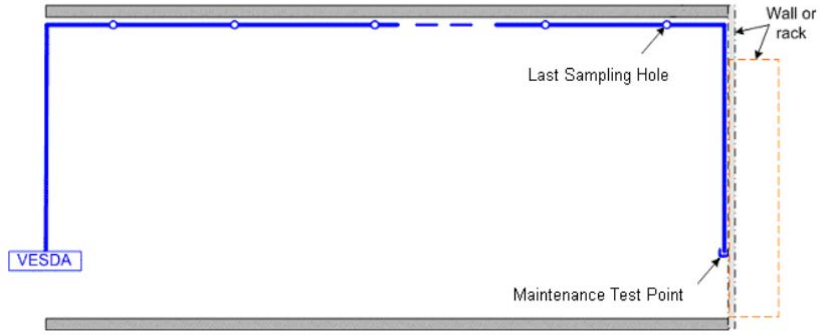


Figure 1: Maintenance Test Point

2.6.2 Sampling Hole Clips

Sampling Hole Clips are an alternative to holes drilled directly on pipes and enable faster and more efficient installation and maintenance (Figure 2). The clips comprise pre-engineered sampling holes that are colour coded to provide an instant visual guide on sampling point location and sampling hole size which is especially beneficial in high ceiling pipe installations.

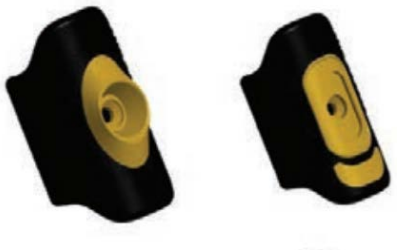


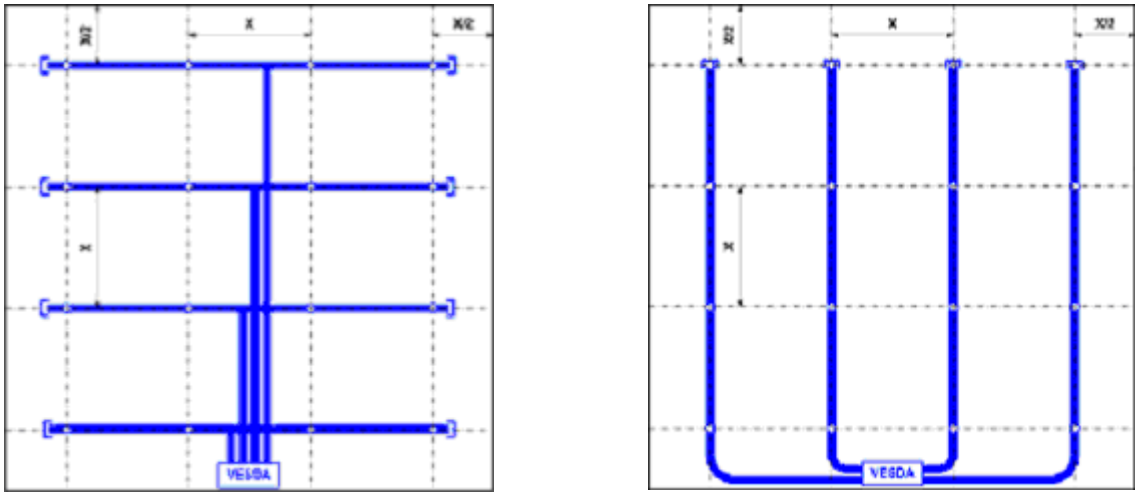
Figure 2: Sampling Hole Clips

There are two formats available: (i) Standard environment (Part. No. F-PC-xx), and (ii) Harsh environment (Part. No. F-PC-HE-xx) featuring a flexi-lip design to help clear contamination build up under compressed air back flush operation. For further information refer to the Xtralis ASD Sampling Hole Clips TDS (Doc. No. 35192).

3 VESDA System Design

3.1 Sampling Pipe Network Configuration Options

The VESDA sampling pipe network layout can be either Branched or Non-Branched as shown (Figure 3). Branched layouts help to reduce smoke transportation times.



