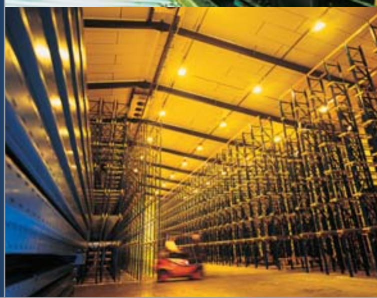
VESDA®

A Guide to the FIA Code of Practice

The best practice design, installation, commissioning and maintenance of Aspirating Smoke Detector Systems



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Contents

All sections are as per the FIA Code of Practice (COP). However, some sections are not commented on by us, so will be shown as no comment in the text.

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Specification
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A. Objective

The objective of this document is to summarise and highlight the most important aspects of the Code of Practice. It is intended that it will provide a short form and quick reference guide to anyone dealing with VESDA detectors. This will provide a basic aid that will prompt further investigation in the correct section of the Code of Practice.

Particular guidance on the use of VESDA detectors is provided where relevant.

It is not intended that this document be used in place of the Code of Practice or any other standard.

1. Scope

The scope is as defined on page 7 of the Code of Practise (COP). The purpose of the document is to provide recommendations on all aspects of the implementation of VESDA from planning to maintenance.

The COP discusses:

- the categorisation of systems and applications where they can be used.
- the performance tests that have always been applied to VESDA with the inclusion of some new and more flexible tests.

The COP also has a series of forms that can be used or modified to suit, covering each process from planning to handover and on to maintenance.

The COP does not advise on the size of sample pipes, capillaries or hole sizes, but does suggest that ASPIRE2 software should be used as a design tool to verify these are correctly sized.

This replaces the previous 1996 version of the COP.

2. References

It is strongly advised that the documents described in section 2 on page 8 of the COP are referred to when using this guide.

3. Terms and definitions

No Comment. Refer to the COP

4. Introduction to VESDA

VESDA detectors are the market leader in Aspirating Smoke Detection (ASD) technology and since the introduction of ASD and incorporation in to British Standards and NFPA documents, its use has significantly increased providing a solution to a wide range of applications.

A VESDA system is an integral part of the overall fire system, even replacing conventional systems in certain applications (refer to 4.1). As such, the designer must ensure compliance to National Standards.

4.1 Reasons for using a VESDA detector and its applications

The following three points are the principal reasons for applying ASD and reflect the classes within EN54-20. In the COP, section 10 discusses applications and we have included them in to each of the three classes here. Each heading will define the Class and each sub heading defined as a reason for using a VESDA system.

4.1.1 Very early warning (Class A)

A level of detection well before conventional systems would operate.

4.1.1.1 High sensitivity applications (Reason No.1)

- Computer Rooms
- Clean Rooms
- Telecommunications
- Process Control Machinery
- Bio-Medical Facilities

4.1.1.2 As an alternative or as an initiating device to extinguishing systems (Reason No.2)

This includes all the areas shown above, but can also include foam extinguishing systems in areas like:

- A warehouse with high value stock
- Aircraft Hangers

It is also important that Primary & Secondary detection is considered in High Sensitivity areas and this is discussed in Design Considerations, Chapter 6.

4.1.2 Enhanced smoke sensitivity (Class B)

For areas where a higher level of sensitivity than normal is required, e.g. where smoke is diluted due to height. When designed to this Class, a VESDA system can be configured to operate a smoke management system or actuation of suppression systems.

4.1.2.1 Large open spaces (Reason No.4)

- Shopping Atria
- Warehouses
- Cold Stores
- Aircraft Hangars
- Sports Stadia

4.1.2.2 Objects that require better levels of detection (Reason No.5)

- Process Machinery
- Organs in Churches and Cathedrals
- Works of Art
- Business-critical Areas

4.1.3 An alternative to point or beam type smoke detectors (Class C)

There are many reasons why a VESDA system is used as an alternative to conventional detection systems. The following identifies some of these areas.

