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Fire detection and alarm systems —

Part 30: Design, installation, commissioning and service of video fire detector systems

Systèmes de détection et d'alarme d'incendie —

Partie 30: Conception, installation, prise en charge et entretien des systèmes de détection incendie par vidéo

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 21, *Equipment for fire protection and fire fighting*, Subcommittee SC 3, *Fire detection and alarm systems*.

A list of all parts in the ISO 7240 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The installation of a video fire detection system (VFDS) can only be successfully accomplished if the following conditions are fulfilled:

— materials are of a suitable quality;

— special knowledge in the field of video fire detection (VFD) is implemented;

— skilled personnel carry out the work.

Although the quality of the material can be ensured by adherence to applicable standards and quality audits, the overall effectiveness of an installation depends widely on the quality of work, the experience of the designer and installer, and regular service.

This document has been prepared by ISO/TC 21/SC 3. A number of existing national codes and standards were reviewed during the preparation of this document. As VFD technology is significantly different from conventional fire detection technology, different considerations need to be addressed and therefore a document specifying the installation of VFDSs has been developed. While specific to VFDSs, this document has the same objective of early fire detection as ISO 7240-7. This document specifies the minimum requirements for fire detection installation using equipment conforming ISO/TS 7240-29.

Fire detection and alarm systems —

Part 30: Design, installation, commissioning and service of video fire detector systems

1 Scope

This document specifies the design, installation, commissioning and service requirements for video fire detector systems (VFDS; see ISO/TS 7240-29), which are primarily intended to provide early detection of fire within one or more specified indoor areas for the protection of lives and equipment. The VFDS can also serve to protect from specific defined risks. The VFDS can be an independent fire detection system or can be used in conjunction with a fire detection and alarm system (FDAS; see ISO 7240-1:2014, Figure 1).

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7240-1, *Fire detection and alarm systems — Part 1: General and definitions*

ISO 7240-4, *Fire detection and alarm systems — Part 4: Power supply equipment*

ISO 7240-13, *Fire detection and alarm systems — Part 13: Compatibility assessment of system components*

ISO 7240-14, *Fire detection and alarm systems — Part 14: Design, installation, commissioning and service of fire detection and fire alarm systems in and around buildings*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 7240-1 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1.1
alarm zone
geographic subdivision of the premises in which one or more alarm devices are installed and for which a common zonal alarm indication is provided

3.1.2
detection zone
geographic subdivision of the premises in which one or more points are installed and for which a common zonal detection indication is provided

3.1.3
field of view
image captured by the video fire detector

Note 1 to entry: Field of view is a 2D projection/representation of the objects within a 3D rectangular pyramid.

3.1.4
active field of view
area in field of view in which smoke and/or flame can be detected by the video fire detector

Note 1 to entry: The active field of view takes into consideration any borders to the field of view where detection is not effective and areas within the field of view deliberately masked to avoid nuisance alarms.

3.1.5
illuminator
light source, internal or external to the video fire detector that assists the equipment to operate in low ambient light conditions

3.1.6
monitored volume
3-dimensional space within a protected space that is visible in the active field of view of the video fire detector such that smoke/flame occurring in (or around) that space is detected

Note 1 to entry: The monitored volume takes into consideration the active field of view, the declared range for the video fire detector and any obstacles within the space which can potentially obscure the view.

3.1.7
protected space
the area(s) where the threat of a fire is to be detected by one or more video fire detectors

3.1.8
quiescent condition
functional condition characterized by the absence of the alarm, fault warning and disabled and test conditions

3.1.9
video fire detector
self-contained device or distributed system in which analysis of video images is performed in order to detect the presence of smoke and/or flame within the images being analyzed

3.1.10
video fire detector system
fire detection system comprising one or more video fire detectors

3.2 Abbreviated terms

AC	alternating current
AHJ	authority having jurisdiction
EMC	electromagnetic compatibility
EMI	electromagnetic interference
FDAS	fire detection and alarm system
FoV	field of view
aFoV	active field of view

FDCIE fire detection control and indicating equipment

VFD video fire detector

VFDS video fire detector system

4 Equipment and material

4.1 Quality of components

Components used as part of the VFDS shall be designed and manufactured in accordance with a recognized quality system.

