

## Sprinkler Systems in Warehouses: Curse or Godsend?



No matter where they are in the world, virtually all reasonably sized warehouses have a sprinkler system. The reason they are so widespread is because sprinkler systems have been demonstrated to significantly reduce the risk of loss of buildings and their contents in the case of fire. The expected size of fire damage is 5% at a sprinklered warehouse, against 100% if the warehouse is not sprinklered. Hence, insurers of both warehouse premises and the products stored there often stipulate the use of such a system. Governments often also play a key role by outlining safety regulations for preventing or limiting fire risk.

In addition to reducing the risk of fire, a certified sprinkler system in most countries offers the opportunity to create considerably larger fire compartments. Since compartmentation not only limits the flexibility of a logistics operation but also increases the distances in a warehouse, larger compartments mean greater efficiency. And yet when warehouse managers are asked about their sprinkler systems, they tend to focus on the inconvenience associated with the annual inspection and are generally less than enthusiastic. Why?

### Legislation

Part of the answer can be found in the regulations pertaining to the use of sprinkler systems, and the framework of criteria for the buildings and the goods that may be stored there. These regulations have usually been drawn up based on input from the insurance sector and are largely based on fire tests, since it is not yet possible to create sufficiently detailed models of fire behaviour. Such fire tests are also used as the basis for defining the criteria that sprinkler systems must meet in order to comply with the regulations. For instance, if a fire test has been carried out successfully in a situation in which pallets are stored back to back in racking with a 150mm gap between them, there is a reasonable chance that 150mm will become the distance stipulated in the regulations – not because there is proof that a gap of 149mm is insufficient, but because 150mm has been proven to be sufficient. Indeed, the regulations applying to the use of sprinkler systems are weighty tomes.

### Inspections

Another development in recent years has been that inspection agencies are paying greater attention to the degree of compliance with the regulations. Insurance companies' margins have been under pressure for some time, and this is slowly but surely having an impact on how the rules are applied. After all, from an insurer's point of view, better compliance means reduced risk. While it is definitely not so that insurers are making demands that go above and beyond the regulations, they do seem to expect their customers to follow the rules more closely. In the case of a sprinkler system that has been designed based on a complex set of rules, such as an ESFR sprinkler, stricter compliance can lead to a few surprises.

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### **In-rack sprinklers versus ESFR sprinklers**

In the past (in the Seventies, Eighties and part of the Nineties), sprinklers were often installed in warehouses with racking systems as a combination of a ceiling-mounted sprinkler system and an in-rack sprinkler (sprinklers positioned at various heights within the racking). In the Nineties, it became possible to replace this with just a ceiling-mounted system comprising so-called ESFR (Early Suppression Fast Response) sprinklers.

The ESFR sprinkler was an especially welcome development for warehouses and distribution centres since it often meant that in-rack sprinkler systems were no longer needed. In-rack sprinklers were notoriously sensitive – one careless move with a pallet could result in an employee triggering them accidentally. Furthermore, in-rack sprinklers limit the flexibility of the warehouse design considerably due to the associated sprinkler adaptation costs. This is particularly relevant nowadays, with warehouse operations and designs changing at an ever faster pace.

Since an ESFR sprinkler system immediately releases a large volume of water onto a fire, a ceiling-mounted system suffices from a technical perspective. Traditional sprinkler systems, on the other hand, do not generate sufficient extinguishing force. However, the application of ESFR technology is subject to even stricter criteria than traditional sprinkler systems, both in terms of the system itself and the framework of conditions applying to warehouses and how they are designed. Since the warehouse manager is rarely involved with decisions surrounding the sprinkler system's installation, the criteria applying to the warehouse and its design often pose the biggest challenge.

The case of the gap between pallets stored back-to-back in racking, as described above, is a prime example of this. The underlying technical justification is that a purely ceiling-mounted ESFR system must also be able to extinguish a fire at the very lowest level. To do so, water must be able to reach that area, meaning there must be open space from floor to ceiling (flue space in accordance with the regulations). Furthermore, the heat from a fire must be able to reach the sprinklers quickly to trigger them, which also necessitates flue space. Based on tests, the width of such flue space has been set at minimum 75mm. But as every warehouse manager knows, pallets do not stand with millimetre precision in the racking. Sprinkler system inspectors are aware of this too, and hence pay close attention to this aspect.

Another topic that causes much confusion is the presence of any type of plastic, which may or may not be inside a cardboard box, in the racking. Aside from the fact that plastics carry a high fire risk, different types of plastic react very differently in the case of fire. Expanded plastics have the nasty tendency to melt and drip, which can cause a fire to spread rapidly. As a result, these particular types of plastics are subject to very strict guidelines regarding whether they may be stored in sealed cardboard boxes. If such criteria cannot be met, the use of the sprinkler system will be restricted to stacks of one or two tiers at most, for example. Hence, a relatively small change to one aspect of the logistics, such as a switch to a different packaging material, can have significant consequences for fire safety, and in turn for a warehouse's operational possibilities and limitations. A recommendation would be to take into account possible changes in the future when designing the sprinkler installation.

### **Older sprinkler systems**

In warehouses with older sprinkler systems, use may be even more restricted. As described above, sprinkler regulations are evolving all the time as they are adapted to incorporate new insights. For example, 1996 marked a turning point in the Dutch sprinkler regulations (then known as VAS and now NEN-EN 12845 + NEN 1073) when an important update was issued. The update had far-reaching implications for the use of sprinkler systems, including how the various types of plastics should be handled. As is the case with all new building regulations, it is not mandatory to immediately adapt all existing sprinkler systems in line with the new rules. The existing system can continue to be used for a certain period of time, and can be certified based on the regulations that applied when it was installed. However, if any major changes are to be made to the sprinkler system, there is a good chance that the new regulations will apply. This can result in different regulations applying to different parts of the warehouse operation – a situation which most certainly does not help to increase general awareness and understanding of the rules surrounding sprinkler systems. A recommendation would be to take into account possible changes in the future when designing the sprinkler installation.

### **Curse or godsend?**

Returning to the question posed in the title: from a warehouse manager's point of view, is a sprinkler system a curse or a godsend? I have concluded that the key factor is a lack of understanding about the reasons underpinning the regulations. While warehouse managers obviously realise that sprinkler systems need to comply with the rules, they sometimes get caught up in the everyday problems of their jobs. And if they then also have to deal with a visit from a sprinkler inspector, who presents them with a report outlining a whole range of things they need to do differently – without knowing why – that can sometimes lead to frustration. I believe that sprinkler inspection agencies, installation companies and consultants can play a part in improving the situation. Warehouse managers might still not necessarily be delighted to see an inspector arrive, but they will have a greater appreciation of the reasons why – and, perhaps even more importantly, will also take a more proactive approach to considering the impact of sprinkler regulations when making operational decisions.

**If you would like more information about this subject, please [contact Groenewout](#) or call tel. +31 (0)76 533 04 40.**