THE DYNAMIC WORLD OF SMOKE DETECTION & FIRE ALARM SYSTEMS:

What It Means for Building Owners and Facility Managers

Being a building owner or facility manager goes hand in hand with accepting

responsibility for safeguarding the lives of building occupants on a daily basis.

Part of that responsibility is having a working knowledge of commercial fire alarm systems and the codes and standards that govern them.

As codes and standards evolve, so too does the fire safety industry that

develops the products to detect and notify occupants of fire threats. This e-book

is intended to provide an overview of the product landscape so you can engage

in more informed discussions about the right solutions for your buildings.

HOW UL 268, 7TH EDITION AFFECTS YOUR SMOKE DETECTION SYSTEM

Research on a range of persistent issues pertaining to smoke detection has driven industry changes requiring substantial improvements to the components comprising the typical system. These changes were so sweeping that UL needed to modify the way it tested fire devices it would certify. At its facility outside Chicago, where smoke detection research is conducted and products can be tested for certification, UL built a new 800-square-foot lab to deliver controlled, consistent and repeatable measurements in testing. The facility controls climate variables such as humidity, air pressure and thermal equilibrium consistency.

UNPRECEDENTED DEVICE SOPHISTICATION

UL 268, 7th edition (effective June 30, 2022) ushers in several significant changes to what will be expected of commercial smoke detectors, including:

- Smoke detectors that are engineered to alarm faster with greater accuracy while still reducing cooking nuisance alarms by better distinguishing the type of fire and the danger it creates. View video **here**.

- Next-generation sensors that conform to the smoke profiles from fires of new building materials. These types of fires can reduce occupant evacuation times to unacceptable levels, highlighting the need for faster alarm times. View video **here**.

ALARMING FASTER WITH GREATER ACCURACY

Now it is possible for a smoke detector to classify particles as emanating from smoke, a nuisance or a combination of the two. The ability to discriminate down to such a granular level applies not only to cooking sources but also now includes some of the more common nuisance conditions that have plagued the smoke detection industry, such as steam and dust. In fact, it is possible for a detector to perform to this level using only optical sensing elements, as opposed to requiring other sensing elements, such as those found in combination optical, heat and carbon monoxide sensors.

Smoke detectors certified to UL 268, 7th edition will also have met the technical challenges of UL's new flaming and smoldering polyurethane fire tests. These simulate the smoke profiles and behavior of modern commercial building fires, where polyurethane-based materials are known to ignite and burn faster than traditional materials. The new testing procedures are intended to ensure building occupants have adequate time to evacuate.

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UNIVERSITY PARES DOWN FREQUENT NUISANCE ALARMS TO NOTHING

In September 2018, Edwards became the first multi-criteria smoke detector manufacturer to receive certification to UL 268 – Standard for Smoke Detector Systems, 7th edition. Our Signature Optica™ smoke detectors are able to distinguish between different types of fires, enhancing the protection of people and property while reducing business interruptions and unnecessary emergency responses.

SITUATION

A New Jersey university housing complex comprised of over 100 apartments was plagued by more than 60 nuisance alarms, from cooking and other sources, logged during the 2018 – 2019 school year. Nuisance fire alarms were a weekly, if not daily, occurrence within the complex. Whenever an alarm sounded, the entire student housing unit had to be evacuated until the local fire department arrived, investigated and restored the system. These nuisance alarms disrupted the tenants, and disciplinary actions were taken if a tenant did not evacuate from an adjoining unit during an alarm. An accident or injury during a nuisance alarm evacuation could have presented a liability issue.

SOLUTION

In an effort to reduce the rate, frequency and number of nuisance or false alarms, the university contracted with Franklin Alarm Co. of Franklinville, New Jersey, and they identified a solution – to install more than 100 newly UL-certified Edwards Signature SIGA-OSD Optica smoke detectors in the housing complex. According to Joe Petsch, president of Franklin Alarm Co., the two-day installation on the first floor of the complex was not disruptive to the tenants and was simple for the installer, as no system hardware or programming changes were required to replace the old units with new ones.

RESULTS

Following installation in the housing units of 100 Edwards Signature Optica smoke detectors in April 2019, false alarms went down to zero on the first floor and have remained at zero into the first few months of the 2019 – 2020 school year. The one nuisance cooking alarm reported post-installation was from an older detector on the second floor.

