VdS	VdS Guidelines for Fire Protection Systems	VdS 6003en

Fire Protection Requirements for IT Rooms and Data Centres

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VdS Guidelines for Fire Protection Systems

Fire Protection Requirements for IT Rooms and Data Centres

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To avoid any distraction from the understanding of the text, VdS Schadenverhütung uses the generic masculine throughout. There is expressly no preference or other valuation implied of the male, female or other genders.

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1 General

1.1 Introduction

Fire protection plays a central role in the planning and operation of data centre (DC) and information technology (IT) infrastructure, ensuring the safety of data, equipment and employees. There are three central operating models frequently found in this context in the data centre and IT world. Enterprise, colocation and hyperscaler. Enterprise comprises traditional, company-owned data centres, while colocation enables companies to use external data centres to optimise costs and scalability. Hyperscalers, on the other hand, provide global cloud services that set new standards with their massive scalability and flexibility, and are designed for one large company only.

Different operating models require customised fire protection solutions to address specific risks and requirements. The key requirements and solutions in the area of fire protection and detection are described below.

The VdS guidelines form the basis for technical fire protection in accordance with the normative references. This applies irrespective of any existing requirements resulting from statutory directives or regulations.

1.2 Scope of application

These guidelines apply to monitoring by fire alarm systems and protection by fire extinguishing systems (FES) for IT rooms and data centres and the associated peripheral rooms. The requirements of these guidelines apply in addition to the guidelines for planning and installation of the system types involved. These guidelines do not apply to small extinguishing systems, in-rack extinguishing systems and CO_2 fire extinguishing systems.

1.3 Validity

These guidelines apply to all orders placed from 01.06.2025.

Note: This is a translation of the German guidelines. If there are any discrepancies, the German version shall be binding.

2 Normative references

These guidelines contain dated and undated references to other regulations. The references are made in the relevant sections and the titles are listed below. Amendments or additions to dated regulations only apply if they are published by amending these guidelines. The latest version of undated regulations applies.

DIN EN 54 all parts Fire detection and fire alarm systems

DIN EN 50600-2-5 Information technology – Data centre facilities and infrastructures – Part 2-5: Security systems

DIN EN IEC 62966-2 Mechanical structures for electrical and electronic equipment - Aisle containment for IT cabinets – Part 2: Details of air flow, air separation and air cooling requirements

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VdS 2007	Publikation der Deutschen Versicherer zur Schadenverhütung, Informationstechnologie (IT-Anlagen) – Gefahren und Schutzmaßnahmen (Publication of the German insurers on loss prevention, information technology (IT systems) – risks and protective measures)
VdS 2095	VdS-Richtlinien für automatische Brandmeldeanlagen – Planung und Einbau (VdS guidelines for automatic fire detection and fire alarm systems – planning and installation)
VdS 2108	VdS-Richtlinien für Schaumlöschanlagen – Planung und Einbau (VdS guidelines for foam extinguishing systems – planning and installation)
VdS 2109	VdS-Richtlinien für Sprühwasser-Löchanlagen – Planung und Einbau (VdS guidelines for water spray extinguishing systems – planning and installation)
VdS 2496	VdS-Richtlinien für die Ansteuerung von Feuerlöschanlagen – Planung und Einbau (VdS guidelines for the control of fire extinguishing systems – planning and installation)
VdS 3188	VdS-Richtlinien für Wassernebel-Sprinkleranlagen und Wassernebel-Löschanlagen (Hochdruck-Systeme) – Planung und Einbau (VdS guidelines for water mist sprinkler systems and water mist extinguishing systems (high-pressure systems) – Planning and installation)
VdS 3527	VdS-Richtlinien für Brandvermeidungsanlagen (VdS guidelines for oxygen reduction systems– Planning and Installation)
VdS CEA 4001	Richtlinien für Sprinkleranlagen – Planung und Einbau (Guidelines for sprinkler systems – planning and installation)

3 Terms and abbreviations

3.1 Terms

Aisle containment: boundary that separates the internal volume from the environment and usually includes the floor, front access doors or end piece, roof elements and containment doors of the enclosure (cabinet) in which the IT equipment is located

Source: DIN EN IEC 62966-2

Cold aisle concept: Aisle containment into which cooled/conditioned air is supplied; this can be achieved physically through a structure or conceptually through the layout (see Figure A-3 and Figure A-4).

Hot aisle concept: Aisle containment from which the heated air is discharged; this can be achieved physically by a structure or conceptually by the layout (see Figure A-5 and Figure A-6).

Two-sensor dependency type B: Measure to prevent false alarms; after receiving an initial alarm signal from a fire detector, entry into the fire alarm state can be prevented until an alarm confirmation signal is received from another fire detector of the same or a different detector zone.

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Note: If alarm signalling has priority over the prevention of false alarms, the fire alarm status may also be reached if the assigned detectors or detector zones have an alarm and a fault status instead of two alarm statuses, but no switch-off status.

