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Fixed firefighting systems - Water spray systems - Design, installation and maintenance

Ortsfeste Brandbekämpfungsanlagen - Sprühwasserlöschanlagen - Planung, Einbau und Wartung

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Fixed firefighting systems - Water spray systems - Design, installation and maintenance

Installations fixes de lutte contre l'incendie - Systèmes d'extinction à pulvérisation d'eau - Conception, installation et maintenance

Ortsfeste Brandbekämpfungsanlagen - Sprühwasserlöschanlagen - Planung, Einbau und Wartung

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Foreword

This document (CEN/TS 14816:2008) has been prepared by Technical Committee CEN/TC 191 “Fixed firefighting systems”, the secretariat of which is held by BSI.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

It is included in a series of European standards planned to cover:

- automatic sprinkler systems (EN 12259, EN 12845),
- gas extinguishing systems (EN 12094),
- powder systems (EN 12416),
- explosion protection systems (EN 26184),
- foam systems (EN 13565),
- hydrant and hose reel systems (EN 671),
- smoke and heat control systems (EN 12101).

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to announce this Technical Specification: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Water spray systems can be suitable, in some instances, for extinguishment of fire and in others for prevention of fire spread, and may be independent of or supplementary to other forms of fire protection.

A water spray system consists of a water supply (or supplies) and one or more sprayers usually open; each system consists of a control valve set and a pipe array fitted with sprayers.

The design of specific systems may vary considerably, depending on the nature of the hazard and the basic purposes of protection. Because of these variations and the wide choice in the characteristics of sprayers, it is assumed that these systems are competently designed, installed and maintained. It is essential that their limitations as well as their capabilities be thoroughly understood by the designer.

It should not be assumed that the provision of a water spray system entirely obviates the need for other means of fighting fires and it is important to consider the fire precautions in the premises as a whole. Special measurement may also be required, for example bounding flammable liquid risks or the protection drain of flammable liquids spillage.

Structural fire resistance, escape routes, fire alarm systems, particular hazards needing other fire protection methods, provision of hose reels, fire hydrants and fire extinguishers, etc., safe working and goods handling methods, management supervision and good housekeeping all need consideration.

It is essential that water spray systems should be properly maintained to ensure operation when required. This routine is liable to be overlooked or given insufficient attention by supervisors. It is, however, neglected at peril to the lives of occupants of the premises and at the risk of crippling financial loss. The importance of proper maintenance cannot be too highly emphasized.

When water spray systems are out of service, extra attention should be paid to fire precautions and the appropriate authorities informed.

This standard is intended for use by those concerned with purchasing, designing, installing, testing, inspecting, approving, operating and maintaining water spray systems, in order that such equipment will function as intended throughout its life.

It is a basic assumption that this standard is for the use of companies employing personnel competent in the field of application with which it deals. The design, installation and maintenance of water spray systems should be undertaken only by trained and experienced personnel. Similarly, competent technicians should be used in the installation and testing of the equipment.

1 Scope

This Technical Specification specifies requirements and gives recommendations for the design, installation and maintenance of fixed deluge water spray systems internal and external to buildings and industrial plant and other premises on land. This Technical Specification covers only the use of the types of sprinklers and sprayers specified in EN 12259-1. The requirements and recommendations of this Technical Specification are also applicable to any addition, extension, repair or other modification to a water spray system. This Technical Specification does not deal with sprinkler systems.

It covers the hazards, provision of water supplies, components to be used, installation and testing of the system, maintenance, and the extension of existing systems, and identifies construction details of buildings which are necessary for the satisfactory performance of water spray systems complying with this Technical Specification.

The general principles may well apply to other uses (e.g. maritime use), for these other uses additional considerations will almost certainly have to be taken into account.