(a) Branched *(b) Non- Branched*

Figure 3: VESDA Pipe Layout Configurations

There are five VESDA pipe network design options depending on environment, application, rack arrangement, access to voids and aesthetics.

1. On Ceiling Detection – sampling pipes are located on the ceiling (Figure 6).
2. Below Ceiling Detection – ceiling sampling pipes comprise drop-down pipes with sampling holes.
3. High-Low Alternating Detection – alternating ceiling and drop-down sampling holes (Figure 7).
4. Multi-Level Detection – applies to Warehouses comprising high bay storage racks and utilizes more than one VESDA system for ceiling and intermediate level protection (Figure 8).
5. In-rack Detection – sampling pipes run horizontally or vertically through racks at various heights (Figure 9). Drop-down pipes from the ceiling can also be used for in-rack detection Figure 10).

For pipe installation at ceiling when drilling into the roof decking is not allowed, sampling pipes can be installed directly on trusses or fastened on beams using suitable fixings. An alternative approach is to use catenary wire to support the pipe network.

For Warehouses comprising storage rack areas, sampling pipes can run perpendicular (Figure 4) or parallel (Figure 5) to the rack orientation. For intermediate level protection, sampling pipes should be installed on the underside of catwalks (mezzanines). Where catwalks (mezzanines) are not present, the pipes can be fitted to the sheltered side of the racking, fixed to the rack frame. It is important to ensure that the pipes are not installed in locations where they could be damaged by forklifts.

Wind loads and temperature fluctuations may cause expansion or contraction of the warehouse's structural beams and pipes therefore ensure sufficient distance between pipe clips and joints / endcaps or use of expansion joints or conduit saddles to compensate for small pipe length variations.

The VESDA sampling pipes should not be placed underneath or near (<1 m (3.3 ft)) to lighting fixtures, heaters, skylights or other heat emitting objects.

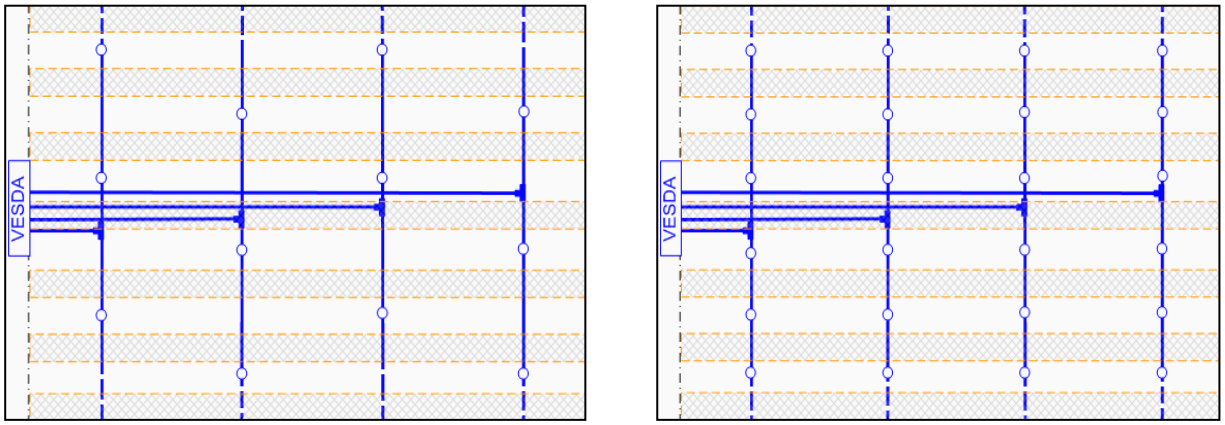
Note!

All sampling pipe network configurations should be verified using the ASPIRE™ Pipe Network Modelling Program.

3.2 Sampling Holes Spacing / Location

Sampling hole spacing for VESDA detectors is determined by a grid layout.

- Open space: sampling holes and/or drop-down pipes are placed in accordance with local codes and standards (Figure 3).
- Rack storage: ceiling sampling holes should be located above each aisle in a staggered layout (Figure 4a). When storage racks extend to the ceiling, each aisle is treated as a smoke compartment and ceiling sampling holes should be located above each aisle in the standard rectangular grid layout (Figure 4b).