Source: EN 54-2: 1997/A1:2006 modified (deletion of the alarm confirmation signal from the same fire detector, multiple alarm dependency on only 2 detectors)

3.2 Abbreviations

ASD Aspirating smoke detector

FES Fire extinguishing system

SD Smoke detector

UPS Uninterruptible power supply

4 Concept of the fire protection system

4.1 Obligations of the client

The client shall provide the installer with sufficient technical documentation for planning purposes:

– documents in accordance with the applicable planning and installation guidelines

– protection classification of the individual areas of risk

– maximum possible air exchange rates of the individual areas to be monitored with fire detectors and/or protected with fire extinguishing systems

– information on the ventilation concept

4.2 Components of the concept

The concept of the fire protection system consists at least of the system concepts of the fire protection systems used. These are supplemented by requirements for

– definition of protection target/protection classification (see section 4.3)

– fire protection certificate/concept (if available)

– personal protection

– equipment shutdown

– disposal of extinguishing agents

EXAMPLE for system concept: Fire detection and alarm concept

4.3 Protection classification

DIN EN 50600-2-5 defines protection classes for rooms (data centres and IT) and their infrastructure with regard to fires that break out in functional areas in which the components of the various facilities and infrastructures are housed.

The system fire protection concept is drawn up on the basis of the protection classification or the specification of availability and IT size (see also VdS 2007 Information technology (IT systems) - risks and protective measures).

Rooms and infrastructure of protection class 1 according to DIN EN 50600-2-5 are not considered in these guidelines. The following applies to all others:

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1. Fire alarm monitoring and protection by fire extinguishing systems are implemented according to protection classification
2. Installation monitoring is mandatory.
3. Equipment protection by an FES is optional.
4. In cold and hot aisle concepts, Class A ASD shall always be used for fire alarm monitoring. ASD are recommended in all other areas.

4.4 Fire detection

4.4.1 General information

In the various utilisation units of the building in which a fire alarm system is required, it shall be planned, installed and operated in accordance with the VdS guidelines VdS 2095. The following requirements also apply.

4.4.2 Fire detection in hot aisle/cold aisle concepts

In the case of cold or hot aisle concepts, the hot and cold areas shall each be monitored with class A ASDs. In addition, in the case of cold aisle concepts, the cold aisle shall be monitored with at least point smoke detectors in the event of the ventilation system coming to a standstill.

The supply and exhaust air shall be monitored via the ceiling and raised floor area (in the air conditioning coil) for non-ducted (open) recirculation units (see also Figure A-8 and Figure A-11). In individual cases, it may be necessary to detect directly at the supply air and/or exhaust air opening of the recirculation units.

With ducted recirculation units, the supply and extract air shall be monitored at the intake and extract air grilles. In this case, the installation area of the recirculation units (room, raised floor and, if applicable, false ceiling) shall be monitored with the maximum permissible monitoring areas in accordance with section 4.4.5.

In any case, sufficient air return to the monitored area shall be ensured. The monitoring of cold and hot areas with the same evaluation unit or the same fan of an ASD is not permitted.

4.4.3 Fire detection in areas without hot/cold aisle concepts

In IT rooms without a hot/cold aisle concept, the room, the false ceiling, the raised floor, the air circulation (supply and exhaust air) and the furnishings shall be monitored. In individual cases, it may be necessary to detect directly at the supply air and/or exhaust air opening of the recirculation units. In any case, sufficient air recirculation of the ASD into the monitored area must be ensured. The monitoring of cold and hot areas with the same evaluation device or the same fan of an ASD is not permitted.

Note: For enclosure cooling systems with cooling units between the racks, reference is made to the necessary equipment monitoring.

4.4.4 Areas with high air changes and/or high flow velocities

If automatic detectors with the detection criteria “smoke” are used in areas where the smoke concentration required for fire detection is not achieved due to high air exchange rates, special measures are required. These are, for example

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– increase the sensitivity of the detectors used (caution: false alarm tolerance)

  Note: Increased sensitivity can increase the risk of false alarms, depending on the fire detector used.

– reduction of the monitoring areas of the individual detectors/individual intake openings

Filters and other elements in ventilation and air conditioning systems can influence the detection capability of an ASD. This shall be taken into account when planning/projecting the ASD.

When monitoring the air flows within or directly in front of and behind ventilation units or recirculation cooling units, the properties of the filters used in these units shall be taken into account. If the filters used are capable of filtering out smoke, intake openings of an ASD shall be provided inside the ventilation unit behind the fan but before the filter. The use of an ASD for monitoring in ventilation ducts is only permitted if suitability in accordance with DIN EN 54-27 has been proven.

In areas with air exchange rates greater than 30 1/h, proof of the detection capability of the automatic fire detectors used is required. This verification shall be carried out by VdS Schadenverhütung.

4.4.5 Maximum permissible monitoring areas

The maximum permissible monitoring areas are shown in Table 4-1 and Table 4-2. Regarding the reduction of the monitoring areas for two-sensor dependency type B (with and without control of an FES) the specifications of VdS 2095 apply.