4.1.3.1 Restricted or difficult access (Reason No.6)

When the area to be protected is restricted or dangerous; locating the VESDA detector outside this area provides a safer workplace for maintenance activities.

- Ceiling Voids
- EMC Areas
- Floor Voids
- High Ceilings
- Above process machinery

4.1.3.2 Aesthetics (Reason No.7)

Concealed detection is important for appearance or for reducing the risk of vandalism.

- Museums
- Art Galleries
- Churches and Cathedrals
- Stately Homes
- Prison Cells
- Police Custody Suites

4.1.3.3 Environmentally challenging area (Reason No.8)

There are many areas that cause an environmental issue to conventional detection where VESDA can offer a suitable solution whilst avoiding false alarms and reducing maintenance demands.

- Areas with a high temperature
- Cold areas
- Areas with high humidity
- Wash down areas in food production
- Dusty areas

5. Categories of system

The COP identifies a method of defining, in a single unambiguous sentence, the system description. This is important when specifying a VESDA system that it has been designed to meet a specific requirement so as to ensure it can achieve the desired outcome.

With the wide sensitivity range of a VESDA detector, it is capable of achieving all categories of application.

The important aspects for the category take into account the Sensitivity Class, the Sampling Method, the Compliance Test and the Motivators for using a VESDA system.

5.1 Sensitivity class

These classes relate directly to those specific to prEN 54-20:2004 and are adopted to ensure that the detector specified can meet the sensitivity class required. This relates to the whole VESDA system and not the just VESDA detector, taking into consideration dilution from multiple sample holes.

- Class A – Very High Sensitivity – e.g. computer rooms.
- Class B – Enhanced Sensitivity – e.g. large open spaces where better detection is required than conventional systems offer.
- Class C – Normal Sensitivity – e.g. where detection equivalent to EN54-7 is required.

5.2 VESDA sampling types/methods

5.2.1 Primary sampling

This is essential in applications of high sensitivity and is an arrangement of sample pipes in the direct line of airpath as the low levels of smoke created at the pre-combustion stage of a fire will travel with the airflow. This could include:

- Air Return Grilles of Air Handling Units
- Pressure Relief Vents
- Extraction Fans

5.2.2 Secondary sampling

This is the spacing of sample holes in place of point-type detectors on the ceiling, or within voids, and needs to be installed as per the requirements of the National Standard.

In this case it is expected that a hole is equivalent to, or better than, a point-type detector.

5.2.3 Localised sampling

This is the use of a VESDA detector to monitor a specific item(s) within an overall space. i.e. a printing press in a print hall.

5.2.4 In cabinet detection

This type of application is very effective, as only a small flexible capillary tube need enter the cabinet, thus making installation simple and avoiding future maintenance restrictions.

5.2.5 Duct detection

VESDA detection applied to ducts provides a simple to install and reliable detection system. Extensive testing of this type of detection method has resulted in a design approach that will overcome pressure changes as a result of airflow changes in the duct.

5.3 Route to compliance

This section talks about compliance to BS and the performance tests that are to be done for systems that do not fully meet BS. Our view is that any VESDA system should be tested using the performance tests described within Appendix A of the COP.

Table 2 of the COP is designed to allow someone to categorise an ASD system. This method ensures that the level of detection and performance of the system meets the protection design objectives of the end-customer. A VESDA system can achieve all aspects of table 2.

5.4 Summary and examples

ASD categories encompass:

- Detector Class A, B or C
- Type/Method of sampling
- Primary Motivation
- Requirements for compliance

This will then result in a useable statement that fully describes the performance characteristics of the system. These examples are as used in the COP:

- Class A Detector providing primary sampling for very early warning to meet test E2
- Class B detector providing localised sampling of equipment X to BS6266 spacing
- Class C detector providing secondary sampling for an area with restricted access to BS5839 spacing

6. Exchange of information and definition of responsibilities

No comment. Refer to the COP

7. Variations of recommendations

No comment. Refer to the COP

8. Design Considerations

There are many important aspects to design and the COP discusses these at length. However, the key points are:

- A VESDA system should be designed to meet the local National Standards, e.g. BS5839, BS6266 or be designed to meet a performance criteria
- A single VESDA detector should only be used to cover areas up to one BS5839 fire zone, 2000 m^2
- Failure of any single aspirator or critical component must not affect more than 2000 m^2 or the fire zone
- Due to the probability that a VESDA detector could generate an alarm before smoke is visible in Very High Sensitivity applications, special training should be considered for personnel dealing with the system.
- If monitoring within a duct, ensure that the area extracted by the duct isn't greater than 2000 m^2. If it is, additional detection will be required.

