Sprinkler Systems Application Range

Fire Protection Leaflet

1 General

With their generally recognized reliability, sprinkler systems are world-wide the most effective fire protection measure inside buildings belonging to industrial, commercial, and service enterprises.

This reliability is ensured by systems that are especially adjusted to the risk potential to be protected against. The use of such systems reaches its limits where extinguishing agents, manner of working, and response behaviour of a sprinkler system are not up to the operational risk potential, at least not as the sole system. Seen from the view of fire protection engineering a concept to be assessed as full protection often requires additional protection measures for facilities, equipment, or systems of special exposure. Among these are special local application systems as well as structural and business-operational measures

Installation of the fire protection systems below is based on the guidelines for planning and installation mentioned on Page 4 whereas installation of fine water spray systems is based on the respective installation guidelines of the system owner. More information about VdS-approved systems are given on www.vds.de.

2 Protection measures for special risks

2.1 Electrical operating rooms

Due to the conductivity of water and the risk of consequential damage the use of sprinkler systems in electrical operating rooms is generally impossible or at least unreasonable. Risk-responsive protection is reached with volume and local protection systems working with CO_2 and inert gas in controllers, control units, and special machinery.

2.2 Electronic data processing

Due to the response behaviour of sprinklers and their design as volume protection system, a sole sprinkler system in these areas cannot provide for the required fire protection. Heavy smoke development combined with low heat development in the beginning of a fire as well as the closed design of equipment and devices could lead to considerable consequential loss.

Additional CO_2 local application systems are used to effectively detect and fight fires in the devices. This helps reducing business interruptions in these areas, which are so delicate in many plants.

To protect a building against total loss, the additional installation of a pre-action sprinkler system is suitable.

2.3 Raised floors with cable installation

It is almost impossible to protect raised floors with cable installation by means of sprinkler systems. Cables could develop smouldering fire releasing a lot of smoke and only little heat. Moreover, the smoke is sucked in by the ventilation system and rapidly guided into other areas.

Water spray systems and fine water spray systems controlled by fire detection and fire alarm systems are the suitable systems to protect raised floors with cable installation of approx. 1.5 m in height and more. Gas extinguishing systems can also be used to protect such floors, even in case of less height.

2.4 Rooms where combustible liquids are stored

Due to the different specific weights and the property of many combustible liquids that they do not easily mix with water, there is the risk that a fire will not be extinguished by the extinguishing water applied but will even spread around.

In addition to water extinguishing systems featuring proportioning of film-forming foam concentrate, CO_2 fire extinguishing systems or foam extinguishing systems are suitable to protect stores of combustible liquids (TRbF [German codes of practice for combustible liquids] or VdF [German Ordinance on flammable liquids] risk categories AI und AII).

2.5 Paint-spraying and -coating equipment

The type of coating (solvent-containing paints, powder) and the high consequential losses, which could occur when fighting the fire with conventional sprinkler systems, in many cases lead to the demand for the use of CO_2, inert gas extinguishing systems, fine water spray systems, or special local application systems.

The scope of protection delivered by the extinguishing system also shall be extended to other equipment components such as exhaust air ducts, filters, etc.

Drying ovens, flash-off zones, and other equipment at fire risk in the neighbourhood of varnishing and coating equipment require an installation of CO_2 or foam extinguishing systems. Enclosed equipment can also be protected with inert gas extinguishing systems.

2.6 Equipment at explosion risk

Explosions are characterised by an above average flame spread rate causing spontaneous increase in pressure and sudden destruction. Sprinkler systems and almost any other fire protection system, except for special equipment providing explosion protection, are unsuitable to control such risks because of their system-inherent response time.

In zones involving a risk of explosion, first and foremost technical, structural, design, and organisational measures are required to prevent explosion and control or minimise the consequential damages.

2.6.1 Pneumatic conveying equipment

High speeds and little heat development in pneumatic conveying equipment (dusty air lines, product conveyors, waste conveyors) require especially suited fire detection and extinguishing systems. Spark extinguishing and spark separation systems have been especially designed for such conveying equipment. Featuring a fast fire detection component and a downstream extinguishing and separation system, this system is tailored to the risk so as to minimise the danger of fire spread or carrying sparks over to downstream areas at explosion risk.

2.6.2 Silos, bunkers, and filtering installations

In case of fire, the equipment used to store and remove the different combustible dusts, fibres, chippings, etc. in- and outside buildings cannot always be protected effectively by a conventional room protection sprinkler system as such equipment provides enclosed structures.