IT room or data centre		**Peripheral rooms**	
Raised floor and false ceiling area	Room	Raised floor and false ceiling area	Room
40	25	60	40

Table 4-1: Maximum permissible monitoring areas [m²] without cold/hot aisle concepts

Protection class acc. to EN 50600-2-5	**Warm areas**	**Cold areas**
2	40	60
3 / 4	25	40
Without specification of a protection class	25	40

Table 4-2: Maximum permissible monitoring area [m²] for hot/cold aisle concepts

4.5 Fire extinguishing systems and fire prevention systems

4.5.1 General information

In the various utilisation units of the building where automatic FES or fire prevention systems (hereinafter referred to as oxygen reduction systems) are provided, these shall be planned, installed and operated in accordance with the relevant VdS guidelines.

The extinguishing system shall be designed in accordance with the guidelines for planning and installation for the respective type of extinguishing system.

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4.5.2 Suitable extinguishing system types

When selecting the type of extinguishing system, the protection objective (building, building parts and/or equipment protection) shall be taken into account.

	Gas extinguishing systems	Oxygen reduction systems[1]	Water extinguishing systems[2]	Foam extinguishing systems	Aerosol fire extinguishing systems[3]
Entrance area, office, security centre	-	-	+	-	-
Storage area/ test environment	+	+	+	+	○
Telecommuni-cations, RDT	+	+	○[7]	-	○
Generator	+	○	+	○	○
Transformer	+	○	+[4]	-	○
Electrical distribution (MV, LVMDP)	+	+	○[7]	-	○
UPS distribution	+	+	○[7]	-	○
Battery (UPS)[5]	○	○	○[7]	○	○
IT room/ server room/ data centre	+	+	○[7]	-	○
Climate (brace)	+	○	○[7]	-	○
Supply rooms (ventilation, water)[6]	+	-	+	-	+
Sep. server rack	+	-	○[7]	-	○

Legend:
Well suited +
Conditionally suitable ○
Not suitable -

1) In the sense of building law, oxygen reduction systems are not fire extinguishing systems.
2) The main purpose of water-based FES is to protect the building and areas. When protecting electrical installations, the risk of damage to the installations posed by water-based systems shall be taken into account.
3) When protecting electrical installations, the risk of damage to the installations caused by the aerosol shall be taken into account.
4) Dry-type transformers
5) Depending on the technology used in the battery
6) Depending on the room type (closed room)
7) Limited use of water mist systems in accordance with the tested system manuals

Table 4-3: Suitable extinguishing system types

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4.5.3 Personal protection

The requirements for personal protection are set out in the guidelines for planning and installation of the FES used or the corresponding DGUV (German social accident insurance institution) information.

4.5.4 Additional requirements for gas extinguishing systems

4.5.4.1 General

The requirements of VdS 2380 and VdS 2381 shall be observed. Irrespective of the requirements of the underlying planning and installation guidelines, it may be necessary to keep a reserve of extinguishing agent available.

Note: Under certain circumstances, gas extinguishing systems can have a negative impact on the IT hardware due to effects such as the sound pressure or frequency of alarm systems or extinguishing nozzles. Possible measures to reduce these effects could be

- *silencer on the nozzles for non-liquefied inert gases*
- *sound pressure dampers on the pneumatic alarm devices*
- *appropriate enclosure of the IT facilities, which has a sound-absorbing effect*
- *appropriate use of other hard drives (e.g. SSD)*
- *structural measures to reduce noise*

4.5.4.2 Nozzle arrangement for gas extinguishing systems

4.5.4.2.1 Cold aisle

Nozzles in the cold aisle can be dispensed with for extinguishing systems with non-liquefied inert gases if the required quantity of extinguishing agent for the raised floor, cold aisle and rack is introduced in total via the nozzles in the raised floor. This does not apply to extinguishing systems with halogenated hydrocarbons. The following conditions shall be observed:

- The calculation of the extinguishing agent for the raised floor shall include the volume of the cold aisle and the racks.
- The pressure relief for the room shall be dimensioned so that the extinguishing agent flow from the raised floor and the cold aisle can also be discharged.

See also Figure A-13, Figure A-14 and Figure A-15.

4.5.4.2.2 Warm aisle

The nozzles in the hot zone cannot be dispensed with. The calculation of the extinguishing agent for the cold zone shall include the volume of the racks. In the hot zone, the pressure relief for the cold zone shall also be taken into account.

See also Figure A-16 and Figure A-17.

4.5.4.3 Enclosure

Structural requirements for the enclosure may be disregarded, provided that none of the boundary surfaces are part of the room enclosure.

Storage within the enclosures is not permitted.

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4.5.4.4 IT equipment

In the event of insufficient extinguishing agent distribution within the IT equipment, additional equipment protection shall be realised in addition to the room protection system. Alternatively, other measures, such as automatic opening of the rack doors, can be used to achieve sufficient extinguishing agent distribution in the rack. These measures shall be implemented as a primary function in accordance with VdS 2496 using the fail-safe mode[1].