For water spray systems covered by this Technical Specification the authority shall be consulted.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 54-1, *Fire detection and fire alarm systems – Part 1: Introduction*

EN 54-2, *Fire detection and fire alarm systems – Part 2: Control and indicating equipment*

EN 54-3, *Fire detection and fire alarm systems – Part 3: Fire alarm devices – Sounders*

EN 54-4, *Fire detection and fire alarm systems – Part 4: Power supply equipment*

EN 54-5, *Fire detection and fire alarm systems – Part 5: Heat detectors – Point detectors*

EN 54-10, *Fire detection and fire alarm systems – Part 10: Flame detectors – Point detectors*

EN 54-11, *Fire detection and fire alarm systems – Part 11: Manual call points*

EN 12094 (all parts), *Fixed firefighting systems - Components for gas extinguishing systems*

EN 12259-1, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 1: Sprinklers*

EN 12259-2, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 2: Wet alarm valve assemblies*

EN 12259-3, *Fixed firefighting systems – Components for automatic sprinkler and water spray systems – Part 3: Dry alarm valve assemblies*

prEN 12259-9, *Fixed firefighting systems – Components for sprinkler and water spray systems – Part 9: Deluge valve assemblies*

EN 12845:2004, *Fixed firefighting systems – Automatic sprinkler systems – Design, installation and maintenance*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
authorities
organizations responsible for approving water spray systems, equipment and procedures, e.g. the fire and building control authorities, the fire insurers, the local water authority or other appropriate public authorities

3.2
control valve set
assembly comprising an alarm valve, a stop valve and all the associated valves and accessories for the control of one water spray installation

3.3
deluge valve
water supply control valve intended to be operated by an auxiliary means to admit water into a system of piping with open sprayers

NOTE The auxiliary means of operating a deluge valve may be mechanical, electrical, hydraulic, pneumatic, thermal, manual or a combination of these.

3.4
deluge installation
part of a water spray system comprising a control valve set, the associated downstream pipes and sprayers, and the means of release

3.5
design density
minimum density of discharge, in mm/min of water, for which a water spray installation is designed, determined from the discharge of a specified group of sprayers, in litres per minute, divided by the area covered, in square metres

3.6
detector sprinkler
sealed sprinkler mounted on a pressurized pipeline used to control a deluge valve, such that operation of the detector sprinkler causes loss of air, inert gas or water pressure to open the valve

3.7
distribution pipe
pipe feeding either a range pipe directly or a single sprayer on a non-terminal range pipe more than 300 mm long

3.8
exposure protection
application of water spray to structures or equipment to limit absorption of heat to a level which will minimize damage and prevent failure, whether the source of heat is external or internal

NOTE Exposure protection is not an extinguishing system.

3.9
fire resisting compartment
enclosed volume capable of maintaining its fire integrity for a minimum specified time

3.10
fully calculated
term applied to an installation in which all the pipe work is sized by hydraulic calculation

3.11
impingement
striking of a protected surface by water droplets issuing directly from a sprayer

3.12
multiple control
automatic multiple control: a pipe line valve, with a thermally sensitive sealing device which opens to discharge water for fire fighting

3.13
multiple control installation
part of a water spray system comprising a multiple control, the associated downstream pipes and sprayers

3.14
run-down
downward travel of water along a surface

3.15
slippage
the horizontal component of the travel of water along a surface beyond the point of impact

3.16
sprayer
water spray nozzle that gives a pre-determined pattern of discharge

3.17
sprinkler, open
sprinkler not sealed by a temperature sensitive element

3.19
water spray installations
deluge installation or a multiple control installation

3.21
water spray systems
the entire means of providing water spray protection in the premises comprising one or more deluge installations or multiple control installations, the pipe work to the installations and the water supply/supplies

3.22
zone
area protected by one water spray installation

4 Operating condition of water spray systems

4.1 Operation in the open air

Consideration shall be given to the effects of wind on water spray protection. The selection of sprayers, their position relative to the burning materials and sprayer spacings will vary depending on the anticipated conditions. Where extreme conditions may be experienced, it may be necessary to provide structural protection to reduce the influence of wind.