Stored data analysis by Edwards of five Optica units revealed detection of ongoing nuisance events from that time period that could have triggered alarms. However, the certified detectors were able to properly classify these events and did not sound. Proper operation was further validated when subjected to a UL-listed aerosol smoke test. Read the full case study **here**.

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NFPA 72® UPDATES THAT SPECIFIERS MUST CONSIDER

In 2019, changes to the National Fire Alarm and Signaling Code® (NFPA 72) eliminated the 100ms strobe pulse exception that had been in place for hallways, with all strobes now required to meet the standard 20ms pulse width duration requirement. Longer pulse widths must be compensated for through more intense device light output. NFPA added a rating multiplier to address this. For example, at 100ms pulse, the candela rating should be 3.67 times higher for the same rated area.

To address these changes, engineers can specify LED strobes that meet the 20ms requirements and are also synchronized within 10ms of existing xenon strobes for both new construction and retrofit projects. This allows them to be mixed and matched on the same loop and in the same line of sight.

ENERGY AND DESIGN EFFICIENCIES
In shifting to LED technology, new notification products have been designed with:

■ Current draws lowered by as much as 90% through proprietary lens designs and electronics, which reduce the requirements for booster power supplies.

■ The flexibility to have more devices on a loop, reduced wire size and conduit, and longer wire runs.

These electronic advances make it possible for devices to maintain the same current rating regardless of candela setting. With a constant current draw, designing new systems hinges only on the number of strobes, not the setting of each, to conform to AHJ expectations. Constant current draw also allows candela settings to be modified

for future NFPA requirements, reducing the need for rewiring or power calculations.

NFPA also proposed a new requirement for bright ambient rooms for future revisions of the standard. Rooms with always-bright ambient light, such as operating rooms and supermarkets, may need to have increased candela output to compensate for the bright ambient conditions. NFPA's initial proposal is to have any room where the ambient light is above 500 lux reduce the listed spacing by 30% or require double the light output. For example, supermarkets can be at 750 lux, and typical office spaces may be at the cusp of being affected at 500 lux.

Table A.18.5.5.5.1 Typical Ambient Illumination for Various Locations

Locations	Illumination (1x)
Unoccupied rooms (only emergency lighting active)	100-150
Warehouses, homes, theaters, archives	150
Classrooms	250
Normal offices, study library, show rooms, laboratories	500
Supermarkets, mechanical workshops	750
Detailed work spaces, operating rooms	1000

Note: Table derived from "Recommended Light Levels" published by National Optical Astronomy Observatory. Reproduced with permission of NFPA from NFPA 72® , National Fire Alarm and Signaling Code®, 2019 edition. © 2018, National Fire Protection Association. For a full copy of NFPA 72, please go to www.nfpa.org.

Since NFPA already has requirements for 15dB sound above ambient, there is a precedent for creating a similar standard for light above ambient. While the outcome of these requirements is not known at present, it will likely be addressed in future NFPA revisions.

DEALING WITH MORE COMPLEX FACILITY DESIGNS AND GOING BEYOND FIRE ALARMS

The prevalence of campus-style building layouts in urban and suburban settings has led to the need for more advanced networking designs that challenge fire safety practices in new ways. Up-to-date fire panels need to have a flexible mesh topology along with a modular architecture in order to accommodate modern building designs.

These advances are enabling:

- Fire alarm control panels that connect to outside networks and support a variety of network topologies

- Panels that store messages digitally for ease of access in an emergency

- Retrofit schemes that use existing wiring as much as possible

- The capability to adapt to a wider range of panel-to-panel alarm network configurations than traditional Class A and B wiring

- The capability of two-way communication with external devices, such as building management systems, enabling real-time system status and decision-making from anywhere

On a more micro level, new fire panels offer facility managers the ability to:

- Quickly understand and respond to system status via a color touchscreen

- Easily update panels without business interruptions and downtime

- Make use of up to 100 digital audio channels to ensure the right message is heard at the right time and in the right place

- Reduce cabling requirements by up to 75%

See how a building owner **saved 25% of the installation cost** by switching to the EST4 platform. Read the **case study.**

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CHAPTER 3

Dealing with More Complex Facility Designs and Going Beyond Fire Alarms (continued)

The next chapter will describe applications that can be customized to match a site's cybersecurity assessment needs, all while keeping the life safety demands at the forefront. This means blending active protection, compensating controls and capability for audit trails for a successful and secure installation.