4.5.4.5 Raised floor or false ceiling

There shall be a sufficient opening area for overflow in the direction of flow (cold to warm area) between the raised floor or false ceiling and the room. Elements of enclosures, such as ceiling panels or doors, shall be able to withstand the overpressure.

4.5.4.6 Air conditioning

The air conditioning system with the associated recirculating air, in-row cooling units or ventilation ducts shall be included in the quantity calculation of the extinguishing agent, unless other measures are taken, such as structural separation in the event of fire with timely shutdown of the air conditioning system.

4.5.5 Additional requirements for oxygen reduction

The requirements of VdS 3527 shall be observed. There are no special requirements or simplifications for IT environments.

4.5.6 Additional requirements for water extinguishing systems

The requirements of VdS CEA 4001, VdS 2109 and VdS 3188 shall be observed. There are no special requirements or simplifications for IT environments.

4.5.7 Additional requirements for foam extinguishing systems

The requirements of VdS 2108 shall be observed. There are no special requirements or simplifications for IT environments.

4.5.8 Additional requirements for aerosol extinguishing systems

The requirements of the established regulations shall be observed. There are no special requirements or simplifications for IT environments.

Note: The publication of VdS 6049 Aerosol extinguishing systems – Planning and Installation is planned.

[1] The fail-safe mode is a safety feature used in various systems to ensure that a device can return to a basic operating state in the event of a fault or malfunction.

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Annex A Drawings

A.1 Key

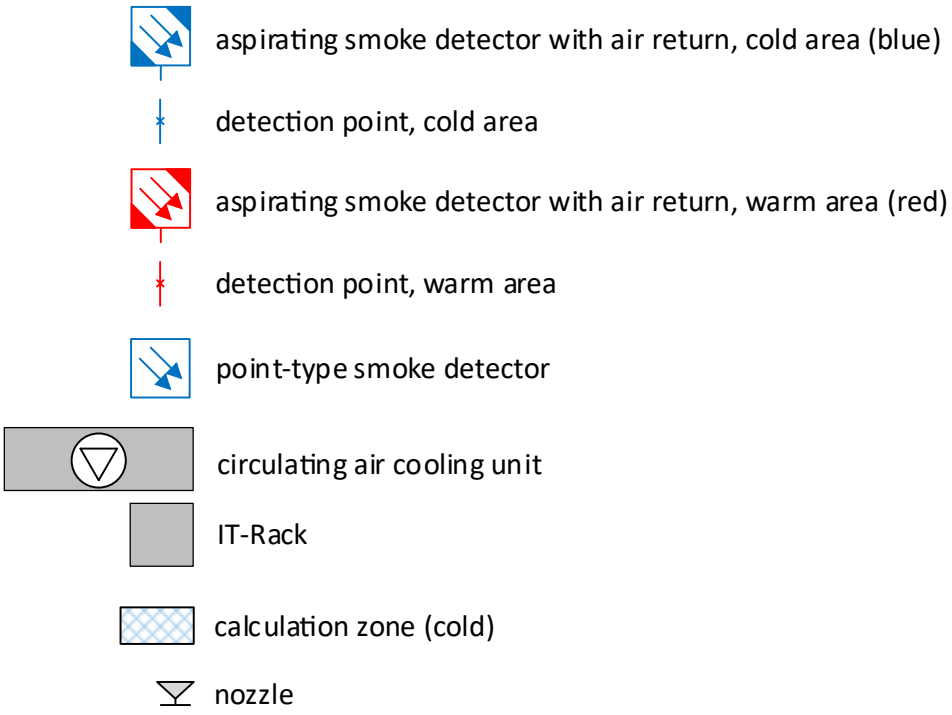


Figure A-1: Key for figures in Annex A

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A.2 Ventilation concepts for cold and hot aisles

