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INTERSCHUTZ
2015

New approach to sprinkler systems

Basic principles of sprinkler fire suppression have not been changed for more than a century since the first sprinklers were introduced in practice. At the same time, efficient means of fast fire detection, as well as opportunities of programming algorithms of any complexity for operation of fire suppression systems have been developed. Based on the analysis of the limitations inherent in conventional water-based fire suppression systems, the following avenues and requirements for improvements were identified:

To reduce damage from the fire, a fire suppression system must be activated at the early stage of fire growth (implementation of this requirement will increase false alarm probability);

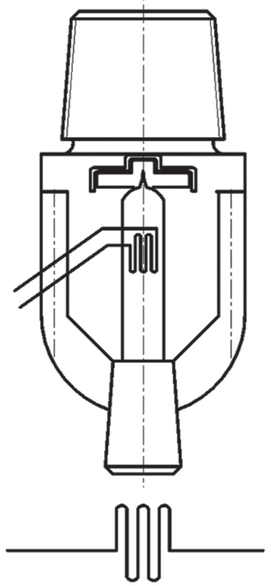
To reduce damage from spilled water, the wetted area must be bounded by the fire size at time instant of system activation;

There must be an option of displaying the information on activated sprinklers and the operation of the entire system for remote control by an operator.

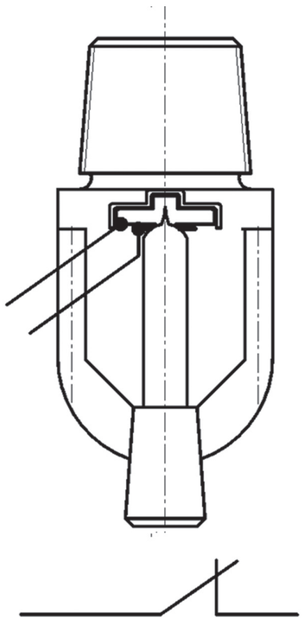
Neither usual sprinkler nor deluge systems simultaneously fit all the above principles. So the new approach to sprinkler systems has been designed, manufactured, properly reflected in fire codes and brought to the market.

Traditional sprinkler technology was improved by using modern technical solutions. For this purpose sprinkler design was changed and special systems were developed for managing such sprinklers.

The first new option introduced in classical sprinkler is the opportunity to enforce his activation by electric signal. The option of controlled sprinkler activation was implemented in the starting device, which consists of the heating element placed on the glass bulb. Being switched on by the external signal, the element warms the bulb up to the break-up temperature.

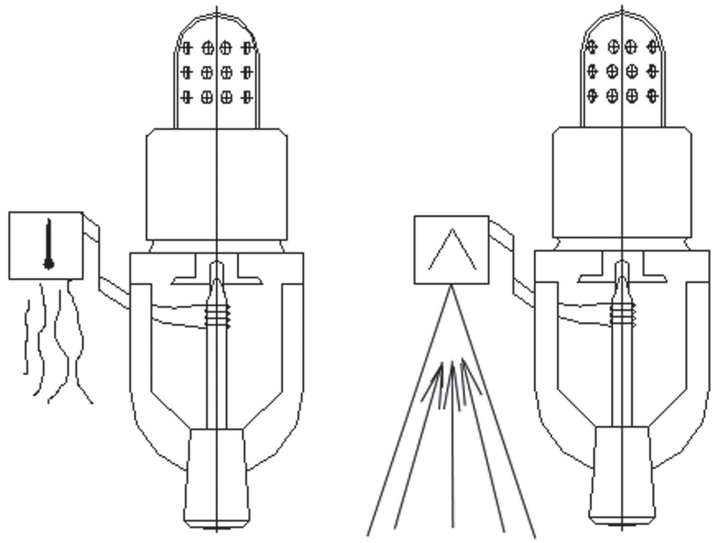


The second improvement introduced in this work is the facility to monitor the activation of the sprinkler. Such a facility consists of the interrupting contact placed between the bulb and the lock valve. The contact is closed when sprinkler is inactive and it disconnects when the sprinkler activates. Availability of the check-up facility is crucial for getting information of sprinkler status. It may be used when we need information about precise location of fire.



