



Protecting Fire and Life Safety Systems with Advanced Surge Protection Devices

Fire alarm and life safety systems are essential for protecting people, property and assets in virtually every school, hotel, hospital, office complex and public facility across the country. In addition to helping ensure safety, these systems are mandated for occupancy and operation, and are regularly inspected to verify that they meet NFPA codes that mandate strict compliance standards. If even a single problem with the alarm system is detected, it can shut down a facility, which triggers a number of challenges that can be expensive for facility management and disruptive to every occupant of the affected properties.

One of the most problematic and longstanding challenges associated with maintaining consistent operation of fire alarm and life safety systems is disruption caused by power surges and spikes, which often originate from external sources, but can be generated from within a facility as well. Such power anomalies can result in extensive operational consequences, and can generate

substantial repair costs due to the destruction and subsequent replacement of vital fire and life safety equipment and related expenses.

For example, a well-known resort in Florida that did not have surge protection in place paid \$260,000 to replace their fire alarm system that was destroyed by a random power surge from the grid. Compounding the matter, they also had to pay the local fire department for a “fire watch” mandated by local codes that cost \$53,000 over a 17-day period while the fire alarm system was being replaced. To prevent a reoccurrence of this incident, the resort installed advanced surge protection solutions to cover the entire fire alarm and life safety system for approximately \$8,000. Had this equipment been in place, damage to the fire alarm system and over \$300,000 in expenses may have been completely avoided.



Power Surges Can Strike at Any Moment

A common misconception about power surges is that electrical and electronic devices are only at risk during thunderstorms. According to the Insurance Institute for Business and Home Safety, lightning strikes account for only 2% of all surge-related damage. Hence, 98 percent of the damage is done by countless power surges that typically go unnoticed, caused by everyday occurrences including external sources such as powerline switching on the grid; as well as internal sources such as powering-up HVAC systems, elevators, refrigeration systems, motors and pumps that are often present in commercial and industrial facilities. These minor power surges and spikes may not be noticed in real time, but they have long term effects on fire alarm and life safety systems that can hamper proper operation and/or shorten equipment lifecycles, resulting in early, unexpected failures.



Another common misconception is that Fire Alarm Control Panels (FACP) with built-in fuse/circuit protections do not require external surge protection. The truth is that surge protection built into any individual device will not protect all of the various system components from damaging power surges.



What Needs to be Protected

Let's consider a typical fire alarm system that is built around a central control panel, called a Fire Alarm Control Panel (FACP). The FACP is the 'brain' of the fire alarm and life safety system that connects all system sensor and device inputs via Signaling Line Circuits (SLC), which are data circuits embedded in the FACP. This allows the FACP to monitor and control all connected detectors and input/output modules, controlling alarms and outputs to other systems, and information relays. Because the FACP sits at the heart of the fire alarm and life safety system, its 120V power source should be equipped with a surge protection device.

While protecting the input power is necessary to protect the FACP, it is not sufficient on its own for system-wide protection. There are other electrical pathways into the FACP that can expose it to potentially damaging power surges, causing the system to fail over time due to a series of small surges, or all at once in the event of a dramatic surge or a lightning strike in the area.

Because FACPs are connected to external power and devices, all connected devices are susceptible to electrical disturbances – including accidental contact with power lines, or induced currents from lightning strikes that could be miles away. Any such power surge can be passed into the alarm system and cause damage.

One potential pathway is through electrical connections that pass to the exterior of a facility. For example, communications devices are often connected to the FACP to enable management notifications and



to automatically summon emergency response action during alarm conditions. This can include a number of connected devices including telephone lines and dialers, modems and other related IP peripherals. In the event that the notification system employs cellular communications, an external cellular antenna can actually serve the unintended purpose of being a lightning rod.

Another potential area of vulnerability via outside connections is with SLCs that connect multiple buildings together via external wiring. The probability of a power disruption via an outside influence is so prevalent that NFPA code 72 – 2013, chapter 12 mandates that “all non-power-limited and power-limited signaling system circuits entering a building shall be provided with transient protection”. In these instances, surge protectors will help prevent surges applied to exterior wiring and devices from damaging interior fire alarm and life safety systems.



Fire alarm notification appliances, such as audible alarms and visual emergency signals (e.g. horns, buzzers, flashing lights), can also provide alternative pathways for power surges to enter the FACP. These devices are all connected to the FACP via Notification Alarm Circuits (NACs) and monitored via Initiating Device Circuits (IDC) within the FACP. Protecting these devices and FACP circuits will protect the fire alarm and life safety system from possible power surge points of entry.