4.2 Fire resisting compartments

A fire occurring in an area not protected by an automatic fire fighting system which is in open communication with an area protected by a water spray system may render the protection ineffective, unless the protected area is in a fire resisting compartment in accordance with national regulations with a minimum of 60 min fire resistance.

4.3 Protection against frost

In areas which are subject to low temperatures, piping and equipment which contain water under normal conditions must be suitably protected from the risk of water freezing.

5 Fire hazards and system design

5.1 General

Water spray systems shall not be used for direct application to materials that react with water producing violent reactions or hazardous by-products.

NOTE Water spray systems may be installed for the protection of buildings and objects where a rapid fire spread is to be expected and water is a suitable extinguishing agent.

Water spray systems are suitable:

— for protecting objects,

— for controlling a spill fire,

— for protecting against heat radiation (exposure protection by cooling).

Water spray systems can be used where it is essential that a certain amount of water is discharged, at the same time, over the whole of the protected construction or area.

Water spray systems are suitable for extinguishing fires in paper machines, printing machines and other machinery with three-dimensional shape, and where combustible materials such as paper are transported within the machinery as an integral part of the process.

Water spray systems are suitable for extinguishing fires in escalators, conveyor belts and other looped and running constructions which can easily spread the fire within the loop.

They are also effective in ducts, such as cable ducts in which a fire can spread rapidly, and storage or handling areas for explosives, gun powder, rocket propellant, cellulose-nitrate/acetate and other solid chemicals containing oxygen, for instance $KCLO_4$, KNO_3 or $KMnO_4$.

The specifications in Clause 6 give prescriptive requirements for systems known to be satisfactory. Other system designs may also be used on the basis of performance fire testing.

5.2 Protection of various hazards

5.2.1 Design criteria

The design criteria have been determined in tests and proven in practice. In some instances it may prove necessary to use higher values than stated in this document.

5.2.2 Timber industry

Object protection for:

— woodchips dryers,

— cyclones,

— dust bunkers,

- timber mills,
- dust filters,
- silos for wood chips.

Minimum duration of protection: 30 min

Minimum design density: 5 mm/min

If detector sprinklers are used the maximum spacing shall be 3,75 m

5.2.3 Conveyor belt

Minimum duration of protection: 30 min

Minimum design density: 7,5 mm/min

Maximum distance between roll and sprayers (for rollers): 2,5 m

Maximum vertical distance between belt and open sprinkler with ceiling protection: 4 m

Maximum area per open sprinkler with ceiling protection: 12 m²

Other systems shall be designed with a maximum area per sprayer specified by the manufacturer on the basis of fire tests.

The fire detection or manual activation shall activate the water spray system and the conveyor belt shall be stopped automatically.

NOTE When determining the area of operation and zoning, belt speed, moved material, compartmentation and detection method should be taken into account.

5.2.4 Cable trays inside buildings

The design criteria shall be:

a) Directional sprayer minimum design density: 7,5 mm/min on each cable tray

Minimum duration of protection: 30 min

Minimum operating length: 30 m or the length of the zone separated by a fire resistant separation, which ever is the lesser