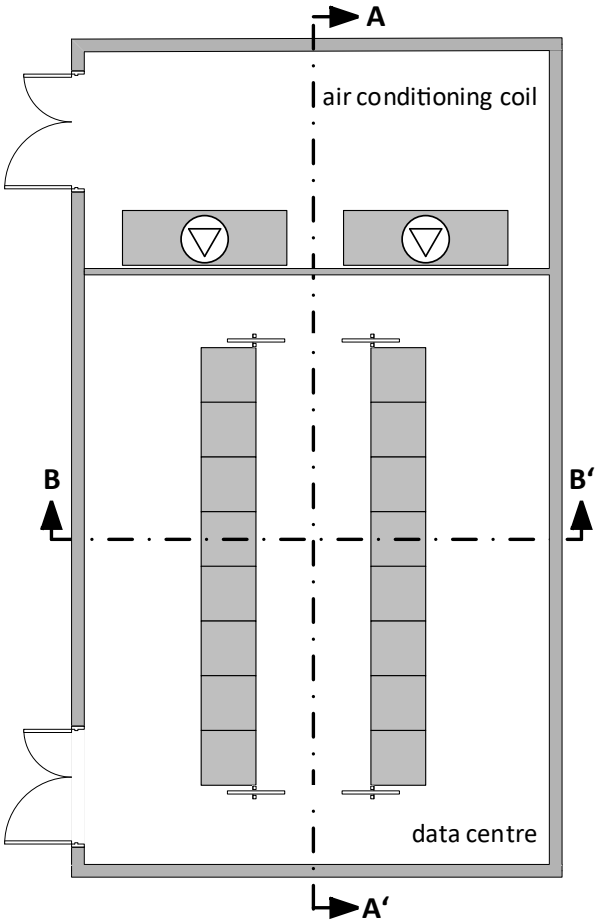


Figure A-2: Floor plan of data centre with air conditioning coil

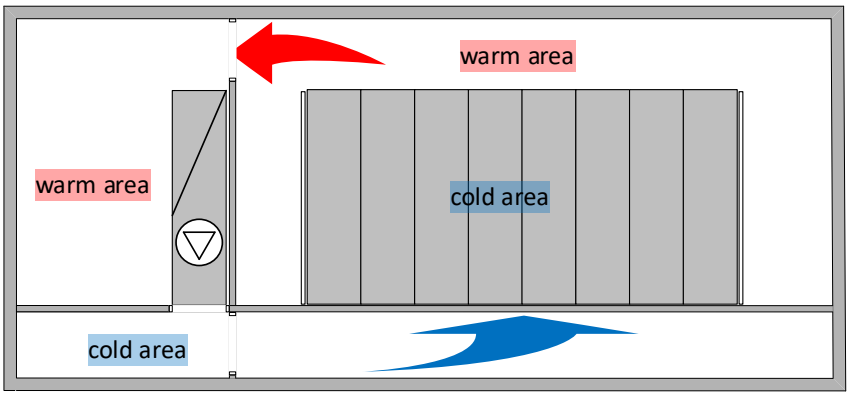


Figure A-3: Section A-A' cold aisle

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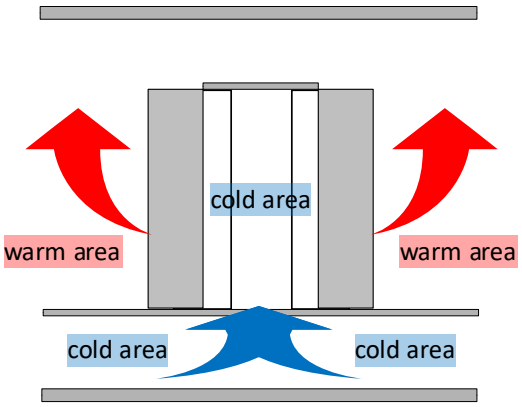


