Automatic Sprinklers: Prelude to Disaster?

The Dangers of Putting All Your Fire Protection Eggs in One Basket

By Francis L. Brannigan

In 1898, the International Association of Fire Chiefs resolved to have nothing to do with the practice of pumping into the new fangled automatic sprinkler. That argument continued for several years. Today, in general, fire chiefs are enthusiastic supporters of automatic sprinkler systems. However, in a curious sort of way, many fire departments act as if “the sprinklers are none of our business.”

There is no doubt that a properly designed, adequately supplied (water) sprinkler system can almost guarantee that a fire will not destroy a building. In order to “sell” sprinkler protection, concessions are made with respect to other fire protection and life safety features, such as travel distances to and the number of exits, flammability of surface finishes, size of enclosed fire areas, protection of void spaces, etc.

In essence, we are placing all the fire protection “eggs” in the sprinkler basket, and many fire departments are not watching the basket. Are you?

Automatic sprinklers function perfectly when sufficient water hits the fire to absorb enough heat to prevent the fire from propagating. In short, there must be more H2O than Btu. However, are you really aware of the many conditions that can cause sprinkler failure? And when notified of a potential sprinkler failure, do you know the proper action to take?

Consider the following statement: If the exits are located as permitted in a sprinklered building and the water is turned off, the building is then considered unsprinklered and the exits illegal.

Do you accept the logic of this statement? You should. What action would you take if you learn that the sprinkler system in a department store is out of service? The action should be the same as if a large number of the exits were blocked-vacate the store until the condition is corrected. This doesn’t mean that stores will have to be shut down. When the alternatives are properly explained, the work can be done after business hours.

If you don’t accept the statement, or don’t take any action when sprinkler systems are shut down, I suggest that you send the following memo to the city attorney:

Counselor:

Please look over the marked paragraph in the attached article. What is our legal position if a disaster occurs in a building where life safety code exceptions were permitted because the building was sprinklered; the sprinklers were turned off; and a serious loss of life occurred? In addition to the city, can I be personally sued successfully?

Fire Chief:

It is dangerously unrealistic to dismiss a potential fire risk with statements like: “It’s sprinklered, no problem there,” or “Sprinklers are a matter between the owner and the insurance company.” Many circumstances can cause sprinkler systems to fail. If the sprinkler system was installed in lieu of other life safety measures, the fire department should...
“We’re placing all the fire protection eggs in the sprinkler basket, and many fire departments aren’t watching the basket.”

take special care to see to it that the system stays in service when the building is occupied or that adequate substitute protective measures are provided.

If the sprinkler system was not installed for life safety, it may still be legally required. Sprinklers could have been installed to gain exceptions to height and area restrictions of combustible buildings.

Some sprinkler systems may literally be a “private matter,” installed in a structure not required by law to be sprinklered because the owner wanted the insurance benefits. Or the owner simply may have been determined that a serious fire loss was to be averted by the best available technology.

Regardless of why a sprinkler system was installed, the fire department has a responsibility to see to it that the system can do its job when the need arises.

The fire department should have a formal policy on the subject of sprinkler system disabilities, covering such items as:

• Fire department notification. It may be necessary to seek the cooperation of other licensing authorities to place a burden on the sprinkler contractor to notify the fire department of sprinkler problems. This does not pardon the building owners or tenants of their responsibility to report sprinkler problems, it is simply a safety net.
• Situations where the fire department should take formal legal action such as vacating a department store.
• Modifying pre-fire plans, working with management to establish fire watches, or shutting down hazardous processes for which the sprinkler system was originally ordered.
• Authority to modify the safety and protection requirements set forth by law.

An instructional program for personnel involved in the inspection of sprinkler systems should include:

• A basic knowledge of sprinkler protection, including the types, adequacy, and reliability of water supply systems.
• An understanding of the different reasons why sprinklers are installed. This will give the inspector motivation to perform a more thorough evaluation of the system’s effectiveness.
• The fire department’s policy on sprinkler impairment.
• Detailed knowledge of conditions that can decrease or destroy the efficiency of sprinklers.

Sprinkler system disabilities . . .

Sprinkler impairment can be divided into water supply and water distribution.

Since the design of a water supply system is beyond the scope of this article, we will assume that the designed supply is adequate. However, are flow tests made to assure that the designed supply is actually available? Are static water supplies such as roof tanks, surface tanks, and pond intakes necessary? Are fire department siamese connections available? The National Fire Protection Association Standard 13, Installation of Sprinkler Systems, (mistakenly) makes them optional.

In many industrial plants, fire department sprinkler connections are
omitted from individual buildings. As a result, when a water main is out of service, the sprinklers served by that main are out of service. Since there is no connection, it is not possible for the fire department to use their hose lines to supply the system. A major plumbing job is required to keep the system supplied, and this is often neglected. All systems should have siameses whether required by law or not.

When Siamese connections are installed, are they properly protected from damage? All siamese openings should be capped, otherwise the open pipe is a target for stones, rags, and other debris which will block the flow of water.