Inerting protection systems working with N_2 or CO_2 are used to control smouldering fires or to effectively prevent dust explosions. Water spray or foam extinguishing systems are used as fire extinguishing systems depending on the product and the static load-bearing capacity - particularly in case of expanding matters.

Silos and filtering installations should always be separated from buildings, either by structural measures or spatially.

2.7 Deep fat fryers

Hot oil and grease in deep fat fryers and the kitchen areas in general cannot be extinguished with pure water as the immediate evaporation of water would cause a so-called fat explosion.

In these areas, fire extinguishing systems working with special extinguishing agents shall be used.

2.8 Other fields

In plants where the production of combustible materials increases the amount of dust and lint depositing (e.g. paper, textile, wood industry), it has to be expected that a sprinkler system cannot cope with the speedy burning combustion without any heat development worth mentioning in the early stage of fire.

In addition to technical and organisational measures taken to prevent depositing of combustible material in the corresponding production areas and to constructional measures to divide the area into fire-resistant sections or fire compartments, the installation of local application systems for exhaust air ducts, underground waste conveying systems, pneumatic conveying equipment, filtering installations, silos, etc. is required. Appropriate systems are CO_2, water spray, fine

water spray, or foam extinguishing systems. The sprinkler system gets supplementary importance as room or building protection provided that special technical, constructional, and organisational local application protection measures have been taken.

3 Building geometry and use

3.1 Covers

To provide for successful fire fighting with sprinklers, the extinguishing water has to directly reach the burning material. If large-scale covers, encapsulated systems, or other obstructions cover the seat of fire and, consequently, "protect" them against the ceiling sprinklers, this fosters spreading of fire. It could even be that the sprinkler system cannot cope with the fire.

This problem can be solved by installing additional sprinklers underneath the obstructions or additional local application systems.

3.2 High rooms

In extreme cases, as in very high rooms, at low fire load or slowly starting fires, opening of the sprinklers become retarded. This does not cause failure of the sprinkler system; however, the resulting fire loss will be excessively high.

For room of heights above approx. 10 m, e.g. water spray systems with triggering by special fire alarm technology could be reasonable.

3.3 Compartment shelving systems

In case of compartment shelving systems completely made of materials impermeable to water - apart from the front - and the compartments of which are too small to provide space for installed sprinklers on each level, you have to reckon with burning down in sections.

Sprinklers are to be installed in the ceiling and additionally on the front side of the compartment shelving systems (so-called face sprinklers).

3.4 Heat accumulation

In case of fire the sprinklers should be triggered by the rising heat as soon as possible. However, unintentional release caused by overheating, heating systems, or heat accumulation in the summertime shall be prevented. To meet both requirements the response behaviour of sprinklers shall be adjusted to the ambient conditions by correct selection of the nominal opening temperature.

3.5 Change of use

Changing the production processes, packaging material, storage type, or storage organisation often may increase the fire risk. Reliability of any fire protection system depends on the risk potential taken as a basis for initial installation as well as the measures especially derived from and adjusted to this; this also applies to sprinkler systems. Later exceeding of storage heights, storage block size, a change of the stored goods proving different combustion factors compared to the criteria taken as a basis for planning restricts the liability of any fire protection installation.

4 Summary

In many risks protected by sprinklers, effective fire protection requires taking of additional measures. Often the root causes are given in the operational and technological sequences. This leaflet is not exhaustive regarding the mentioned measures and shall not be an established protection concept.

An effective protection concept should be based on the applicable guidelines and agreed upon with VdS Schadenverhütung or the insurer's fire protection divisions in the particular case.

Other papers

VdS 2093
CO_2 Fire Extinguishing Systems
Planning and Installation

VdS 2095
Automatic Fire Detection and Fire Alarm Systems
Planning and Installation

VdS 2106
Spark Detection, Spark Separation and Spark Extinguishing Systems
Planning and Installation

VdS 2108
Foam Extinguishing Systems
Planning and Installation

VdS 2109
Water Spray Systems
Planning and Installation

VdS 2304
Local application protection for electric and electronic equipment - Planning and Installation

VdS 2380
Fire Extinguishing Systems
using non-liquefied Inert Gases
Planning and Installation

VdS 2381
Fire Extinguishing Systems
using Halocarbon Gases
Planning and Installation

VdS CEA 4001
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