(a) Staggered Layout *(b) Standard Rectangular Layout*

Figure 4: Storage rack area ceiling VESDA sampling Pipe Layout (Branched, pipes perpendicular to rack orientation)

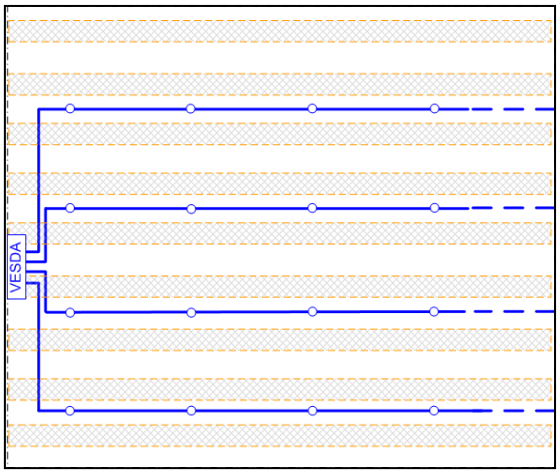


Figure 5: Storage rack area ceiling VESDA sampling Pipe Layout (Non-Branched, pipes parallel to rack orientation).

3.3 On Ceiling Detection

An example of a branched layout, ceiling sampling pipe network configuration is shown in Figure 6.

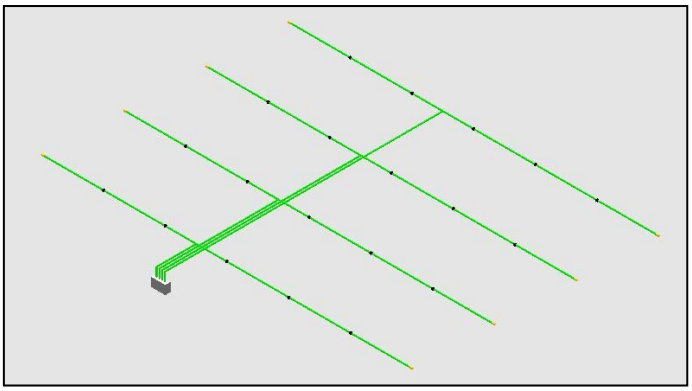


Figure 6: Example of On Ceiling Detection (Branched Layout).

On ceiling detection is used in most Warehouses as it provides the following:

- Lower Installation cost (materials, labour).
- Unobtrusive detection system.

Note!

Consult local codes / standards on installation height limitations. Allocating a separate VESDA pipe network at an intermediate height will overcome such restrictions.

3.4 High-Low Alternating Detection

This option comprises ceiling sampling holes that alternate with drop down pipes and is used to penetrate the hot air layer at the roof level. Local codes / standards should be consulted on the maximum sampling distance below ceiling. An example of this type of sampling pipe network (branched) is presented below (Figure 7).

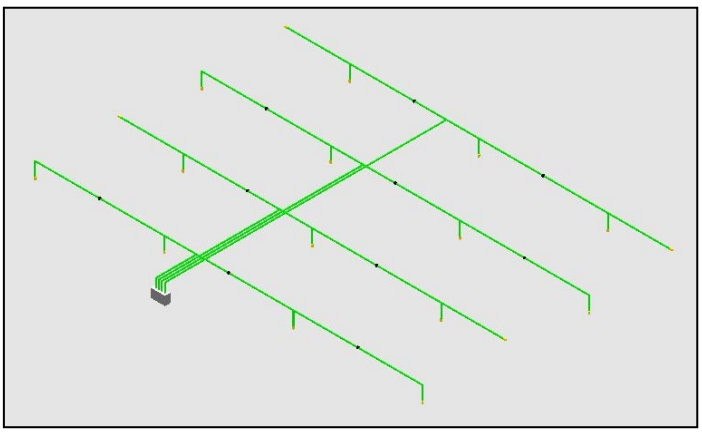


Figure 7: Example of High-Low Alternating Detection

3.5 Multi-Level Detection

The multi-level detection option is used in any of the following circumstances:

- Where there are high bay storage racks
- Where high stratification levels are expected
- Where mezzanines (catwalks) consist of solid flooring that will impede/delay the ascend of the smoke plume

This design option requires on ceiling and multiple intermediate level VESDA systems (Figure 8).