Note that the heading numbering in this section deliberately starts at 8.3 to match the relevant sections of the COP.

8.3 Sample point spacing

8.3.1 Horizontal spacing in normal environments

In essence, all guidance relating to the design of conventional point type smoke detectors, including structural beams, partitions, corridors, pitch roofs etc, should be applied to a VESDA system.

In areas where a performance based design is agreed, the standards provide a very good starting point. However, holes may have to be moved, added or removed from certain areas, e.g airpaths or underneath beams. An agreed test should be used to verify system performance.

8.3.2 Sampling in high airflow environments

This is a common use of a VESDA system and relates to Electronic Data Processing.

8.3.2.1 Primary sampling

There is much information in the COP relating to primary detection, but the key aspects are:

- In areas of Very High Sensitivity, Primary Detection is Essential
- Position the pipe on the return air side prior to any filtration
- Aim for one hole covering 0.4 m^2 maximum of an AHU Grille, (ideal is 0.2 m^2)
- Locate the pipe in the best position to suit laminar airflow
- Position holes typically 30-60 degrees off centre of the airflow
- Utilise socket unions or flexible joints to allow maintenance access

8.3.2.2 Secondary detection hole spacing in areas of high airflow

In some standards, e.g. BS6266, it is recommended that spacing for point detectors be reduced. If a VESDA system is being used, there are a number of reasons why this may not be necessary:

- A VESDA system’s aggregated and active sampling technology significantly reduces the need to having close hole spacing in order to detect highly diluted smoke.
- If a VESDA system is being used for primary coverage and will meet a 2 metre wire burn test and is interlinked to shut the AHUs off, the secondary detection can be installed to normal BS5839 spacing.
- If a VESDA system is being used as primary detection and meets the 2 metre wire burn test and the AHUs are not switched off, then secondary coverage may be to 25 m^2 per point/hole for room and voids with high airflow.
- A VESDA system protecting voids (floor and ceiling) pipe could be designed with holes spaced more closely across the flow as opposed to with it. As long as the area coverage per hole is not more than 25 m^2. Coverage per hole could be rectangular in this case, e.g. a hole covering 10 x 2.5 m.

8.3.3 Vertical sampling

A VESDA system can be designed to overcome the risk of heat barriers not allowing smoke to reach to high levels quickly (stratification). Pipes can be run:

- Vertically up the space being protected
- Drop pipes from the main pipe at high level
- Horizontally, suspended below ceiling level

The types of application this may be used in are:

- Atrium
- Warehouses
- Aircraft hangars

In all cases, code compliant coverage at high level must be adopted.

8.3.4 Ceilings and roof heights

The maximum ceiling heights discussed within BS5839 are important, however, ceiling heights are considered to be conservative if using a VESDA system due to its much higher sensitivity capability and method of operation, e.g. the cumulative effect of smoke into multiple holes.

As such, if designing systems with ceiling heights beyond that in the BS, a suitable performance based test should be agreed with the customer prior to installation.

8.4 Reporting, signalling and system integration

8.4.1 Standalone system

When the VESDA detector does not signal to the Control Indication Equipment (CIE), it is considered to be standalone. This is a rare use of a VESDA detector, however the detectors do have multiple volt free contacts, rated at 2A 30vdc, that can be used to trigger external devices of any description.

8.4.2 Integrated Systems

8.4.2.1 Visual alarm signals

The VESDA detector is able to generate multiple alarms. FIRE1 is the alarm threshold that is normally used to trigger the CIE in to a Fire state.