The equipment manufacturer shall make available to the VFDS designer information about the manufacturer's quality assurance system to satisfy the designer that the components selected for the VFDS are suitable for the application.

4.2 Standards

Equipment used in the VFDS shall conform to the relevant part of the ISO 7240 series or other International Standards, as appropriate. The testing supporting such conformity shall be performed in a testing laboratory that meets the requirements of ISO/IEC 17025.

Note 1 Certification can be used to demonstrate conformity of the equipment to the relevant standard.

Note 2 Accreditation of the testing laboratory for the testing of equipment in accordance with the relevant standard can be used to demonstrate competence of the laboratory to perform the specific tests. Where assessment has not been made by an independent party, the designer identifies the components and describes why assessment has not been undertaken.

4.3 Environmental requirements

Each item of equipment shall be installed within an environment for which it has been certified.

Additional requirements may apply in special cases, e.g.:

— potentially explosive atmospheres;

— special electromagnetic compatibility (EMC) requirements.

4.4 Additional equipment

Additional equipment (e.g. remote terminals or graphic displays) may be included in the design of, or connected to the VFDS.

The operation of the VFDS shall not be reliant on the additional equipment.

Failure of any additional equipment shall not affect the correct operation of the VFDS.

4.5 Installation materials

Installation material (e.g. cable clamps, Catenary cable and cable trays) shall be of a suitable rating, size and strength to meet the design load requirements.

Connectors and distribution boxes shall be suitable for the size of cables used in the VFDS.

5 System functionality

5.1 Responsibility

The VFDS shall be subjected to a performance test by a qualified person to verify functionality in the field as specified by the manufacturer.

NOTE Examples of a qualified person are an installer, designer, commissioning engineer or other responsible party taking into consideration national guidelines.

The designer shall ensure that propagation of smoke from masked areas to unmasked areas is assured and detected by the VFDS. Areas that are masked to resolve nuisance alarms shall be covered by a different fire detector.

The designer shall ensure that equipment conforming to ISO/TS 7240-29 used in the VFDS has been independently assessed as being compatible with the fire detection control and indicating equipment (FDCIE), in accordance with ISO 7240-13 when connected to the FDCIE.

Where the requirements of ISO 7240-13 do not directly apply, then it may be used as a guide to prepare a suitable compatibility assessment procedure.

The designer shall ensure that devices such as motors that may cause vibration or EMI are not in direct proximity to the VFDS.

5.2 Documentation

The designer shall prepare a list of all components used in the VFDS and identify which components are compatible.

5.3 Certification

Certification of compatibility of equipment used in the VFDS shall be included in the design documentation for the VFDS.

Where assessment has not been made by an independent party, the designer shall identify the components and describe why assessment has not been undertaken.

Where the VFDS interfaces to another system (e.g. building-management system) using voltage free relay outputs, then self-assessment may be made by the designer and documented accordingly.

Where the VFDS interfaces to another system (e.g. fire alarm system) using a high-level link (e.g. serial data communication), the designer shall prepare a suitable test plan to ensure reliable interfacing, including the testing of failure and fault modes. This may be done in conjunction with the equipment manufacturer.

6 Design

6.1 Responsibilities

Design of the VFDS, including components and usage requirements, shall be undertaken in a systematic process in accordance with a quality system. A document shall be signed by a responsible person describing the scope of responsibility in such detail that undefined areas and areas overlapping with other responsibilities are avoided.

6.2 Qualifications

The design of the VFDS shall be undertaken by persons having professional qualifications or experience relevant to the scope of the particular design requirements. This may include:

— a person competent in the field of VFD and alarm technology,

— an experienced consulting company, or

— an experienced VFDS designer.

NOTE National regulations might exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition might form part of a recognized competency framework.