However, the problem of late fire detection still remains. But a serious step forward was made: fast fire detection and sprinkler activation were combined.

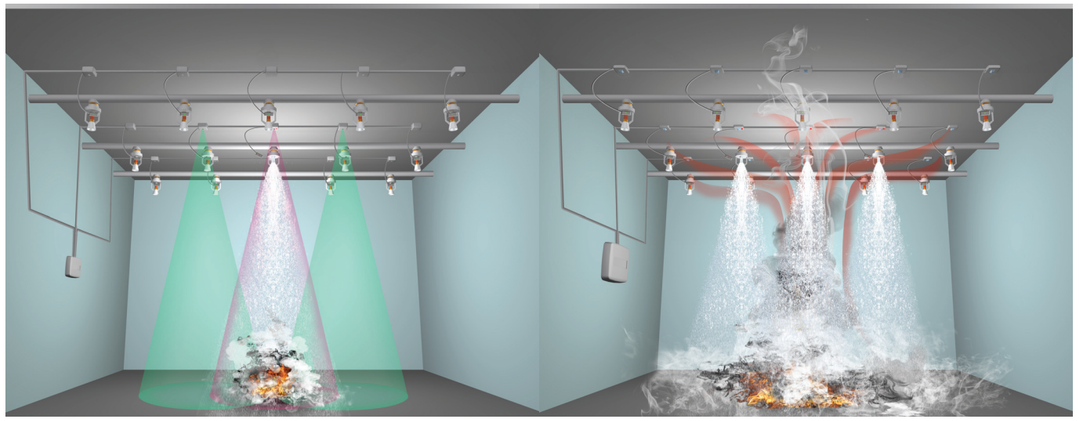
Electrically activated sprinklers with low-inertia fire detectors were integrated. The detector is located near the sprinkler. It observes the same zone as the sprinkler and works as the accelerator. When it initiates an alarm the nearest sprinkler activates. In Russian standards such fire detector is named the satellite. In practice, sprinklers with two types of satellite detectors were integrated: the first one responds to the temperature growth rate in the fire-driven flow. The second one responds to flame radiation and practically has no inertia. First variant is preferable because of the lower cost of the heat detectors. The delay of activation comparing with the flame detector is quite acceptable in most cases.



Three scenarios of using controlled sprinklers were explored: individual activation or group activation – dynamic and static.

First scenario – individual activation or sprinklers with accelerator.

In this kind of a fire suppression system, electrically activated sprinklers are integrated with the differential temperature sensors as described above. This design solution makes the time period between ignition and sprinkler activation several times less than that in traditional systems (this design is therefore referred as thermally accelerated).



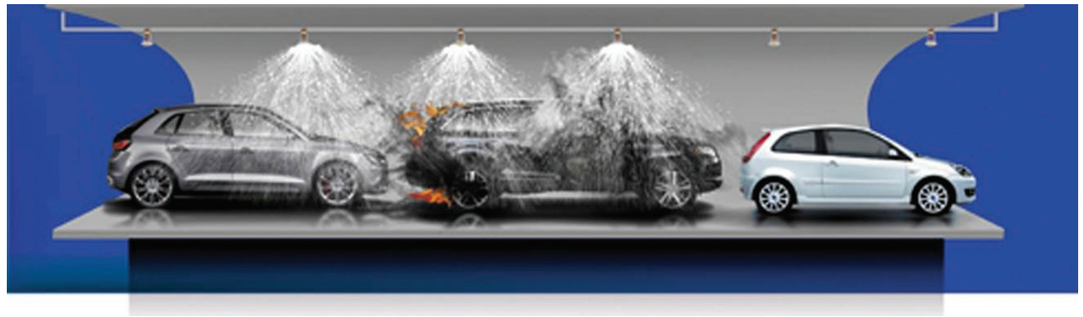
The lower calorific power of a fire source at the moment of activation allows reducing the amount of water required for fire extinguishing. In many cases it's a very important advantage. Also it helps to decrease the size of pipes, the power of pumps and the volume of reservoirs.