8.4.2.3 Multiple alarm thresholds

Multiple alarm levels are discussed in the COP. These can be used for any number of different scenarios, e.g.:

- Alert – Flashing a Beacon
- Action – Stage one of a gas system and shutting down equipment, e.g. AHU's
- Fire 1 – Activating Fire on the CIE
- Fire 2 – Interface to a Gas Extinguishing System or pre-action suppression system (see section 8.8)

Interface of these levels is via volt free contacts from the VESDA detector as discussed in 8.2.1.

8.4.2.4 Networking

Several VESDA detectors can be connected via a VESDAnet network. This is a two core loop utilising, preferably, a Belden 120 ohm data pair or a suitable fire rated cable, e.g. FireTuf, FP200 or MICC. VESDAnet should always be run as a loop as this prevents loss of signal due to cable failure or fault. However, an open ended daisy chain system may be used but is strongly discouraged. VESDAnet allows central display of information on display modules or a PC running VSM (VESDA System Manager). This benefits an engineer in programming and interrogating a complete system from one location.

If VESDAnet is being used with remote relays connecting centrally to the CIE, a suitable fire rated cable must be used. If VESDAnet is used for information only, fire rated cables are not required.

A single communication fault must not affect an area greater than 2000 m^2. As long as VESDAnet is run as a loop, this would not happen as the loop is bidirectional.

If there are two faults on the VESDAnet, it must not affect an area greater than 10000 m^2. This is an issue that must be considered if a central interface to the fire system is being utilised, e.g. using the relays in remote displays to connect at one location to the fire system. If VESDAnet is being used only for information and/or ease of maintenance, and the interface to the CIE is directly at the VESDA detector, then this will pose no problem.

8.5 Fault monitoring

The VESDA detector has three levels of Fault.

- Minor Fault – The system needs some service attention but is still operational
- Urgent Fault – The system may not be capable of detecting smoke and needs urgent attention
- Isolate – The fire outputs have been isolated

Depending on the VESDA detector type, these could be separate relays. However, all Fault levels should be reported to the CIE as Fault. This also includes the external Power Supply Unit (PSU) supplying the VESDA detector with 24vdc. The PSU can be monitored by use of the General Purpose Input on the VESDA detector programmed as “Mains OK”.

8.6 Maintenance

Maintenance of the system should be agreed at the design stage and deviations from the commissioned values for things like airflow and smoke transport time should be agreed.

Commissioning documentation should be used to verify consistency with commissioned values.

The VESDA System Design Manual provides guidance on recommended maintenance activities and schedules.

8.7 Power Supply Unit

A suitable PSU should be used to support the VESDA detector. The PSU supplied by Xtralis are designed specifically for the purpose of supplying the VESDA detector and have sufficient power and battery space for compliance to BS. All PSU supplied by Xtralis are designed to be EN54-4 compliant.

Although the PSU may be capable, it is important that if one PSU is used to supply more than one VESDA detector, if the PSU fails and the VESDA detectors are rendered inoperable, this does not affect an area greater than 2000 m^2. The 5A PSU supplied by us has individual fused outputs to help limit the possibility of this happening.

8.8 Extinguishing systems

The use of VESDA systems as part of the extinguishing release process has been employed for many years. BS6266 and BS7273-1 should be noted. A VESDA detector has a wide sensitivity range. It can be used for the second stage of a gas system release. There are number of innovative and very reliable ways of configuring VESDA systems for coincidence detection.

There are a number of points that should be read and observed within the COP.

9. Design Tools

The COP advises that a suitable design tool should be available for verification of the system. The ASPIRE2 software, provided free by Xtralis, should be used for this purpose.

ASPIRE2 allows the user to input data regarding the pipe layout and detector type. This will then be used to confirm that the balance of the system is acceptable and that the transport time meets the requirements of the customer and meets the COP. There are many other features of ASPIRE2 that aid the installation process including tables showing hole sizes and positions along the pipe and a 3D isometric view of the pipe layout.