What Happens When the Power Goes Down

A number of different possibilities may occur in the event of a power surge. The best possible outcome is that nothing is immediately affected, due to having adequate surge protection solutions in place to protect

vital systems from small disturbances. In the event of a major disruption, surge protection will ensure that the surge does not reach your devices and damage or destroy them. As a vital part of their useful life, one of the responsibilities of surge protectors is to absorb a sudden rush of electrical power – even if it causes them to be severely damaged or go end of life.

In such an event, all surge protection devices must be inspected to verify they are still functional. Some surge protectors have visual indicators to help pinpoint affected devices, but they all need to be checked to determine if they need to be repaired and/or replaced by a qualified technician. This can include a licensed fire alarm technician, electrical contractor or an individual licensed by the respective state or jurisdiction to perform this type of work.

The inspection process can take some time as one first needs to turn off the entire system, notify central station that the system is in test mode, replace the affected surge protection and/or fire alarm system components, test them, and then notify the central station that the system is back online. One way to help expedite system power restoration is to always have replacement surge protective devices on hand and ready to deploy, which typically remedies the situation without needing to directly touch any of the fire alarm system components.



If surge protection was not installed to protect the FACP, the user is probably out of luck as the panel is most likely damaged, or even worse, completely destroyed. If the power surge infiltrated the fire alarm and life safety systems wiring, now you're really out of luck, as all connected components may be a total loss.





Once a fire system loses power, it goes into battery backup mode, and an emergency alert is issued by central station. Unless staff is present on site to verify that no other damage or injury has taken place, the fire department is on its way. They often charge for these house calls, as well as very expensive fire watch services that may be required to sustain business operations while repairs are being made.

New Surge Protection Technologies Save Time and Money

The good news is that there are better and even more cost-effective surge protection solutions available today for professional applications. In addition to employing the latest surge protection circuitry to ensure containment, new power protection devices feature modular designs with LED and audible status indicators that allow individual surge modules to be easily identified and quickly replaced. Additionally, more advanced units include dry contacts to facilitate remote notification of surge protection status. The use of new “rapid replacement” modules provides multiple advantages: they can be easily stocked and stored at a fraction of the price of replacement surge devices; they can be quickly restored by swapping out affected modules; and they significantly reduce costs by virtually eliminating the need for a service call.

Conclusion

Facilities cannot afford to be without surge protection to protect mission critical fire and life safety systems. This extremely cost-effective first line of defense against common power issues increases overall safety while reducing liabilities. Protecting these systems with surge suppression solutions is certainly a necessity. Consult with reputable suppliers of surge suppression technology designed for professional applications to assess your needs and determine the best levels of protection required for your specific application.

The following checklist will assist you with asking the right questions; and provides a basic guideline to help ensure your facilities surge protection needs are met.



Fire Alarm and Life Safety Systems Checklist

- Does facility management understand that electrical surges are a common occurrence, with cumulative damaging effects on all connected electrical systems?
- Has the appropriate staff received training on how surge protection operates, so that they understand the purpose, capabilities and limited lifetimes of these items?
- Is electrical surge protection – with adequate capacity – installed at the service entrance to the facility, and in good working order?
- Have you installed a Surge Protective Device (SPD) on the 120V input power in close proximity to the Fire Alarm Control Panel (FACP)?
- If the FACP is connected to telephone lines that pass outside of the building, are these lines equipped with surge protectors to prevent any electrical surges from entering the FACP and causing damage to the fire alarm system?
- If the FACP is connected to a backup cellular communicator that is connected to an outdoor antenna, is that connection equipped with surge protectors to prevent any electrical surges from the antenna from entering the FACP and causing damage to the fire alarm system?
- If the FACP is connected to any Signaling Line Circuits (SLCs) that pass outside of the building, are these lines equipped with surge protectors to prevent any electrical surges from entering the FACP and causing damage to the fire alarm system?
- If the FACP is connected to Initiating Device Circuits (IDCs), are these lines equipped with surge protectors to prevent any electrical surges from entering the FACP and causing damage to the fire alarm system?
- Are the connections from the FACP to all notification devices (including audible alarms, visual signals and any other notification types) equipped with surge protection devices to prevent any electrical surges on these lines from entering the FACP and causing damage to the fire alarm system?
- Is there a maintenance and/or inspection program in place that will ensure regular inspection of all installed surge protectors to be sure they are in good working order and to provide for replacement when necessary?