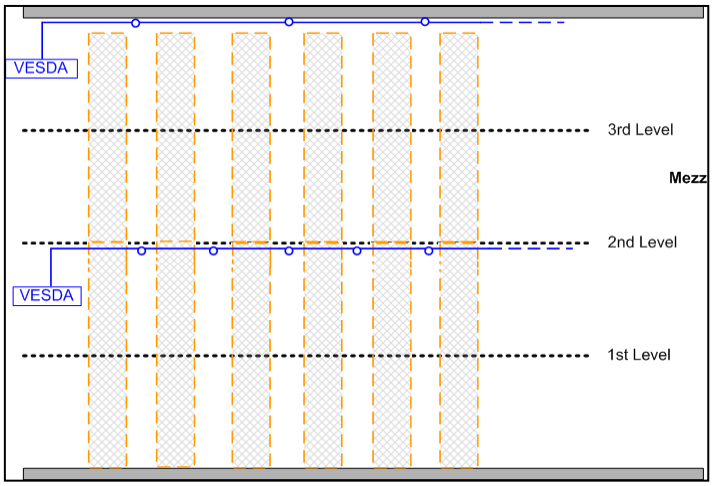


Figure 8: Example of Multi-Level Detection (Ceiling and Intermediate Level)

Note!

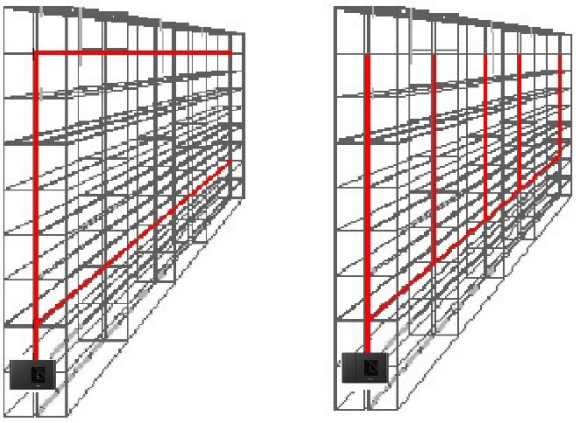
VESDA systems intended for intermediate level protection should have sampling holes in every aisle.

3.6 In-Rack Detection

In-rack detection may be used in installations where the following conditions apply:

- There is high-bay racking.
- Stratification occurs.
- Localized detection is required.

The sampling pipe can either have a horizontal or vertical in-rack detection configuration (Figure 9). The detector is installed at the end of the rack at an accessible level. Ensure sampling pipes are located between back-to-back of racks to safeguard against forklift damage.



(a) Horizontal in-rack detection. *(b) Vertical in-rack detection.*

Figure 9: In-rack Detection

Drop-down pipes can extend from the ceiling for in-rack detection. The drop-down pipes can be fitted to the sheltered side of the racking, which can be fixed to the rack frame as shown (Figure 10) ensuring they will not be damaged by forklift operation. In-rack drop-down pipes would comprise sampling holes at different heights.

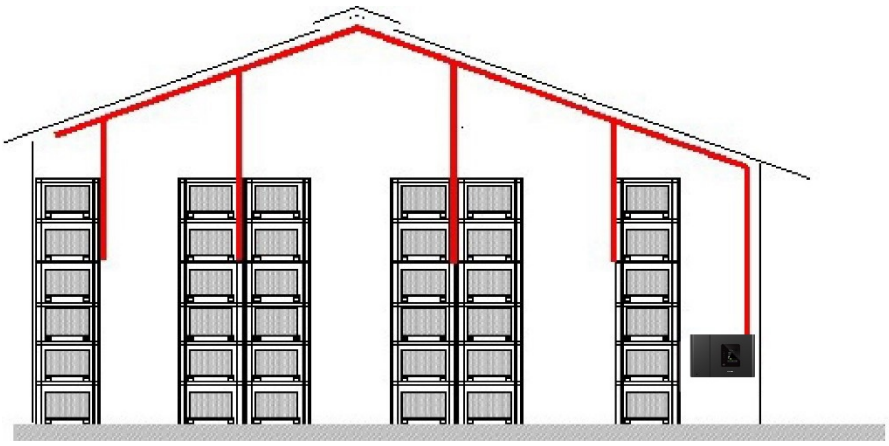


Figure 10: Example of drop-down pipes for In-rack Detection

4 Protecting Other Areas

4.1 Plant Room Protection

This type of area includes air handling plants, forklift battery recharge bays and workshops, all of which typically contain high power appliances, volatile fuels and other combustible materials/equipment. It is recommended that these areas be protected using either capillary sampling (at spot detection) or on ceiling sampling, for the earliest possible detection.