9.1 Closed end pipe

It is rare for the end of the pipe to be closed as invariably the end cap hole forms part of the detection layout. However, this may be the case on duct detection and pipes covering return air grilles.

9.2 Vented end cap

This is the normal method that is used for pipe runs with the end cap of either the same hole size as the main holes or in some cases, to improve transport time, a slightly larger hole. Note that it is good practise to design the vented end cap as the last sampling hole of the pipe.

9.3 Pipe design considerations

- Primary Detection – Refer to 8.3.2.1
- Secondary Detection – Refer to 8.3.2.2
- Maximum Transport Time
- Balance
- Relative Sensitivity

9.3.3 Maximum permissible transport time

The maximum allowed transport time is 120 seconds (2 minutes). Xtralis suggests that the transport time should be as short as possible and ideally less then 60 seconds. This is certainly the case in Class A systems were very early warning is required. ASPIRE2 can be set with the maximum transport time for the particular calculation.

9.3.2 Balance

Balance is the relationship in flow between extremes of holes. Holes nearer the VESDA detector will be drawing more air than those further away. In an ideal system, the balance should be as close to 100% as possible, but a minimum of 70% is required as this allows for a simplified installation using the same or similar hole sizes along the pipe length.

9.3.3 Relative sensitivity

Relative sensitivity is how much smoke would need to enter one hole in isolation of all the other holes on that detector to make the VESDA unit trigger a Fire1 Alarm. This information is clearly shown in ASPIRE2. ASPIRE2 can also determine aggregate sensitivity, i.e. with smoke split between multiple holes. This is more common in the large open spaces that a VESDA system is frequently used in.

10. Applications

No Comment. Refer to the COP and section 4 of this guide.

11. Product Standards and Marking

The VESDA system is manufactured to meet all the requirements EN54 and is marked accordingly.

12. Limitation of False Alarms

There are a number of different categories of false alarm. However, only Unwanted Alarms and Equipment False Alarms relate to a VESDA system.

12.1 Unwanted alarms

Due to the high sensitivity of a VESDA detector, it is a common misconception that it is prone to false alarms. Unwanted alarms are, in fact, rare. Appropriate training is essential in areas of Very Early Warning as an alarm condition from VESDA can be thought of as being false as no fire is evident, but an incipient fire is actually developing.

There are a number of features of VESDA that help in the limitation of false alarm and these are discussed in the FIA COP.

12.1.1 Alarm thresholds

The Alarm thresholds on a VESDA detector have a great deal of adjustment, so setting the threshold above the normal operating background of the protected space is never a problem. The sensitivity range of the VESDA detector is 0.005% to 20% Obs/m* with almost no limit to where the thresholds can be set. Fire1 has a maximum and minimum sensitivity to ensure compliance to LPCB. The main point to note is that the VESDA detector is a fixed calibration unit and the sensitivity is not being continually altered to compensate for degradation of the sensor optics or noise created by background change.

** LaserFOCUS is 0.025% to 20%*

12.1.2 Fault logs

The VESDA detector has a comprehensive log recording up to 18000 events that include smoke changes, alarm conditions, fault conditions and user intervention. This log is invaluable for two reasons:

- Recording the normal background activity to allow a decision to be made as to a suitable alarm threshold
- Investigation in to Fire and Fault activity, seeing trends in alarm conditions that could be attributed to external influences, e.g. a power supply with a fault switching on and off.

12.1.3 Multiple alarm thresholds

As well as the wide sensitivity range of a VESDA detector, it also offers multiple alarm thresholds. Dependant on the detector type, this can be up to four different levels allowing effective application of staged alarms. For example, all four could be used as follows:

- ALERT – As it suggests, alerting someone, so activating a localised strobe or sounder
- ACTION – This could instigate a controlled shut down of plant and machinery and also possibly stage 1 of a gas discharge system
- FIRE 1 – Is generally treated as a normal point-type smoke detector and will activate an Evacuation on the fire alarm panel
- FIRE 2 – Is normally used for the 2nd stage of a gas discharge system.