6.3 Documentation required for the design

The designer shall have access to documentation necessary to design the VFDS, in accordance with the requirements of this document. Documentation shall include the following:

— plans of the building;

— use of the building (where known);

— occupancy of the building (where known);

— description of the hazard, including proposed use of detection zones and alarm zones;

— description of the environmental conditions, such as:

  — temperature,

  — humidity,

  — corrosive atmosphere,

  — electromagnetic influences (e.g. areas subject to severe thunderstorms);

— description of the environment where the equipment is installed (e.g. occupancy of the building, hazardous locations);

— description of the infrastructure of the environment (e.g. traffic conditions, communications, electricity supply, fire brigade access, water supply, etc.).

The designer shall state any assumptions made and provide justifications for solutions selected.

6.4 Power supply

6.4.1 Power supply equipment

Power supply equipment for the VFDS and artificial lighting required to maintain minimum illumination in the aFoV as per 6.5 shall conform to the requirements of ISO 7240-4 or equivalent.

NOTE Standby generators are an acceptable means of maintaining adequate lighting levels.

6.4.2 Main power source

The power supply equipment shall be energized by a reliable source of supply and shall be connected taking into account national electrical wiring requirements. The main power source shall be either:

a) an AC supply from an electricity supply company; or

b) a source of quality and reliability equivalent to that in 6.4.2 a).

6.4.3 Standby power source

The requirements of local regulations are taken into account regarding standby power source standby time in the event of loss of the main power source. Where local regulations do not exist, the standby power source shall power the VFDS for a minimum of 24 h in quiescent condition, followed by a further period in the alarm condition. The alarm condition period shall be the greater of 30 min or the time required to alert responsible personal, or in the event that the VFD is connected to an FDCIE, the time to evacuate the premises.

ISO 7240-14:2013, Annex A, provides example calculations for battery capacity, charging current and power source. When calculating the capacity of the power supply, any ancillary loads powered by the power supply equipment shall be included.

6.5 Minimum illumination requirements

Where VFDS is utilized as primary protection and serves as the sole protection, the following conditions shall be met;

— artificial lighting shall be provided at all times to maintain minimum illumination levels as specified by the video equipment manufacturer in the aFoV;

— the operating power for the artificial lighting system shall be provided by a power supply conforming to at least one of the following:

  — the requirements of ISO 7240-4;

  — national installation standards for VFDS;

  — standby power source requirements as defined in 6.4.3.

The maximum time between interruption of mains power and availability of power to re-establish minimum lighting shall not exceed 30 s.

6.6 VFD smoke detection

Where VFDS is the only protection for smoke detection, it shall be installed in a configuration which monitors a sufficient proportion of the volume within the protected space to ensure that a fire anywhere in the protected area will be detected.

For active areas in the field of view (FoV), detection is (assumed to be) assured within maximum and minimum distances.

6.7 VFD flame detection

Where VFDS flame detection is the only protection in a room it shall cover all potential flame sources.

Flaming material on conveyors or moving hazards can remain undetected as it can be necessary for activity to remain in the same pixels for a required duration in order to satisfy analytics.

6.8 Nuisance alarm mitigation for flame and smoke

The installer shall identify and consider potential sources of nuisance alarms and utilize any product features in the manufacturer instructions to mitigate the effects of these.

6.9 Coverage consideration

6.9.1 General

Based on the manufacturer's specifications, one camera or multiple cameras shall be required for a particular application. Considerations shall encompass installation location, detection target (smoke, flame) and the overlap/gap size of FoV (monitoring area) of each camera. Refer to Annex A.

A sufficient number of cameras shall be utilized in each zone to ensure that a fire anywhere within the zone will be detected.

