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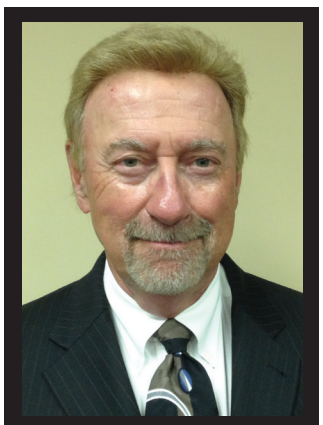
RETAIL FACILITY BUSINESS®

FIRED Up

The evolution of fire safety in retail. BY WILLIAM J. TOMES

Fire and life safety in the retail market is a complex and critically important issue. Many retailers realize the successful continuation of their business depends on keeping their facilities safe and up to code. Those retailers that have had the misfortune to experience a major fire know all too well the importance of regular inspections to avoid another catastrophic blow to their business. While the loss of structures and inventory is damaging enough, when you factor in the potential for injury or death to customers and employees, as well as business interruption over an extended period of time, the impact to a company's reputation and operations can be devastating and sometimes difficult for a retailer to overcome the perception that customers will not be safe in their stores.

In the mid-1970s, a change began to take place in the retail industry with the introduction of large warehouse retail stores to the marketplace. San Diego's Price Club was one of the first warehouse retail stores to open its doors. At that time, fire protection requirements for retail stores and warehouses were markedly different. Thus was born the need for change and the fire safety official's challenge to ensure that a safe and protected environment was being maintained in the big box retail stores.



TOMES

HIGH-PILE STORAGE CREATES NEW DANGERS

In the mid-1980s, most warehouse retailers were unfamiliar with what is required to protect "high-pile storage." Displays or storage that exceed 12 feet in height of regular merchandise, or 5 to 6 feet of height of Group A plastics (plastic materials that have a heat of combustion and burn rate much higher than that of ordinary combustibles) are considered high-pile storage. Warehouse stores were being built with 25- to 30-foot ceilings while displaying merchandise up to 24 feet in height, including large quantities of flammable and combustible products such as paint, aerosols and pool chemicals.

There was a total lack of understanding at that time — by retailers and even their insurance companies — of the special fire protection considerations high-pile storage and large quantities of these materials would require. Thus, inadequate lower density sprinkler systems without consideration of the hazards associated with such storage or other advanced fire protection features were the norm. In addition, some of the rigid code requirements of the time, such as in-rack sprinklers, were impractical for the retailer given their need to move racks and utilize their stores as intended. A process of through testing and analysis requested by one big box retailer in 1986 began the evolution that would establish base fire protection standards and new regulatory requirements for big box retail stores with high stock piling that still remains in effect today.

AEROSOLS, FLAMMABLES AND COMBUSTIBLES

An aerosol test program conducted in the late 1980s produced the first

solution to protect products of concern in this high-pile warehouse environment. The solution that was developed included the segregation of aerosols with the installation of in rack sprinklers within the storage/display racks. This was acceptable to both retailers and regulators, setting the stage for further partnership in research and testing.

Soon followed a comprehensive fire test study involving fire experts, retail representatives, product manufacturers, the Fire Protection Research Foundation, fire marshal's groups and the insurance industry to determine the necessary fire protection precautions for flammable and combustible products in the retail environment. And for the first time, a Class I-B flammable liquid, Heptane, was used in large quantities for a fire test program instead of water or other substitutes for flammable liquids.

These tests concluded that in-rack sprinkler systems would be required to prevent the type of explosion a typical one-gallon can of flammable liquid could create, and retailers came to see the need for in-rack sprinklers to protect their facilities, customers and employees. This inaugurated the requirements for in-rack sprinklers over flammable and combustible liquids that are still typical of many retail stores that stock bulk quantities of paints and other flammable and combustible liquids in use today. Designs were developed for more efficient in-rack sprinkler installation as new stores were built, and most retailers were able to retrofit existing stores.

