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THE IMPORTANCE OF
*Performing and Managing Facility
Inspections, Testing + Maintenance*



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Abstract

Today's buildings, especially sports arenas, tall labs and multi-unit residential buildings, are part of a modern trend of larger structures. These larger and newer structures not only require more advanced active and passive fire protection systems but also a more considered approach towards ensuring life safety for the occupants.

Despite the significant investment in both design and construction, a building's level of protection can be significantly reduced over time if life safety features are not properly maintained or altered after construction and commissioning. Regular inspection, testing and maintenance (ITM) of life safety systems is crucial to maintaining their efficacy and protecting the occupants, property and the building owner's reputation. Digital tools can further support greater efficiency and compliance in ITM activities by helping teams make informed decisions that improve the building's overall environment.

FIRE + LIFE SAFETY CHALLENGES

While NFPA 101 establishes the life safety standards and design principles for building construction, protection, and occupancy features that minimize the effects of fire and related hazards, many significant fires still occur resulting in death, injuries and vast financial losses. Across the United States, structural fires have remained consistent at 486,500 incidents per year since 2000 while direct property damage has increased. Fire-related property damage to warehouse structures, for example, has increased by 270%, escalating from \$248 million in 2000 to \$671 million in 2020. In 2021, fires in apartment buildings and other residential properties, like hotels/motels, accounted for a combined \$5.4 billion in losses.

In many cases, malfunctioning life safety systems and poorly planned processes significantly contributed to fire-related deaths and injuries. Within the last few years, there have been several incidents involving retail environments, apartments buildings and entertainment venues where dozens of people were injured or killed because of blocked exits, defective smoke detection and stairway doors not closing. Overall, 15% of deaths and 31% of injuries related to fires occurred in non-residential structures, apartments and other multi-family housing, and other residential buildings like hotels/motels and residential care occupancies.¹





MAINTAINING LIFE SAFETY SYSTEMS

The evolution of building codes has resulted in structures becoming more dependent on fire protection systems for life safety. This dependence is reflected in increased evacuation distances in buildings with full sprinkler systems, reduced compartmentation in buildings with atrium smoke exhaust systems and the presence of more hazardous materials in buildings with additional compartmentation.

The reliance on fire protection systems can be justified by their effectiveness. Between 2015 and 2019, only about 1% fire-related civilian deaths in the United States occurred in buildings protected by automatic sprinkler systems, with civilian deaths reported as 89% lower in sprinkler-protected properties than in properties with no AES.² However, this reliance is only effective when the systems are functioning properly.

Life safety systems can be either active or passive. Active systems, such as fire sprinklers, fire alarms, and smoke control, have specific inspection, testing and maintenance requirements outlined in relevant NFPA standards. Passive systems, such as fire-resistant compartments and barriers, are designed to prevent the spread of fire and smoke with doors, shutters, and

dampers protecting openings. These systems also have established ITM requirements detailed in respective NFPA standards.

These active and passive features, along with the design and code compliance of a structure, all play an integral part in mitigating the risk of fire events and associated damages. Occupancy types such as health care, power generation and nuclear power facilities, among others, must maintain their compliance with life safety systems and receive regular audits from local, state or federal Authorities Having Jurisdiction (AHJ). They must maintain an appropriate program, for inspection, testing and maintenance of these systems (e.g., NFPA 25).

For example, The Centers for Medicare & Medicaid Services (CMS) Quality Certification and Oversight Reports (QCOR) identifies the inspection, testing and maintenance of sprinkler systems to be its top Life Safety Finding, with this concern identified in 24.5% of surveys.³ Fire alarm inspection, testing and maintenance was identified as the fifth most cited deficiency, with mention in 15.5% of surveys. The Joint Commission, a leading Accreditation Organization

that conducts federal oversight surveys on behalf of CMS, identified Sprinkler and Fire Alarm System installation and inspection deficiencies to be top findings (29% and 19.4%, respectively). Sprinkler ITM was found to be included in 19.4% of their citations.