Figure A-4: Section B-B' cold aisle

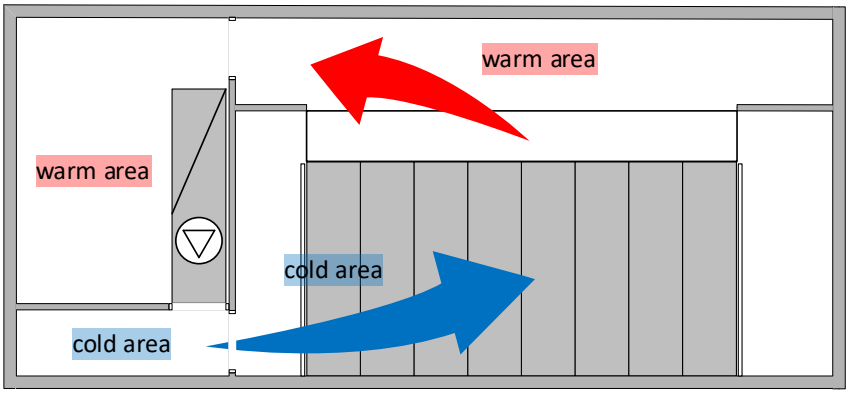


Figure A-5: Section A-A' hot aisle

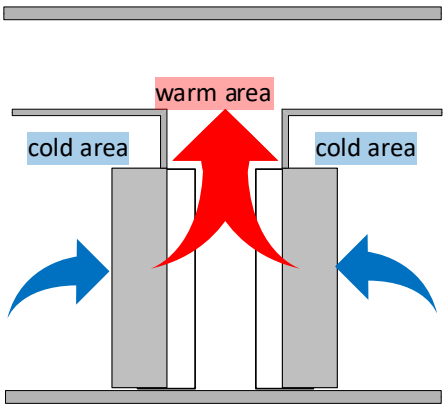


Figure A-6: Section B-B' hot aisle

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A.3 Cold aisle detection

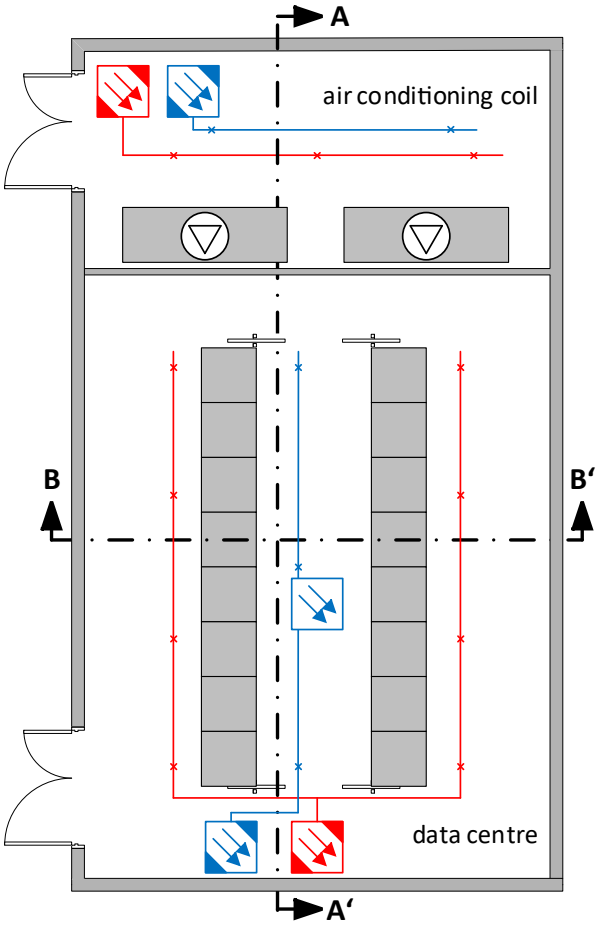


Figure A-7: Cold aisle detection, floor plan

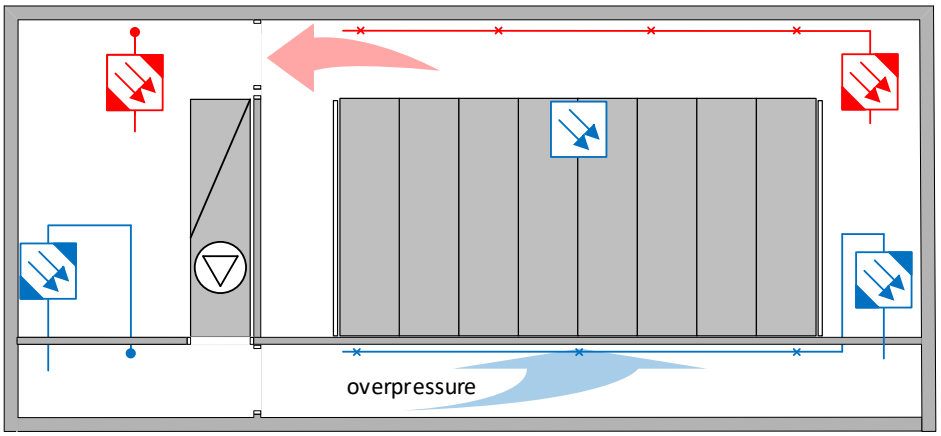


Figure A-8: Detection cold aisle section A-A'

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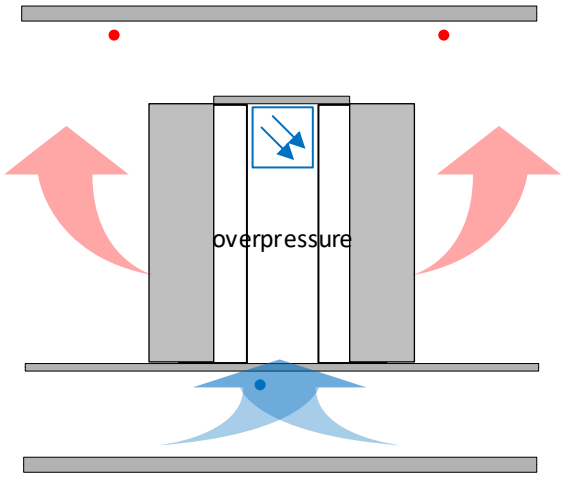


Figure A-9: Cold aisle detection, section B-B'