These staged alarms also allow a response that could prevent activation of the main fire system, for example if unauthorised hot works are being undertaken.

12.1.4 Referencing

As mentioned earlier, a VESDA detector has fixed calibration. As such, once the alarm thresholds are set there is no automatic adjustment of the detector's sensitivity. The only time that a change may happen is when referencing is used. If there is a risk that smoke from an external source can enter the area being protected, the external air can be monitored by use of another VESDA detector acting as a reference.

This reference detector will offset the main detectors to avoid an unwanted alarm caused by this external influence.

12.1.5 Alarm delays

The VESDA detector can have a delay of up to 60 seconds per alarm threshold. These delays can also be made "Cumulative", i.e. if each threshold is 20 seconds and the smoke level rises above Fire 1, there will be a delay of 60 seconds before Fire 1 activates. Alternatively they can be "Simultaneous" where only the delay time for the level breached will take effect. This can vary depending on the detector in use.

12.1.6 Day/night settings

On some VESDA detectors these are referred to as Alarm Set 1 and 2 as it is rare that this feature is used for day and night settings. In essence, all fire thresholds can have a different sensitivity to overcome a normal activity. This change can either happen at specific times as controlled by the VESDA internal clock or via an external input in to the VESDA detector. Some possible uses could be :

- During cleaning stages of plant machinery
- In Churches or Cathedrals where incense is burned during services
- In theatres, where stage smoke is used for effects

NOTE: The LaserCOMPACT does not have different sensitivity sets.

12.1.7 Software algorithms

VESDA detectors incorporate dust rejection algorithms as described in the COP but these do not adjust the detector's sensitivity to smoke. Such dust rejection algorithms should not be confused with "adaptive algorithms" which adjust the alarm thresholds according to the measured background level. While these adaptive algorithms are sometime referred to as "artificial intelligence" they should be treated with some caution as there is some evidence that their behaviour is unpredictable (Annex J EN54-20:2006). As stated in 12.1.1, VESDA detectors have fixed calibration.

12.1.8 Filtering

The filter in a VESDA detector has a unique function. It provides a clean air bleed that protects the optical components of the VESDA chamber. Protecting the optical components from dirt and dust ensures the continued sensitivity of the detector.

The status of the filter is monitored and a service engineer can interrogate the life used of the filter and estimate its replacement time. The life of the filter can be greatly reduced in dirty industrial applications, but in a typical office type environment, life expectancy is up to three years.

12.2 Equipment false alarms

These can be limited by using VESDA detectors as they are extensively tested by third party certification companies to ensure approval and correct operation. All VESDA detectors and remote modules have LPCB compliance. It is also important that servicing is conducted in accordance with section 15 of the COP and as described in the Maintenance Section of the VESDA System Design Manual (available at www.xtralis.com/vesda).

13. Installation

There are a number of points to consider when installing a VESDA detector.

13.1 Siting of equipment

The VESDA detector should be located in an accessible location. This is one of the benefits of a VESDA system when detecting in areas of restricted access.

The filter is located at the front of the VESDA detector, so ensure that nothing restricts access to it.

If the VESDA detector is located in an area different to the risk, consider back venting the exhaust in to the space to avoid an issues with pressure differentials.

Ensure that no environmental issue can damage the VESDA detector. If there is a risk of moisture or dirt affecting the unit, consider mounting it inside our purpose designed IP66 enclosure.

13.2 Electrical installation

The VESDA detector requires a 24 vdc supply. The PSU supplying this must be installed in accordance with specific regulations. Suitable cable should be used according to the risk to link the PSU and the VESDA detector and the VESDA detector and the CIE.

13.3 Mechanical installation

13.3.1 Pipework

The requirements of the pipe used on a VESDA system are that it has a smooth internal bore with a nominal 21 mm ID and any changes of direction are slow radius bends and not tight 90 degree elbows. As such, almost any type of pipe can be used and is invariably chosen based upon the requirements of the installation.