In this picture electrically activated sprinklers are integrated with the optical sensors sensitive to flame radiation. Optical axis of the sensor is directed vertically downwards, and observed area is similar to or larger than the area wetted by the sprinkler in case of activation. To meet this requirement, the view angle is adjusted depending on the sensor elevation. The response of such a system is very fast, being more than an order of magnitude less than that of conventional sprinkler. This system also offers a highly accurate localization of the fire source, which enables to precise delivery of the extinguishing agent (water). The latter might be important in heritage sites or in compartments with highly expensive items inside.

Second variant of using ECS is a programmed system with dynamic logic, when the group of sprinklers that should be activated is determined by the place of a fire origin. For example, here is the one of possible variants of using such technology. After the first sprinkler is activated, an operator identifies it, and the system defines an adjacent group of sprinklers surrounding the host one. The entire group activates as soon as the bulb is electrically heated (which takes about 10 s).

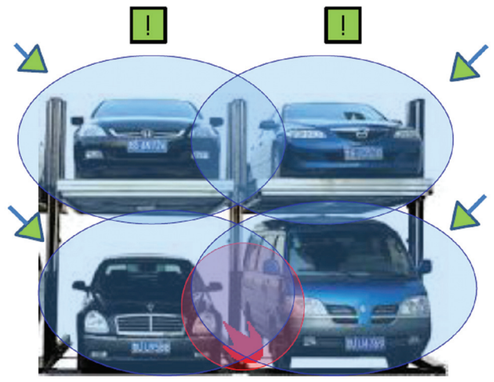
This picture illustrates extinguishing of the fire by the group of simultaneously activated sprinklers, thanks to which the fire is localized rapidly and the damaged area is expected to be much smaller. Actually we form a deluge section close to the axis of the fire seat. Here the size of the deluge section can be optimized and implemented it without any additional pipes and valves by using ordinary sprinkler net.

Another example of this variant is a protection of extended objects, such as transport tunnels or cable collectors. Here activated sprinklers in front and behind of the fire reliably block its spread along the tunnel.



Third scenario of using ECS is a pre-programmed system, when a fire signal from the first activated sprinkler or from a fire detector activates the sprinklers not only in the area of a fire but on the way of its spread. For example, preventing of flame spread through the doorways and windows in hotels or offices is crucial in high rise buildings.

A proposed technology uses an electrical activation, so there is no necessity to install sprinklers on the ceiling. They can be oriented in such way that will ensure maximum efficiency of the fire extinguishing.

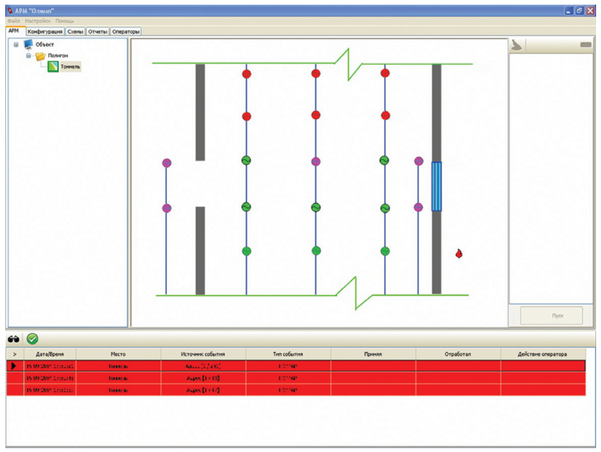


In cases when the traditional placement of sprinklers under the ceiling does not provide an effective extinguishing for example, when there is no possibility of supplying water to the fire source from the top because of the obstacle: high-rack warehouses or mechanized parking, having this new activation methodology there is no need to locate the sprinklers below the ceiling anymore, they can be installed in such way that will allow the maximum quantity of water getting to the fire source.

Concealed sprinklers are often used to protect the premises with special design. It is necessary to say that they have an unacceptably long time of activation. ECS provide activation of concealed sprinklers practically without inertia.

The special system was implemented to control the sprinklers with electrical activation. Its structure is designed to reduce amount of electric wires to the minimum possible value. This is achieved by grouping to one loop addressable satellite detectors combined with sprinklers connected to the line controller. Total amount of sprinklers which could be managed by the system is 3200. Current status of the system operation is displayed on the operator's console.