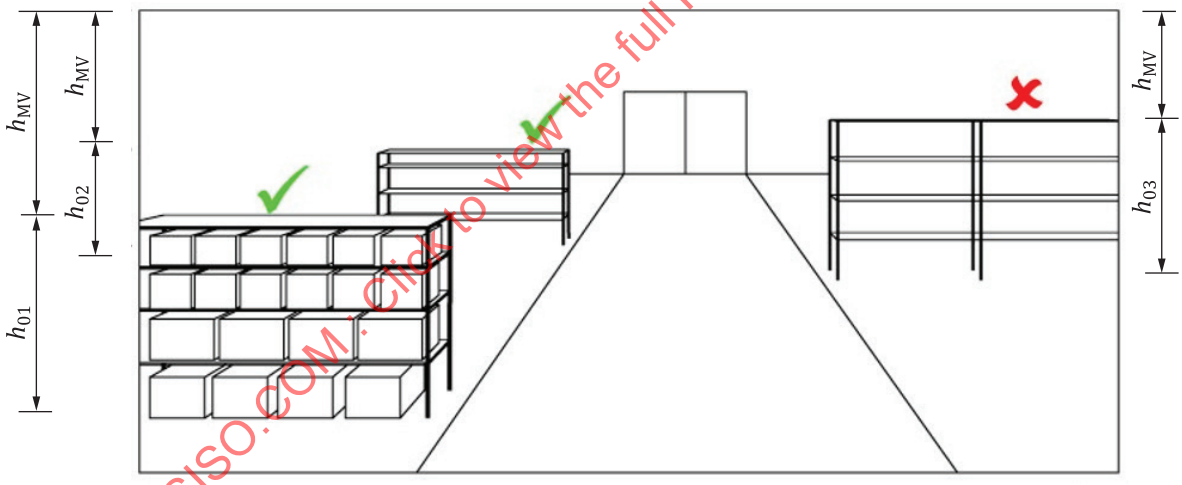
NOTE For some installations and/or specific areas to be protected, VFD is not necessarily the optimum solution. Therefore, it is important for the system designer to give due consideration to utilizing other fire detection technologies.

6.9.2 Full site monitoring

Each point of the application shall be monitored in a way that a point/source of ignition can be detected.

6.9.3 Monitoring for smoke detection

The monitored volume shall be chosen in such a way as to ensure that sufficient space above the source of ignition can be monitored adequately for smoke. The height of the monitored volume, h_{MV}, above the obscured space should be greater than the depth of the obscured space. Refer to Figure 1.



Key

$h_{01} = h_{MV}$ = YES
$h_{02} < h_{MV}$ = YES
$h_{03} > h_{MV}$ = NO

Figure 1 — Monitored volume space above source of ignition

NOTE Smoke rises due to thermal buoyancy; therefore, fires in an obscured space can be detected in the monitored volume above the obscured space.