b) Area sprayer

Minimum design density: 10 mm/min

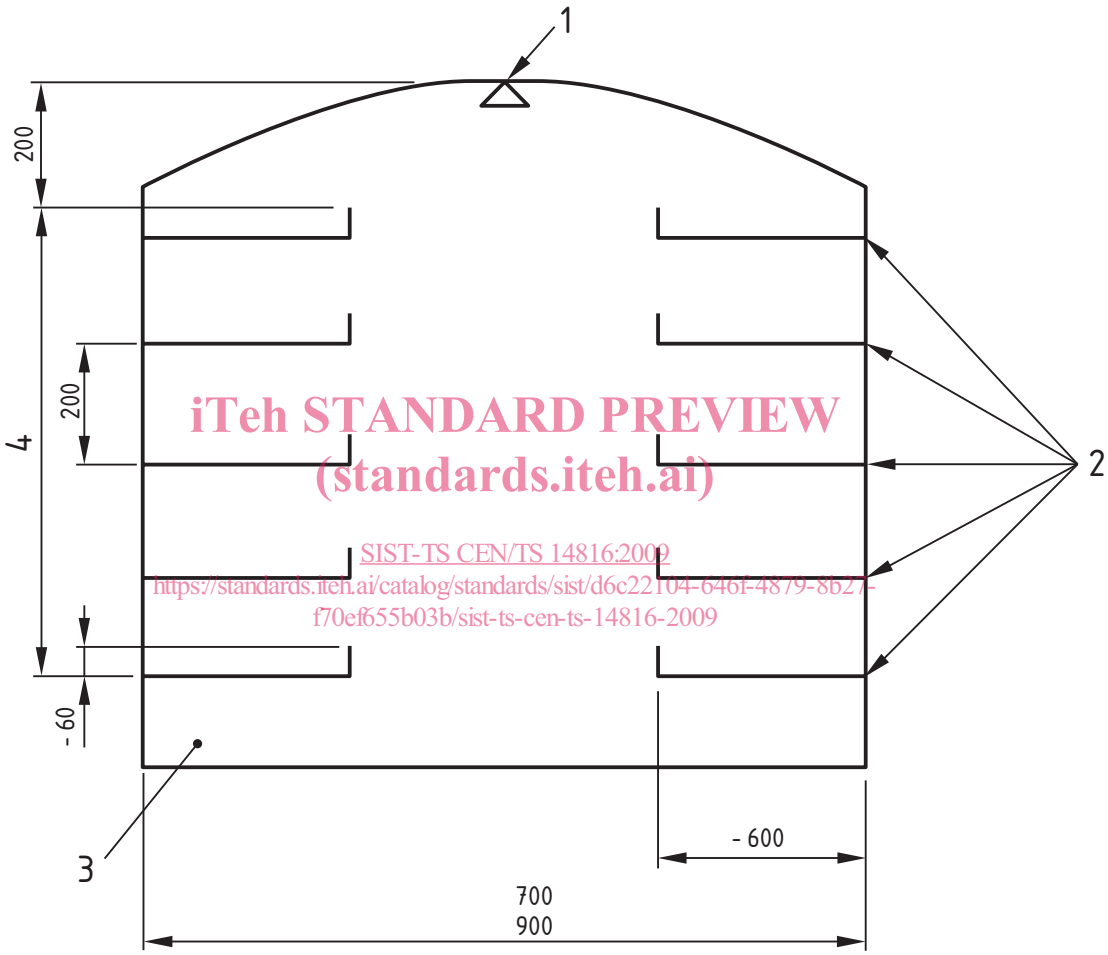
Minimum duration of protection: 30 min

Minimum operating length: 30 m or the length of the zone separated by a fire resistant separation, which ever is the lesser

Design area: height of the cable try arrangement multiplied by the operating length

Figure 1 illustrates one example based on tests in a cable tunnel that ensured good water penetration.

Minimum vertical distance between the cable trays and the ceiling:	200 mm
Horizontal distance between the cable trays:	Between 700 mm and 900 mm
Maximum width of a cable tray:	600 mm
Maximum cable height on each tray:	60 mm
Minimum pressure at the sprayer:	2 bar
Cable trays' minimum openings:	33 %



Key
1 Sprayers
2 Cable trays
3 Openings (minimum) 33 %
4 Height difference between lowest and highest cable tray

Figure 1 – Area spray, cable trays' configuration

5.2.5 Oil filled transformers

For protection of the external surface of a transformer, the following criteria shall apply:

The following concept will only apply when the separation between transformers is at least 5 m or by a wall with fire resistance of minimum 60 min