For detection of gas threats (combustible, toxic gases), VESDA Sensepoint XCL gas detectors integrated to the VESDA pipe network provide a flexible option for the detection of different targeted gases – consult the VESDA Sensepoint XCL Installation Manual (Doc No: 35563).

4.2 Ceiling Void Protection

It is especially important to protect ceiling voids containing cabling and/or any other equipment, which present a fire risk. The spacing of the VESDA sampling holes is determined using the grid method (Figure 3).

4.3 Office and Control Area Protection

For aesthetic reasons, sampling in these areas is usually conducted via capillary tubes fed through the ceiling from the main sampling pipes located in the ceiling void (Figure 11).

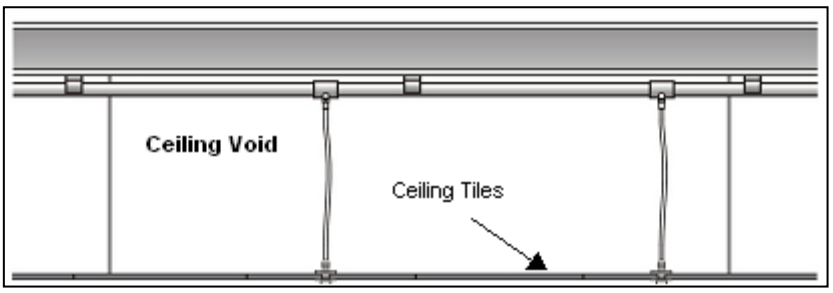


Figure 11: Example of capillary air sampling through the ceiling

4.4 Loading Bay

In addition to smoke detection, monitoring of the air quality in loading bays can be required for protection against vehicle emissions. VESDA Sensepoint XCL gas detectors integrated to the VESDA pipe network can monitor levels of Carbon Monoxide (CO) and Nitrogen Dioxide (NO_2) gases in loading bays to alert personnel and initiate ventilation when gas levels exceed safety thresholds – consult the VESDA Sensepoint XCL Installation Manual (Doc No. 35563).

5 Commissioning, Service and Maintenance

5.1 Commissioning

The commissioning process is designed to systematically check and validate the VESDA system before put into service i.e. performance and sampling pipe network integrity:

- System performance – smoke detection.
- Verification of ASPIRE modelled smoke transport times.
- Transmission signals to Fire Indicating Panels (FIP).

Standardized hot smoke tests, i.e. AS 4391[11], are suitable for testing detection systems in warehouses. For validating early warning smoke detection, consult the Xtralis smoke pellet test method (Doc No.13608).

Smoke Transport Time Test (Maintenance Test Point):

1. Step 1 (*Maintenance Test Point* blocked): conduct smoke test at last sampling hole (Normal Operation) and validate with ASPIRE modelling.
2. Step 2 (*Maintenance Test Point* open): conduct smoke test at Maintenance Test Point and use as baseline for subsequent maintenance tests. Empirical results should be compared with ASPIRE modelling.

In situations where the VESDA system is interfaced with pre-action sprinkler systems the user should consider one of the VESDA smoke alarm thresholds as the interface signal.

5.2 Service and Maintenance

The VESDA system must be serviced and maintained according to local codes / standards and the instructions provided in the Maintenance section of the VESDA Product Manuals.

1. Where applicable conduct smoke transport time test from the Maintenance Test Point and compare with baseline (commissioning) value.
2. Pipe network back flush with compressed air to dislodge dust and contaminations – consult the Pipe Network Back Flush Application Note (Doc No. 20016).



Note!