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A.4 Hot aisle detection

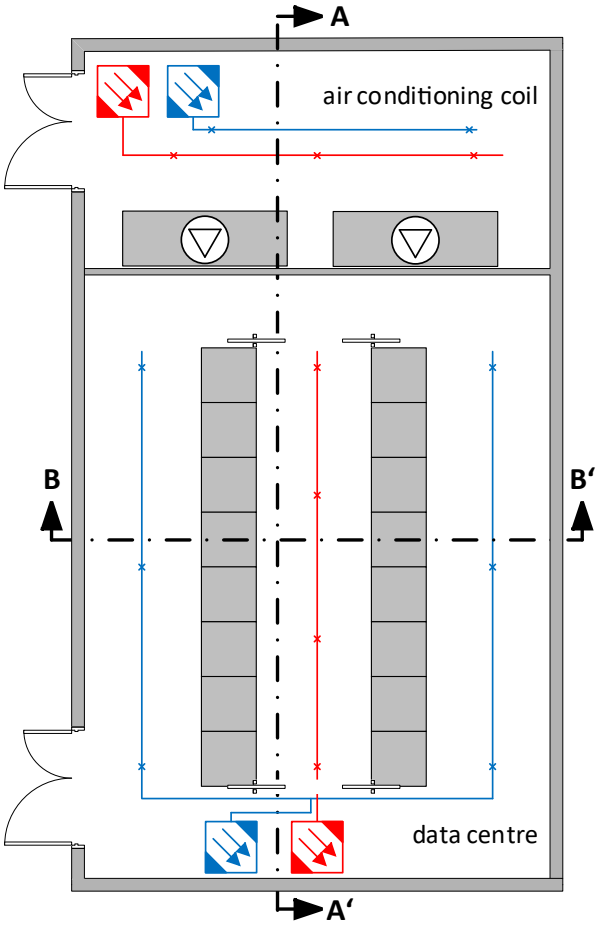


Figure A-10: Detection hot aisle, floor plan

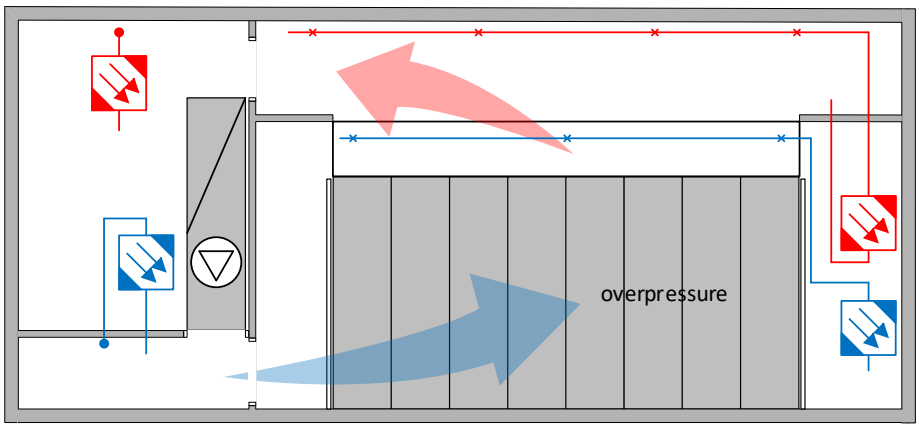


Figure A-11: Detection hot aisle, section A-A'

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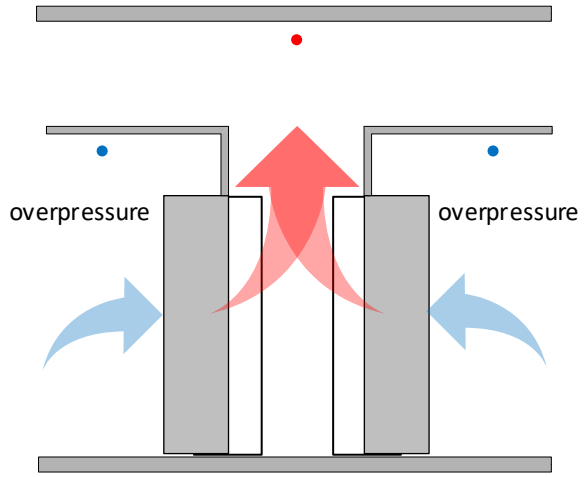


Figure A-12: Detection hot aisle, section B-B'

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A.5 Nozzle arrangement cold aisle

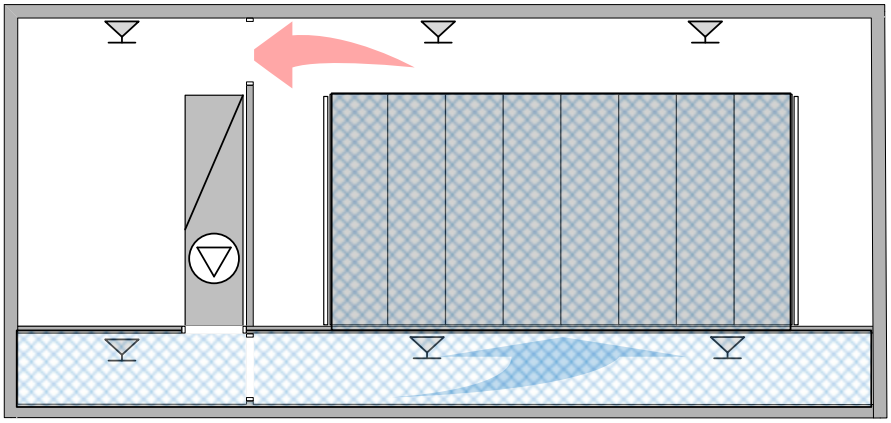


Figure A-13: Nozzle arrangement cold aisle, section A-A'