GROUP A PLASTICS

The threat represented by Group A plastics was the next concern to be examined with a full-scale test program conducted between 1993 and 1995. These plastics are used in everyday products like trash cans, kitchen waste baskets, and containers for household products and represent a significant portion of available consumer products being merchandised. Again, stakeholders from the fire protection and retail industries joined to determine new standards for safe high-pile storage of Group A plastic materials and products. Given that Group A plastics represent the most hazardous of plastics in a retail warehouse environment, other plastic-containing products would also be protected. This test program considered many factors, including sprinkler design densities, shelf design and materials, flue spacing/size, storage/display height, roof deck height and aisle width. The conclusion was that Group A plastics could be successfully stored/displayed and protected in a warehouse retail environment without the need for in-rack sprinklers as long as the sprinkler design utilized K11.2 or was layered with a design density of 0.60 gpm/ft over 2,000 square feet. The test also showed that shelving should be slatted with a 2-inch opening and 6-inch opening.

POOL CHEMICALS

Most labs were initially reluctant to conduct tests with pool chemicals, many of which are classified as oxidizers that not only create an intense fire due to their release of additional oxygen to the burning materials but also release toxic vapors, such as chlorine. After some research, a single lab was identified that would accept the program. The subsequent tests showed that it was impossible to protect calcium hypochlorite pool chemicals without using special encasement, special in-rack sprinklers, and limiting stored quantities of commodities. After these tests, many retailers would not allow calcium hypochlorite inside their stores, placing it outside the primary structure in a garden area to avoid the potential for such an intense fire exposure inside the building. It was found that most other consumer pool chemicals could be protected with standard fire protection.

OVERALL CONCLUSIONS

One conclusion that was reached after this series of testing programs was that the larger the sprinkler orifice, the better the results. After additional research and computer model testing, an additional test program was conducted in partnership with a big box retailer to see if an even larger orifice sprinkler would allow for larger sprinkler head spacing. This would allow retailers to protect their stores with fewer sprinklers and less piping, resulting in considerable cost savings without sacrificing fire protection. Ten retailers participated in the test program from 2000-2001 along with sprinkler manufacturers, regulatory organizations and insurance groups. The result demonstrated that a K25.2 sprinkler with a 1-inch orifice could protect up to 196 square feet of area and produce more superior protection than the smaller orifice-sized sprinklers provided over the previously allowed 100 square feet spacing.

These improved results included less smoke in the building, fires that were pushed down quicker with less product damage and, in most cases, total containment by the K25.2 sprinkler. In addition to providing better fire control, this configuration proved to be very advantageous for retailers, reducing the number of sprinklers required by almost 50% and resulting in significant cost savings.

TODAY'S CODES REFLECT TESTING OUTCOMES

The outcomes of this series of testing programs is reflected today in the National Fire Protection Association's codes and standards (NFPA 13) and in the ICC codes, which has made a positive impact on the construction of retail stores across the U.S. and Canada as well as other areas around the world.

While there have been some fires in stores utilizing the protection criteria developed through this testing, there have been no serious fires, injuries or deaths. Typically, a fire is contained with one to three sprinklers, allowing stores to reopen quickly, minimize losses and maintain customers in a protected environment.

NEXT STEPS IN THE EVOLUTION

Much progress has been made in regard to fire protection in the retail industry over the last 30 to 40 years. Recently, however, some retailers have continued to store and display Group A plastics at heights of more than 5 to 6 feet and even higher without consideration of the high-pile storage provisions provided under current codes. Many believe the 5- to 6-foot height limitation is a somewhat arbitrary standard not based on testing. An additional series of tests to explore the sufficiency of an alternate sprinkler system design with varying sprinkler types and design densities for commodity arrays of 5 or 6 feet in height or even greater would provide sufficient additional information to ensure adequate fire protection as retailers work to take advantage of every square inch of retail space and could again result in overall cost saving for the installation of properly designed fire protection systems.

The fire protection industry should continue to research and test both new and old hazards to accurately and cost-effectively determine solutions to keep big box retailer — and their customers and employees — safe from fire dangers. **RFB**

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