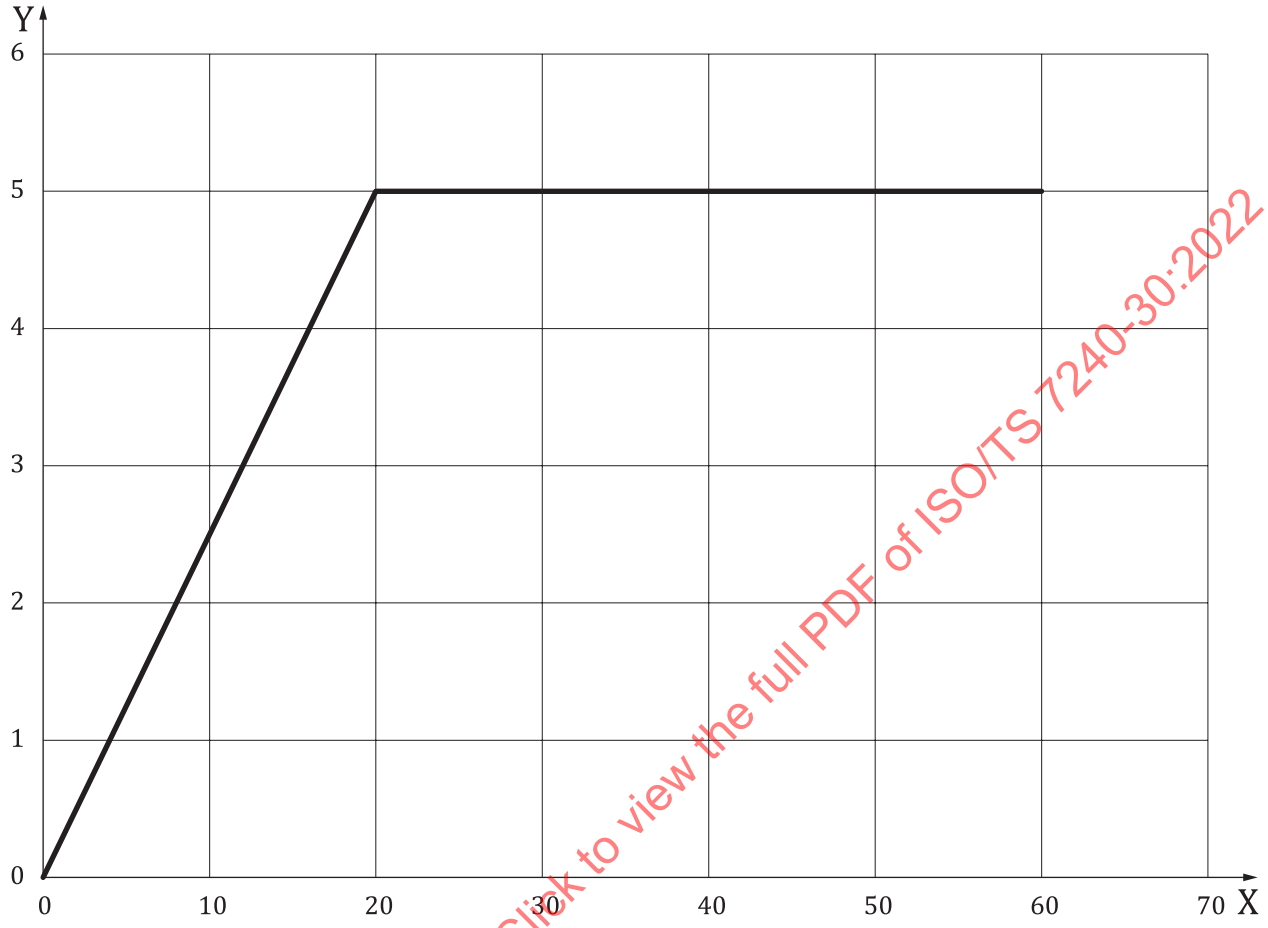
6.9.4 Maximum height of obstacles

The maximum height of obstacles in the monitored volume is limited to 10 m to prevent stratification of smoke before it can be detected by a VFD.

For applications with obstacles higher than 10 m, more than one VFD is needed.

6.9.5 Spacing requirements to walls

The maximum distance of the uncovered area to the walls is a quarter of the height of the top line-of-sight of the VFD with a maximum distance of 5 m. Refer to Figure 2.



Key

X room height (m)

Y maximum distance to wall (m)

Figure 2 — Maximum distance of monitored area to walls depending on top line-of-sight of the VFD

6.9.6 Monitoring for flame detection

The coverage shall be planned in such a way that the VFDS can detect each point of ignition in the protected volume.

6.9.7 Area of interest monitoring

An area of interest is a defined space within an application, which shall be monitored for fire by a VFD.

6.9.8 Monitoring for smoke

The coverage shall be planned in such a way that the VFDS can detect each point of ignition in an area of interest.

The FoV shall be chosen in such a way that sufficient space above the source of ignition can be monitored adequately for smoke.

NOTE See the spacing requirements in 6.9.2.

6.9.9 Monitoring for flame

The coverage shall be planned in such a way that the VFDS can detect each point of ignition in an application (so that the flame is visible in at least one FoV).

6.10 Detection zones

The building shall be divided into detection zones in accordance with ISO 7240-14.

A VFD is restricted to a maximum coverage of one zone.

6.11 Other considerations

Where a VFDS is utilized as supplementary protection in applications such as an alert emitted to attract attention from personnel in the premises, but not used for an evacuation signal, earlier warning, dual system or false alarm mitigation, the following conditions shall be met:

— installation shall be subject to the specifications of the owner and the authority having jurisdiction (AHJ);

— where VFDS is utilized to protect specific defined risks, the following conditions shall apply:

  — care shall be taken to avoid false alarms from activity behind or around the specific hazard.