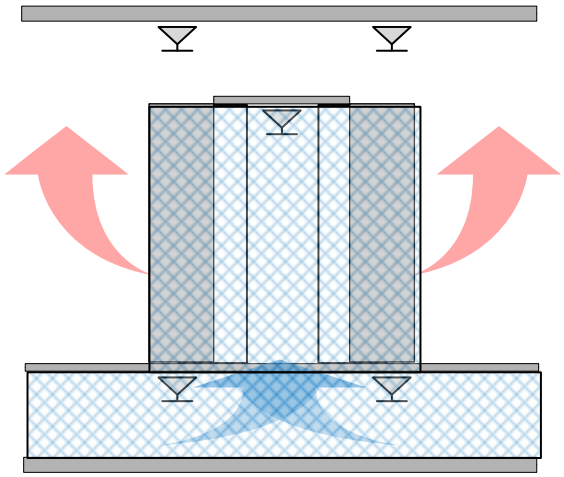


Figure A-14: Nozzle arrangement cold aisle, section B-B'

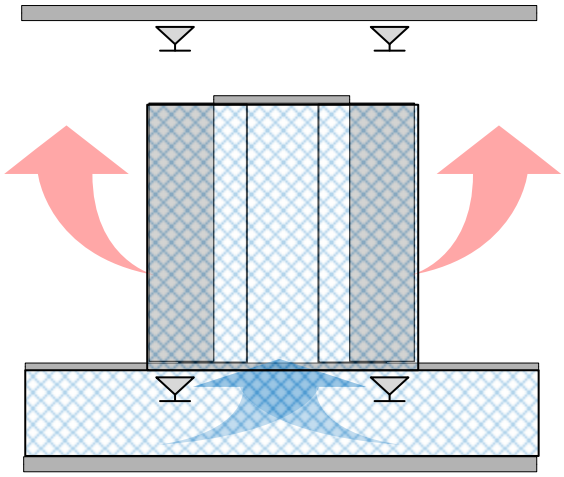


Figure A-15: Nozzle arrangement cold aisle, inert gases, section B-B'

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A.6 Nozzle arrangement hot aisle

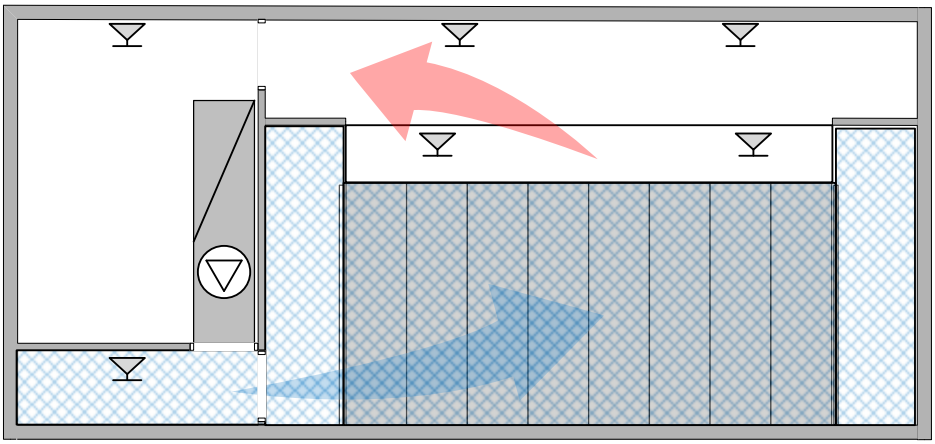


Figure A-16: Nozzle arrangement hot aisle, section A-A'

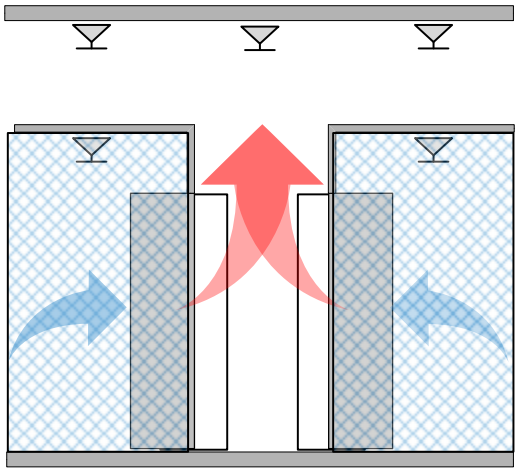


Figure A-17: Nozzle arrangement hot aisle, section B-B'

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Annex B Bibliography

VdS 2380	VdS guidelines for fire extinguishing systems with non-liquefied inert gases – planning and installation
VdS 2381	VdS guidelines for fire extinguishing systems with halogenated hydrocarbons Planning and installation
DIN EN 15276-2	Fixed firefighting systems – Extinguishing systems for concentrated aerosols – Part 2: Design, installation and maintenance;

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