However, we do also supply a pipe specifically for the purpose. This meets the code requirements of being labelled as a smoke detection pipe. It should be clipped at no more than 1.5 m centres. A full range of bespoke pipe fittings is available.

13.3.2 Sampling points

Sample points are either drilled directly in to the main pipe or are in the form of capillary sampling points.

13.3.2.1 Extended sampling pipe or capillary tube

Capillary sampling is simply a method of having the sample hole remote from the main trunk pipe. This could be either for installations where the pipe is located in a void above the protected area, or where a sample hole lower than the pipe is required (drop pipes within racking in warehouses), or where a riser pipe is required (in difficult to access ceiling voids).

We have three purpose designed capillary points to suit most applications. Pipe can also be used to fabricate other suitable capillary forms.

- Conical sample point – this is normally used on suspended ceilings and comes in a kit.
- Flush sample point – this is used where access above for fixing is restricted and is also a kit.
- Discrete sample point – this is used in areas where the hole is required to be invisible, e.g. heritage buildings

- Normal size pipe – this is achieved by utilising an equal Tee, a length of normal pipe and an endcap with a sample hole.

The size of the hole in the end of a capillary should be determined by modelling on ASPIRE2.

13.3.2.2 Sampling holes

Normal sample holes are drilled directly in to the main trunk pipe with a hole size determined through ASPIRE2.

Ensure that the pipe is clear of swarf before connecting to the VESDA detector and also ensure sample holes are clearly identified with the labels available.

14. Commissioning and Handover

14.1 Commissioning testing

Commissioning tests should only be conducted when the building is in its final state and the VESDA system can be configured correctly.

14.2 Commissioning

14.2.1 Inspection of installation

It is important that the final installation is inspected to ensure that it matches the design and the ASPIRE2 calculation. Particular note should be made of :

- Ensuring the installation meets the design specification
- Adequate coverage has been made across Air Handling Units
- Compliance to the relevant BS or National Standard is being achieved. Sample holes should meet the minimum performance requirements for individual points.

A thorough inspection of the physical installation should also be conducted, checking the pipe is secured correctly and all holes are identified and correctly sized and spaced. Wiring is installed correctly, PSU's are correctly sized and batteries adequate to meet stand by requirements.

14.2.2 Power up/configuration

The correct power up sequence should be followed as detailed in the documentation supplied with the VESDA detector.

Using a suitable programming tool, either an LCD programmer on the system, a Hand Held Programmer or a PC connected via a High Level Interface running VESDA System Configurator Software (VSC), the VESDA detector should be programmed following the guidelines in the documentation.

14.2.3 Commissioning tests

Xtralis fully endorse that commissioning tests as discussed in the COP are followed.

Before tests are conducted, the area of protection should be in its final operating state, e.g. full room integrity, air conditioning equipment operating and floors and ceilings in tact.

For a prescriptively designed system, as a minimum the following should be tested:

14.2.3.1 Smoke transport time/pipe integrity test

Introduce smoke in to the furthest sample hole in the pipe and time how long before the VESDA detector reacts to this smoke. A reaction is deemed to be an increase of 2 bars above the normal bargraph reading. It could also include an alarm condition, however, if this is the case, any alarm delays should be set to zero before the test.

On systems with multiple branches or pipes, each must be checked. Results should be recorded to be referred to during maintenance of the system.

Transport time should not exceed the time specified for the system or the maximum time specified by the COP – 120 seconds. Ideally it should be less than 60 seconds.

14.2.3.2 Fault detection

It is advisable that a High Airflow fault is checked (simulating a broken pipe) and a Low Airflow fault is checked (simulating a blocked pipe or blocked sample holes).

In some cases, single sample hole blockage is required where there is a risk of malicious damage to the hole, i.e. in a prison cell or police cell. If this is the case, the system should be suitably designed with a small number of holes.

All flow readings should be recorded during commissioning for future maintenance.

The PSU should also be checked to ensure that correct signalling is made in the event of power or battery loss. If this is via the VESDA General Purpose Input, check that the correct signal is generated by the VESDA detector.