7 Installation

7.1 Responsibility

Installation of the VFDS shall be undertaken by a suitable installer. The installation shall conform to the design plan and shall also include the following:

a) indication of other works that can also be occurring in the building;

b) resources available to the installer;

c) availability of equipment and materials.

Where the installer encounters problems with the design (e.g. due to changes in the building plan or a flaw with the design), the designer shall review the design and make any required changes. Any changes to the design or installation plan shall be approved by the owner and the relevant authority.

7.2 Qualification

The installation of the VFDS shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular installation requirements.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognized competency framework.

7.3 Certification

Conformity of the installation to the design documentation shall be assessed and certified upon completion of the installation. This certification should confirm the correct installation of the components of the VFDS in accordance with the design documentation.

NOTE The owner or the relevant authority can require assessment by an independent party.

8 Commissioning

8.1 Responsibility

Commissioning of the VFDS shall be undertaken by a suitable commissioner.

8.2 Qualification

The commissioning of the VFDS shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular commissioning requirements. This may include:

— engineer or technician with proven experience in the field of VFD technology;

— experienced consulting company, or

— experienced installer.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognized competency framework.

8.3 Procedure

A commissioning plan shall conform to the requirements in this document and any amendments incorporated as part of the design plan.

The commissioning plan shall be approved by the owner and the relevant AHJ.

The commissioning plan should include equipment and system checks and tests to ensure the VFDS and associated lighting system are installed and operating correctly. The following points shall be included.

— Location, identification, correct type and operation of cameras, illuminators and other devices are functional.

— Correct information is available at the FDCIE when fire images are detected.

— Transmission paths to any interconnected FDCIE have been installed in accordance with requirements.

— Actual power consumption ensures the conformance of the VFDS to the required standby time.

— All ancillary functions (inputs and outputs) function correctly.

— Where a VFDS is operating with or in conjunction with a security system for such functions as video surveillance, facial recognition or people tracking, verification by test that the operation of the security system does not interfere or impair the operation of the VFDS. The operation of each VFD is tested to confirm its ability to detect fire or smoke or both as appropriate within the entire FoV.

— Documentation (see 6.3) is correct and available.

Testing shall be accomplished to ensure the system detects signature of smoke produced by the hazard.

Testing shall be accomplished to ensure the system detects signature of flame produced by the hazard.

System testing shall be accomplished to ensure normal operation in protected space to minimize false alarms.

8.4 Commissioning report

As part of the commissioning process of the VFDS, the VFDS system installer shall prepare and complete a detailed report of the system as installed.

NOTE A sample report is included in Annex B.

9 Approvals

The VFDS shall be certified for conformance to this document and other International Standards as appropriate by an independent party acceptable to the regulatory authority.

10 Service

10.1 Responsibility

The building owner or occupier shall be responsible for service to and service quality of the VFDS.

10.2 Qualifications

Service to the VFDS shall be undertaken by persons having qualifications and/or experience relevant to the scope of the particular service requirements.

NOTE National regulations can exist for the registration and recognition of individuals with the requisite qualifications and experience. The recognition can form part of a recognized competency framework.

10.3 Service plan

10.3.1 General

The designer shall prepare a service plan of routine inspections, tests and preventive maintenance to continuously preserve the function and performance of the VFDS and to demonstrate that the VFDS functions and is capable of performing to a standard not less than that to which it was originally designed.

10.3.2 Pre-planned maintenance

The VFDS system shall be subjected to a regular pre-planned maintenance schedule as prepared by the system designer that shall confirm that the system is fault-free.

10.3.3 Precautions

Inspection, testing and preventive maintenance of the VFDS shall be carried out after notifying building occupants.

10.4 Routine inspection

The VFDS shall be subject to annual inspection to verify the correct operation of the system.

Annual verification shall be carried out to ensure that each VFD FoV is pointing at its intended target.