Operator's console is the LCD touch screen, which offers an opportunity of independent control of each sprinkler, includes user's guide and list of expected fire scenarios. The operator's console makes it possible to activate any sprinkler manually, simply by touching the screen.



The new draft for a new part of the International Standard 6182 has been developed. The relevant draft was presented to your attention. It proposed definitions, specific requirements and test methods for new sprinklers. We expect significant advantages of new sprinkler technology over the traditional one in compartments with highly flammable materials or high-value commodities, high-rack storages, atriums, high occupancy objects, sites of historical and cultural heritage and other industrial and social applications.

NEW WORK ITEM PROPOSAL

Closing date for voting 02-09-2014	Reference number (to be given by the Secretariat)
Date of circulation 1-July-2014	**ISO/TC** 21 **/ SC** 5 **N** 662
Secretariat ANSI	☐ **Proposal for new PC**

Proposal (to be completed by the proposer)

Title of the proposed deliverable.
(in the case of an amendment, revision or a new part of an existing document, show the reference number and current title)

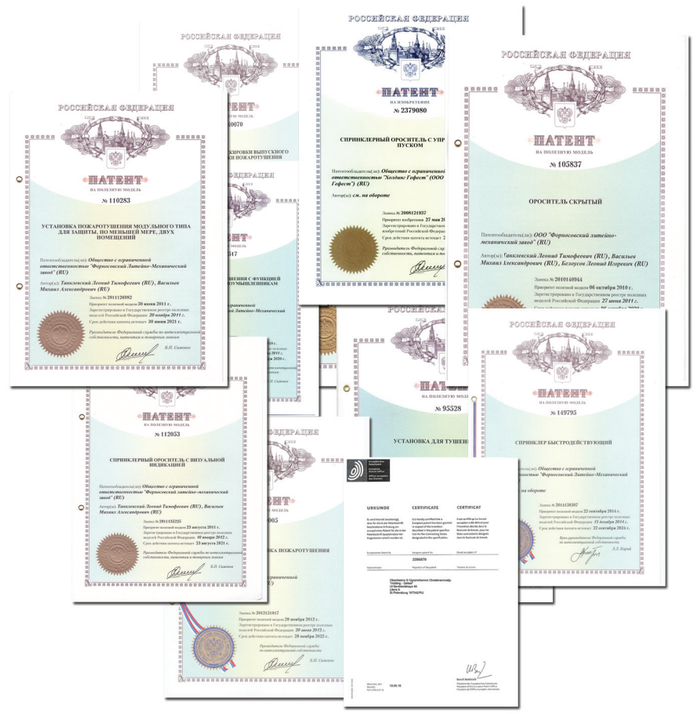
English title: Fire protection — Automatic sprinkler systems — Part X: Sprinklers with electrical activation and sprinklers with electrically controlled activation

French title (if available):

Scope of the proposed deliverable.

This proposal is inclusion of the new part in a currrent document ISO 6182: the part X - Sprinklers with electrical activation and sprinklers with electronically controlled activation

The uniqueness of electrically controlled sprinklers is proved by numerous awards and confirmed by Russian and international patents.



About us

SIO of Gefest Enterprise Group Tanklevskiy L.T.

"Gefest" Enterprise Group was founded in 1999 and nowadays it is one of the leading Russian companies in the area of fire safety. For the years of its work the company has developed into a strong and stable enterprise with more than 200 workers. Basic activity directions of "Gefest" Enterprise Group are manufacturing of fire protection equipment, design and installation of fire safety systems. Wide range of activity types of the company allows integrating effective fire safety systems on the basis of own unique devices.

Scientific and engineering potential of the enterprise is formed by the staff of highly skilled technical and research workers. Scientific research works are resulted into the production, which uniqueness is proved by numerous awards and confirmed by Russian and international patents. Requirements to the designed production have been included into the Russian standards and nowadays are discussed at the ISO/TC21 committee «Equipment for fire protection and fire fighting». High production standards and the production quality are proved by the certificate ISO 9001:2011.

"GEFEST"
ENTERPRISE GROUP

65A Serdobolskaya str.,
St.-Petersburg, Russia
Zip code: 197342
Phone: +7 (812) 600-69-11
e-mail: office@gefest-spb.ru
www.gefest-spb.ru