WHITE PAPER

Sprinkler systems

Failsafe or just the easy option?

IAN KING
COO, ZEROIGNITION

Let's start with the basics.

We recently conducted research that highlighted a fundamental and worrying lack of knowledge when it comes to the basic terms associated with fire protection in the construction industry.

When asked, only 26% of respondents could accurately define, and provide examples of, active and passive fire protection. Yet these are the people who are held responsible for the materials that go into the buildings we live and work in.

That percentage is not one we're very comfortable with.

So, we're on a mission to produce content that helps improve knowledge and provide a wider view of the options available in a balanced and neutral way – because when lives are at stake, that's the only thing that should matter.

Let's start with the basics.

What is active fire protection?

Active Fire Protection (AFP) is a group of systems that require human or computer-based action or motion in order to protect structures and their occupants, in the event of a fire.

Some systems are automatic - like sprinklers - others require human intervention such as fire extinguishers, fire blankets or needing the attendance of the fire service.

In simple terms, this is what building occupants are used to seeing in their surroundings.

Products are split into 'detection' and 'suppressants' and, for the purposes of this article, we're going to focus on suppressants.

What is passive fire protection?

Passive Fire Protection (PFP) contains fire or slows the spread, through the use of fire-resistant walls, floors, and doors (among many other examples).

This class of protection requires no human or computer-based intervention and is actually incorporated into the building's design. So, this is protection you can't usually see, because a fire-resistant material may look almost identical to a non-fire-resistant one.

Protection is also then split into two phases of fighting the fire – protection from a materials reaction to fire, and fire resistance.

Let's start with the basics.

Reaction to Fire

Reaction to Fire (EU) (also known as Flame Spread in the US) describes the fire protection methods and materials designed to help occupants of a space, such as a hotel room, office or room in a home, to escape from the fire.

Generally, it's used in the context of the early stages of a fire – for example a fire in the process of starting from a candle, cooking or electrical appliance.

Products in this category are trying to aid evacuation of the space, by slowing the growth of the fire temporarily, or extinguishing it completely.

Fire Resistance

Once a fire is fully developed in a space, fire resistance is delivered by the set of products and technologies attempting to contain the fire where it started, and prevent fire spreading to other parts of the structure. In essence, they try to compartmentalise the fire and the most obvious forms are fire doors and walls.

Some fire protection options can offer both, but usually a product will be designed to protect in one of these ways.

For the purposes of this article we're going to focus on the seemingly one-size-fits-all active fire protection option – sprinkler systems.

Sprinkler systems

Not all active fire protection requires deliberate human intervention as some systems are automatic. Even then, the human element is never truly removed.

Sprinkler systems are, without doubt, the favoured option in recent years. With awareness fuelled heavily by media coverage, especially following the Grenfell tragedy, it's looking increasingly likely that England and Scotland will follow Wales' lead on mandating the use of sprinkler systems – particularly in multi-occupancy buildings – and this can only be a good thing.

But are sprinklers really a fool-proof solution? Or are we being a little blinkered?

There's no doubt that having a sprinkler system trumps not having one – that's just common sense. But, in order to see the full picture, we do need to look a little closer at the complexities of installing, maintaining and, most importantly, testing a sprinkler system.

Why aren't sprinkler systems properly maintained?

Installation of sprinkler systems is often seen as costly – however, we'd fully agree that they're actually somewhat less costly than fire damage. So, although cost can be a consideration it should certainly not be a priority.

This point was recently raised by Labour MP, Stephanie Peacock, in an article regarding sprinklers in schools:

"The ridiculous thing is that we spend far more rebuilding and repairing schools after fires than we would have paid to install sprinklers in the first place."[1]

In addition, the systems often require a huge amount of water pressure and energy to run. Achieving that is another cost issue, but not one that should stop a system being installed. Water pressure issues can be overcome and even though it can be at a higher price, that should be nothing when compared to preventing loss of life.

What we do need to ensure is that the industry is held accountable and key operating parameters like water pressure are traced and checked both before and after installation and regularly in use, so if it does need additional work, everyone is aware before it's too late.

An advantage that is always promoted is minimal maintenance. However, this is one our industry must disagree with and must keep challenging the legislation and our own thought process on fire protection.

Every sprinkler has a sensor, every sensor has to work, every sensor has to be checked frequently, and every sensor has to trigger a response from a control system in order for the full protection to be working correctly. Anything from an electrical fault to dirt, paint and dead insects around the sensors can affect this chain reaction and again we have to rely on human knowledge and proactive intervention, to make sure that checking and problem resolution is done fully and correctly. This does not happen automatically.

What's more, you have to question how sprinkler systems are actually fully tested in the short, medium, and long term considering they're most likely never turned on in situ, in a simulated emergency, because of the damage they would cause.

Challenging the industry's attitude.