VFD cameras shall be inspected for any condition that is likely to adversely affect their operation, such as excessive deposition of dust or coating of paint.

Wiring connections to cameras, VFD controllers and wiring to interconnected FDCIE shall be inspected.

Battery ventilation and protection against corrosion shall be inspected.

10.5 Routine testing

The VFDS shall be subject to annual testing to verify the correct operation of the system.

It shall be tested that that an alarm simulated from a detection zone causes the VFDS to enter the alarm condition and that all required outputs activate, including delayed outputs.

NOTE One example of a simulated test can be a smoke bomb (cartridge), or a monitor or projector that is recorded by the VFDS.

Testing of the VFDS operation system shall be carried out as per the manufacturer's recommended method.

10.6 Prevention maintenance

Unless the power supply equipment batteries have been tested and found to have sufficient capacity to fulfil the requirements of this document, the batteries shall be replaced after the manufacturer's recommended battery service life.

A visual inspection of the camera image shall be made quarterly to verify a clear sharp image and it shall be compared to the image at installation. If contamination is noted the camera lens shall be cleaned. If the camera is determined to be misaligned it shall be repositioned to its original specified position.

If the camera is directly connected to a fire panel and no display is provided, a temporarily connection to a video display shall be made and the visual inspection of the camera image carried out as described above.

Annex A
(informative)

VFD coverage

A.1 General

Ideally every point within the protected space should be within the AFoV of a VFD camera.

A.2 Operations

VFDS operation basics include:

— One of the confusions with VFD is the intuitive inter-relationship between the 2D image which is being analysed for smoke/flame and the 3D space which is the source of that 2D image.

— In particular, the term “field of view” can be thought of as the 2D projection of the actual 3D space being protected (i.e. encompassing the “depth of field”, a common term for the distance between the nearest and the farthest objects that are in acceptably sharp focus in a 2D image of a 3D space). Figure A.1 is a representation of the 3D space.

— It is therefore essential to understand the special interrelationship between the physical 3D space being protected and the 2D representation that is the basis of VFD operation. See Figure A.2.

— The monitored volume is the 3D space within the protected space that is visible in the active field of view of the video fire detector such that the smoke or flame occurring in or around that space is detected. The monitored volume takes into consideration the active field of view, the declared range for the VFD and any obstacles within the space which may obscure the view. See Figure A.3.

— Figure A.4 shows the image field captured by a single camera. Multiple cameras will be needed for more complete coverage.