Anecdotally, in other occupancies such as warehouse, assembly and industrial facilities where AHJ audits are less likely to occur, organizations tend to lack a robust ITM program. FM Global, a leading property insurance company, identifies the lack of inspection, testing and maintenance of water-based fire protection systems to be a leading hazard.⁴

With the critical nature of life safety systems, it is important to not only remain in compliance with the appropriate codes and standards but also regularly inspect, test, and maintain the systems within your building. In an effort to further reduce the risk of hazardous events, completing a hazard vulnerability analysis or risk assessment for your organization is a first step in understanding risks so that systems, processes, and procedures can be developed or updated to mitigate the level of risk.



DIGITAL TOOLS TO SUPPORT MORE EFFICIENT AND EFFECTIVE ITM

Building owners and operators have historically utilized a paper-based approach to support compliance and inspection, testing, and maintenance activities. Business information modeling (BIM) platforms have been utilized within the industry for years. However, we have begun to see great increases in their capabilities and features to support building owners, engineers and architects in our future built environments.

Improvements to BIM platforms can include industry aspirations to develop Digital Twins — a virtual model designed to accurately reflect a physical building. This form of modeling utilizes sensors and other assets to collect and analyze data from the performance of different assets, such as energy output, temperature, weather conditions, vibration analysis and water flow.

As the industry works towards Digital Twins, many current approaches focus on both process improvement and providing digital tools. These digital tools not only support teams in compliance activities but also allow leadership to use complex compliance data to make informed decisions that can improve a building's overall environment.

The ProtectAdvisr platform provides an easy-to-use inspection, testing, and maintenance tool for managing ITM schedules, documentation, compliance information, and critical vendor information supporting these activities. Evidence shows that maintaining information within a database design can improve ITM programs by:

- + Addressing organizations' "lack of awareness" and limited understanding of ITM requirements as well as the data and findings realized from these activities.
- + Providing a meaningful scheduling platform to improve compliance in completing ITM activities on time while maintaining proper documentation in a centralized repository.
- + Mitigating the risk of non-compliant life safety systems and the hazards associated with improperly maintained systems and processes.
- + Reducing costly repairs to systems by measuring ITM outcomes and having full awareness of the systems' functioning capability.

“In 2021, fires in non-residential properties accounted for a combined \$5.4 billion in losses.”



CONCLUSION

Life safety systems in buildings, especially in larger and newer structures such as sports arenas, tall labs, and multi-unit residential buildings, are critical for the protection of occupants and property. The regular inspection, testing, and maintenance of these systems are essential for maintaining their efficacy and compliance with relevant codes and standards. The reliance on these systems for life safety in buildings underscores the importance of digital tools, such as BIM platforms and digital twins, to support more efficient and effective ITM activities. Building owners and operators must prioritize the maintenance of life safety systems and complete a hazard vulnerability analysis or risk assessment to identify risks and develop or update systems, processes, and procedures to mitigate the level of risk. The use of digital tools can help teams make informed decisions with actionable data that improve the building's overall environment and reduce the risk of hazardous events.

“It is necessary for the building operators to ensure that the approach to safety is maintained throughout the building’s life cycle.”

Source: *Facility Executive Magazine*
<https://facilityexecutive.com/life-safety-systems-inspection-testing-maintenance-save-lives/2/>

References

¹Hall, S., & Evarts, B. (2022, September). Fire loss in the United States during 2021. National Fire Protection Association. <https://www.nfpa.org/-/media/fd0144a044c84fc5baf90c05c04890b7.ashx>

²Ahrens, M. (2021, October). US experience with sprinklers. National Fire Protection Association. <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Suppression/ossprinklers.pdf>

³S & C Quality Certification and Oversight Reports (QCOR). <https://qcor.cms.gov/>

⁴FM Global. (2023). Fire protection system inspection, testing and maintenance. FM Global Property Loss Prevention Data Sheets 2-81. <https://www.fmglobal.com/research-and-resources/fm-global-data-sheets>



About Us

At Jensen Hughes our team of engineers, scientists and consultants work as one team to address the complexities of safety and security to help our clients protect what matters. Mitigating the factors that could put lives, property and reputations at risk has been our objective for over 80 years. We're dedicated to advancing the science of safety through technology, knowledge and best-in-class research and development.

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