- Smoke transport time tests should be conducted for every branched sampling pipe network.
- The Maintenance Test Point should bear a label identifying the detector zone, pipe number and transport time (as commissioned).

References

[1] Australian Government State and Territories of Australia, International Fire Engineering Guidelines.

[2] BS 7974, Application of Fire Engineering Principles to the Design of Buildings.

[3] NFPA 72, National Fire Alarm and Signal Code.

[4] SFPE, Engineering Guide to Performance-Based Fire Protection Analysis and Design of Buildings.

[5] ISO 31000, Risk Management – Principles and Guidelines.

[6] SFPE, Handbook of Fire Protection Engineering.

[7] NFPA 13, Standard for the Installation of Sprinkle Systems.

[8] The Plastics Pipe Institute, Inc., “Suggested Temperature Limits for the Operation and Installation of Thermoplastic Piping in Non-Pressure Applications, TN-11/99”. www.plasticpipe.org.

[9] Plastic Pipe and Fittings Association, “Information & Technical Guide – ABS Plastic Pipe & Fittings www.ppfahome.org.

[10] ISO 7240-20, Fire detection and alarm systems – Part 20: Aspirating smoke detectors.

[11] AS 4391-1999, Smoke management systems - Hot smoke test.

Disclaimer On The Provision Of General System Design Recommendations

Any recommendation on system design provided by Xtralis is an indication only of what is considered to be the most suitable solution to meet the needs of the common application environments described.

In some cases the recommendations on system design provided may not suit the unique set of conditions experienced in a particular application environment. Xtralis has made no inquiry nor undertaken any due diligence that any of the recommendations supplied will meet any particular application. Xtralis makes no warranty as to the suitability or performance of any recommendation on system design. Xtralis has not assessed the recommendation on system design for compliance with any codes or standards that may apply nor have any tests been conducted to assess the appropriateness of any recommendations on system design. Any person or organization accessing or using a recommendation on system design should, at its own cost and expense, procure that the recommendation on system design complies in all respects with the provision of all legislation, acts of government, regulations, rules and by-laws for the time being in force and all orders or directions which may be made or given by any statutory or any other competent authority in respect of or affecting the recommendation on system design in any jurisdiction in which it may be implemented.

Xtralis products must only be installed, configured and used strictly in accordance with the General Terms and Conditions, User Manual and product documents available from Xtralis. Xtralis accepts no liability for the performance of the recommendation on system design or for any products utilized in the implementation of the recommendation on system design, aside from the General Terms and Conditions, User Manual and product documents.

No statement of fact, drawing or representation made by Xtralis either in this document or orally in relation to this recommendation on system design is to be construed as a representation, undertaking or warranty.

To the extent permitted by law, Xtralis excludes liability for all indirect and consequential damages however arising. For the purposes of this clause, ‘consequential damage’ shall include, but not be limited to, loss of profit or goodwill or similar financial loss or any payment made or due to any third party.

Recommendations on system design are provided exclusively to assist in design of systems using Xtralis products. No portion of this recommendation on system design can be reproduced without the prior approval in writing of Xtralis. Copyright and any associated intellectual property in any such recommendations on system design or documentation remains the property of Xtralis.

www.xtralis.com

Doc. No. 10885_03
June 2020

The contents of this document are provided on an “as is” basis. No representation or warranty (either express or implied) is made as to the completeness, accuracy or reliability of the contents of this document. The manufacturer reserves the right to change designs or specifications without obligation and without further notice. Except as otherwise provided, all warranties, express or implied, including without limitation any implied warranties of merchantability and fitness for a particular purpose are expressly excluded.

Xtralis, the Xtralis logo, The Sooner You Know, VESDA-E, VESDA, ICAM, ECO, OSID, and Sensepoint are trademarks and/or registered trademarks of Xtralis and/or its subsidiaries in the United States and/or other countries. Other brand names mentioned herein are for identification purposes only and may be trademarks of their respective holder(s). Your use of this document does not constitute or create a licence or any other right to use the name and/or trademark and/or label.

This document is subject to copyright owned by Xtralis. You agree not to copy, communicate to the public, adapt, distribute, transfer, sell, modify or publish any contents of this document without the express prior written consent of Xtralis.