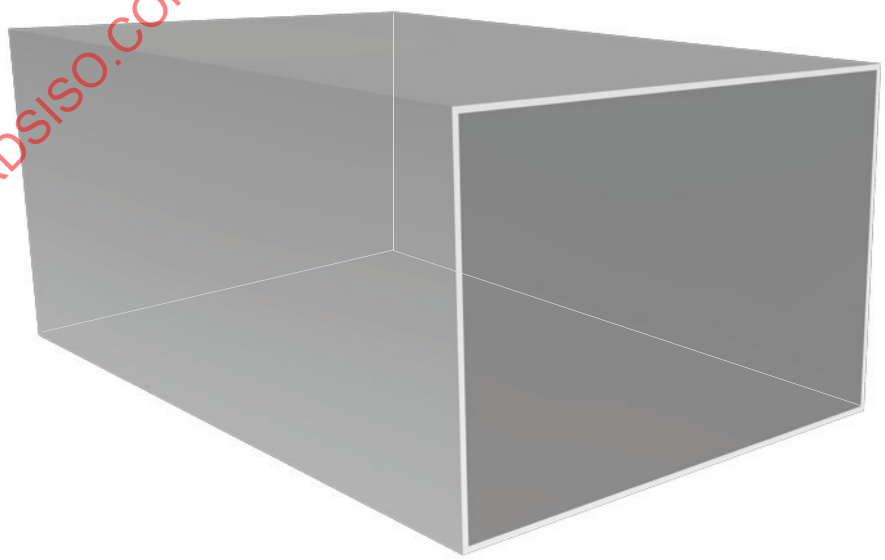


Figure A.1 — Area/volume to be protected

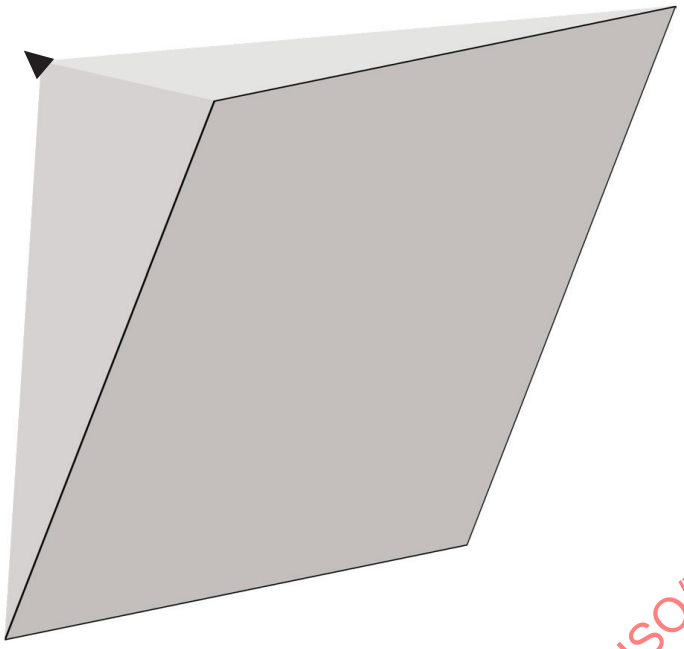


Figure A.2 — Area to be protected and 2D image captured by VFD camera

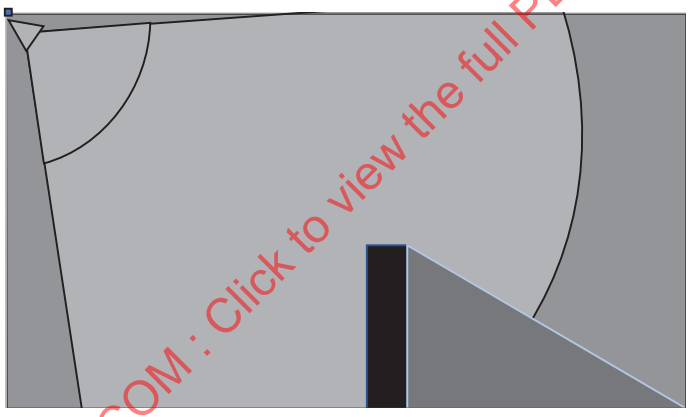


Figure A.3 — 3D monitored volume

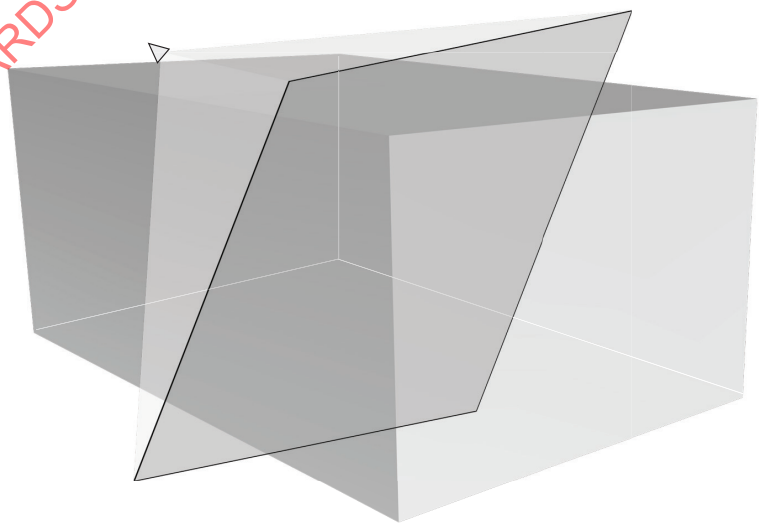


Figure A.4 — Image field captured by a single camera