It is also possible to use the diagnostics function of the VESDA detector to check for a general fault or a flow fault to ease commissioning and maintenance.

14.2.3.3 Functional tests

Functional tests should be agreed and conducted as detailed in the maintenance section. These tests are to verify that smoke is entering sample holes and the system responds as expected.

If a system is designed to performance requirements, then additional performance tests may be required.

14.2.3.4 Performance tests

When a performance test is required, it should be as described in the COP. However, it is also possible that an agreed test of a different nature may be conducted.

14.2.4 Signalling

All signalling between the VESDA detector and the CIE must be checked. This can be done during performance tests, or the Diagnostics function of the VESDA detector can be used to force certain conditions or control relays independently.

It should also be verified that Isolating the VESDA detector triggers a fault condition at the CIE.

14.2.5 System handover

It is strongly advised that suitable handover documents are provided to the customer. This can either be in the form of those described in the COP or they could follow those recommended in the VESDA System Design Manual.

15. Maintenance

It is important that the VESDA system gets the same level of maintenance as the Fire System. As a minimum this should be annually.

15.2 Recommendations for routine inspection and testing

Maintenance guidelines for the VESDA system are clearly detailed in the Maintenance section of the VESDA System Design Manual and should be adhered to.

15.2.1 Routine inspection

For a suitable level of maintenance, a programmer or PC connection will be required.

All Fault and alarm outputs should be checked ensuring that the CIE is isolated or disabled so as to ensure an evacuation signal is not generated.

The PSU and batteries should be checked ensuring that any fault on the PSU is reported correctly either directly or via the General Purpose Input.

The filter life should be checked in the filter menu.

All parameters set and recorded during commissioning should be verified with the current readings.

A visual inspection of the pipe work should be made.

15.2.2 Functional tests

The purpose of the functional test is to ensure the system remains as it was during commissioning. Smoke being injected in to each hole is ideal, however, due to the applications of a VESDA system, this may not always be possible, so other techniques can be adopted such as:

- A transport time/pipe integrity test should be conducted to ensure consistency with the commissioned system.
- Flow readings as taken during commissioning are the same, particularly the Raw flow or l/min flow and the percentage flow
- Blockage of one hole (or a group of holes) in certain applications creates a fault.

There are also a number of other suggestions made in the COP that should be considered with regard to testing.

B. Appendix

The appendix section details the relevant performance tests and the procedure for conducting them. The original tests are still used although there have been some improvements and also there is the inclusion of some new tests. As such, this section should be considered when determining what test should be conducted.

It is important that prior to system design, it is agreed what performance test will be conducted so as to avoid any confusion at hand over of the system.

Appendix A – Table detailing the type of tests

Appendix B – Smoke Pellet Test – used for typical areas complying to BS5839.
We are able to supply pellets for the test but not the test equipment.

Appendix C – Paper Burn Test – This test is rarely used for VESDA, although in an office type of environment it is possibly a better test than Appendix B.

Appendix D – Overheated Enamel Wire – This test is not used for VESDA detectors.

Appendix E – Overheated PVC/LSF wire – There are three tests here,

- E.1 is the 1m wire and is for Class A and Class B systems, so computer rooms/telecom rooms etc.
- E.2 is a 2m wire and is for Class A only as it only gives off very small amounts of smoke.
- E.3 is the 2 x 1m test and is for Class A and B systems were more smoke is required than in test E.1.

Xtralis manufacture a suitable test unit for this procedure and wire for the test.

Appendix F – Overheated Resistor test. Three different tests within this process but this is normally aimed at small cabinets. However, due to the complexity of the equipment, the 2m wire test is normally used here.

Appendix G – Polyurethane Mat Test. This is rarely done in the UK but is commonly conducted in mainland Europe in place of Appendix B.

Appendix H – Potassium Chlorate/Lactose Test. This is an inherently dangerous test and its use is discouraged. It would be done in place of Appendix B or G.

Appendix I – .1 to I.5 are the hand over documents.

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