Part of the maintenance and testing of a system should always be an evaluation of the building as well as the fire protection. A system is only designed and installed based on the environment at that particular time – but things change, buildings get adapted and added to, users of the buildings change and this all has a bearing on the effectiveness of the fire protection that was put in in the first place.

So, even if the system itself may be in perfect working order, if the correct surveillance and maintenance of the environment around it isn't also taking place, we are putting lives at risk – which became very apparent in the recent Ocado warehouse f that we'll come back to later on.

The sprinkler industry is very vocal regarding the minimal maintenance that is involved with their systems. The 'our system don't need much checking' attitude is only valid is absolutely nothing changes between installation and testing – not even a build-up of dust – which in 99% of cases won't be true.

For us, the industry should be challenging this, and a realistic framework of sprinkler testing and maintenance put in place which accounts for real world environment changes.

Why wouldn't sprinkler systems stop the spread of fire?

In this article from the US, the top five reasons why sprinkler systems fail to prevent or stop a fire are highlighted, and it's definitely worth a read despite being a few years old. Four out of five of the points raised are human error – because even though a sprinkler system triggers automatically, it's still classed as active.

Here's a top line rundown of the five in order:

64% of failures were because of system shut-off. This can be due to the system having never been switched on in vacant buildings, or through problems such as leaks.

17% of failures were put down to manual intervention. This could be down to building staff or firefighters switching off the system after the fire starts but before the sprinklers are set off, or if there's been an obstruction installed into the building after the sprinkler system is put in that stops the heat reaching the sprinkler head to activate the spray.

7% of failures occur because of damaged components. Usually a non-human error and can be caused by an explosion or collapse of ceiling or building entirely.

6% were put down to a lack of maintenance and failure to ensure proper function.

5% of failures were due to the system being inappropriate for the hazard. This can be caused by the incorrect design of the system, wrong type of agent or incorrect type of system.

There's also further UK research to support sprinkler systems conducted by the National Fire Chiefs (NFCC). This report into effectiveness, collated data from fire services across the UK to analyse sprinkler system efficiency and failures.

Interestingly, this research shows the big difference between commercial and residential failures. It's very clear that in a residential environment sprinkler systems have proved that with the correct installation, usage and maintenance they are a very reliable solution. However, in a commercial context there have been over a 1000 'failures to operate' – which accounts for 82.6% of sprinkler system failures in the UK during the period analysed.

It does pose the question, are sprinkler systems the best solution in a commercial environment?

Neglected fire causes chaos for Ocado

Earlier this year, there was an electrical fire at an Ocado site in Hampshire, UK. The robot-manned packing warehouse was ablaze for nearly four days causing local environmental issues as well as health worries for the residents nearby. The warehouse had a sprinkler system and although it activated, it did not contain or prevent the spread of the fire.

There are various reports as to why, ranging from it being turned off when the staff of the site thought the fire was contained but didn't want to damage the robotic equipment, through to the system not being able to penetrate the fire because of the location of the fire source and the way that the packing racks were placed within the building.

If nothing else this one example, of many, shows that sprinklers are not a failsafe for every building and there are a huge number of factors that need to be taken into account before the correct fire protection options can be designed in.

Are sprinkler systems the one-stop solution?

We cannot fall into the trap of thinking that sprinklers are the answer to all of our fire protection problems. Not only is this a dangerous attitude, but it also promotes laziness in innovation and new product creation in an industry that already has a reputation for being resistant to adaptation and change.

As shown in our research, it also allows those designing and building our homes and businesses to get away with a limited knowledge of fire protection. If they're not being forced to think about it at design stage, they can wrongly rely on only ticking 'fire protection' boxes with active suppression like sprinkler systems rather than passive fire protection. this approach means things will never change like they should.

Fire is a systemic problem and no single solution - like sprinklers - is the fix.

The construction industry needs to change.

Following disasters like Grenfell, it's only natural and right that we try and find a solution because society needs to feel, and know, that something is being done – because it does. Building protection at the moment is not good enough. Our fear is that because sprinklers are in the market already, and the stats available are hard to argue with, they seem like the easy option meaning their downsides and limitations are not being highlighted.

The truth is, there is no single thing that's going to completely eliminate the risks of fire in the buildings in which we live and work.

It has to be an eco-system of protection, both passive and active, and it all needs to be produced, tested, installed and maintained correctly.

If we are truly going to take fire as seriously as we should and finally listen to the warnings from devastating events like Grenfell – we have to find a way.

The automotive industry had to do it. And Aerospace, and Transportation. So too must the construction industry.

Get in touch

We are curious by nature and our continued education on all aspects of life that our technology affects is something that is fundamental to our company. This is why we are dedicated to producing papers, undertaking research and creating resources to educate and challenge the industries we work within.

Want to learn more?

Telephone: +1 902 201 0499
Email: info@zeroignition.com

zeroignition.com

1 https://www.bbc.co.uk/news/uk-47923843