THINKING BROADLY ABOUT EMERGENCIES

While having a fire alarm solution that can help adapt to modern construction trends is important, facility and risk managers often have to think about more than just fire. In fact, they should consider all of the possible emergency incidents that could occur on their property. Using the fire alarm system as the basis of incident management can enhance the range of solutions building managers have available to them.

Looking at the big picture, this approach enables facility managers to think strategically and go beyond the fire alarm. Many believe that Mass Notification & Emergency Communication (MNEC) is synonymous with a distributed messaging service, but that is only part of the equation in incident management. Distributed messaging may only deliver communications to those who opt in to the program, so the local community and visitors can be left out, and depending on the incident, there could be inadequate cellular service available for emergency text messaging.

Combining distributed messaging with in-building and wide-scale voice annunciation can help expand coverage. When these systems are listed to UL 864 and UL 2572, they are designed and installed in a manner that ensures survivability, meaning they will continue to operate when needed most.

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ADDRESSING CYBERSECURITY WHEN FIRE PANELS CONNECT TO EXTERNAL SYSTEMS

External connectivity is necessary and expected in many installations to enable diagnostic data transmission or even emergency communications via email based on a system event. The advent of smart, interconnected systems that enable critical remote connectivity also opens the door to vulnerabilities that were not previously a concern.

Users cannot simply hope for the best as cyberattacks become more prevalent and damaging. As a safeguard, fire alarm platforms must have protections in place, such as the capability to deploy a UL-listed proxy firewall using Advanced Encryption Standards when connecting to a building's TCP/IP network. This firewall serves as a secondary barrier of protection in addition to the commercial grade firewall that is part of the facility's building network. All network traffic is then handled within the firewall itself, transformed and repackaged before being provided on the other side of the firewall. This protects the fire system from outside threats such as malware, ransomware and denial-of-service (DoS) attacks; protocols and ports are restricted to only those needed for fire panel operation.

A SHORT GUIDE TO BEST PRACTICES
Up-to-date fire systems should also consider overall access to the panel based on industry-standard best practices. A physical barrier, such as a locked door, provides the first layer of defense for unauthorized access to the system, and tamper switches can be installed to monitor panel access. All panel access should be role-based; a user should only be able to perform actions explicitly allowed by the system configuration and permissions policy set for the access level entered.

Additional precautions should be taken to gain access to higher-level system operations, including special passcodes. For example:

- A user with a high level of access can enable and disable devices, but a lower-level user cannot.

- The user interface (UI) should not be locked if the maximum number of login attempts is exceeded, keeping the primary objective of the life safety system active, available and unobstructed.

- To further enhance access security, a timeout is put in place to force a user logout after a period of inactivity, limiting exposure due to panels being logged into without surveillance.

- All password attempts by users, successful or not, are logged to local history for audit trail access.

- No passphrases, access codes or PINs are stored in any database as plain text.

Ideally, system configuration software, its project and connection to the fire alarm platform should meet the infrastructure requirements of Federal Information Processing Standard (FIPS) 197, the Advanced Encryption Standard. Also ideal is two-factor authentication for configuration access to the panel, including a project passphrase that is up to 40 Unicode characters combined with a licensed PC and a six-digit session access code randomly generated by the panel.

LEVERAGING YOUR EXISTING INVESTMENT

A contemporary fire alarm control panel will only be as effective as the thought and advanced planning that goes into its design. Specifying engineers and architects should collaborate with knowledgeable dealers and system integrators in order to plan the optimal solution at the lowest cost. Those conversations should cover:

- A comprehensive picture of building design and use cases

- Building requirements that are unique to the locale which may call for more than the standard four panel event queues (Alarm, Supervisory, Trouble, Monitor)

- Understanding of an end user's previously installed systems, e.g., older control panels and their related subsystems and other panel hardware, so that existing investments can be leveraged in the migration

- Deployment of systems with both backward compatibility and forward migration built into the design

Fire alarm systems represent a significant investment on the part of end users, so reuse of field devices, wiring and other ancillary equipment should always be part of the conversation when selecting a fire alarm system. Incorporating reuse strategies can translate into significant cost savings over the life of the building.

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Let's Get Started

When you are ready to talk about your site- or campus-specific opportunity

to upgrade smoke detection and fire alarm systems, you only need to **click here**

to find a knowledgeable Edwards solutions partner and begin that discussion.

Life safety systems today are modular, scalable and versatile. Take what you've

learned here and become even more familiar with the latest technologies today.

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