The piping from the Siamese to the sprinkler system is dry and unsupervised. It’s not evident if anything is broken. In modern construction, Siamese connections are often distant from the building they service. They are sometimes found under driveways and parking lots, subject to traffic pressure and corrosion. I don’t know of any code that requires periodic testing of this connection, yet without it the fire department cannot augment the building’s sprinkler system. (Always happy to stand corrected.)

If the sprinkler system depends on pumps, check on pump maintenance and test procedures. Is the power supply vulnerable to a fire? At one naval base, the electrical cables to the fire pumps passed over a barracks that, inconveniently, was the fire building. Are emergency power supplies adequate? Is the emergency system tested regularly? Pre-plans should include checking that the fire pumps have started, and detail the action to be taken if they don’t. It may be that maintenance of fire pumps is “their responsibility,” but fixing responsibility runs a poor second to putting out the fire.

The fundamental purpose of a sprinkler system is to hit the incipient fire with enough water to suppress it. There are too many ways for sprinkler failure to occur to cover them all here, but a few examples should get you to begin to look more critically at sprinklered buildings.

The designers of sprinkler systems understood and accounted for the possibility of closed supply valves. Unlike other valves, sprinkler valves are made to indicate their position. Outside post indicator valves show an “open” or “closed” sign in a window on the valve body. Interior valves are “outside stem and yoke.” If the stem is protruding, the valve is open; conversely, if the stem is flush with the valve wheel, the gate is closed.

In the best system, electrical alarms transmit a signal if the valve is turned. At the very least, valves should be chained, locked, and sealed. There should be a system for reporting any closed valves. The system should assure that all closed valves are opened and records kept. In a New York department store, 29 sprinkler valves were closed and 28 were opened. A fire occurred in the area “protected” by the closed valves.

The details of the system for con-
trolling sprinkler valves and the special precautions taken when valves are shut are very much the fire department’s business. This is especially true if the sprinklers were installed by law, or if other code requirements were granted because of the sprinkler system installation.

Old sprinkler systems may be of inadequate design. Dry pipe systems that have become “wet” a number of times are often found to be plugged by scale carried by the inrushing water. Often, industrial buildings and warehouses are built on speculation. The builder puts in a sprinkler system to make the building attractive to tenants; yet, the fire load introduced by the tenants is far beyond the capacity of the sprinkler system.

A serious failure in sprinkler effectiveness occurs in occupancies using high stack storage practices. This occurs due to the failure to provide adequate sprinkler protection within the stacks. In such instances, expect a difficult and dangerous suppression operation. High piled stock requires both automatic and manual suppression, and the situation may be too unsafe to permit an interior attack.

Merchandise piled in aisles is not calculated into the protection ability of the designed sprinkler system. Storage racks are usually constructed of light, unprotected steel. Never get into a position where they can collapse behind you. In one high storage warehouse fire, with adequate sprinkler protection, the chief described an “inferno” in an aisle between stacks. Fortunately, an open loading door permitted the placement of a multiversal nozzle to hit the fire. Beware of heroics or just plain stupidity. Ask yourself, “How much consideration has the owner of this turkey given to the safety of firefighters?”

Sometimes, shopping malls are only partially sprinklered. Often the original structure was built as an open group of unsprinklered stores. When the mall was enclosed, sprinklers were provided in the open mall area but not in the individual occupancies. You may also find that major commercial store structures that “anchor” the mall are sprinklered because of corporate policy, while other stores are not. Mall investors want to keep their cash flow down and sometimes provide only the sprinkler main, leaving each owner to install sprinkler heads in his store.

There is a national mania to preserve old “dumps.” Often they are just given a coat of paint and called a “boutique.” Sometimes, the building department gets on the stick and demands sprinklers. Often, the sprinklers just cover the accessible areas and are not the void spaces. This may be deliberate. The system is needed for life safety of occupied space and the sprinklering of the voids will make the cost prohibitive. Fine, if this is the case. But, if the fire starts in or penetrates the void, the building may be destroyed.

Unsprinklered voids are often created by the construction of “buildings” within the building. Offices on factory floors, special storage rooms, and mezzanines are typical structures that can allow the fire to grow unchecked and overpower the sprinkler system.

Everybody is clapping hands about the new “residential sprinkler systems.” Lord knows, I’m not against residential sprinklers; my wife and I raised our children in a sprinklered house. And in the overwhelming majority of cases, a fire that starts in a building’s occupied spaces will be cut off by the sprinklers. However, I must raise a strong caution. Voids, on the whole, are unsprinklered. And the gypsum membrane that is supposed to protect the voids is full of pinholes. If the fire starts in or penetrates the void, the fire can take the building. Typically, the voids in present day construction are “truss lofts.” Despite alleged firestopping, the voids are interconnected. Early collapse and the loss of firefighters is a distinct possibility.

Management is the big buzz word these days. Unfortunately, much management effort is concerned with managing the fire department—not managing the fire problem. The integrity of sprinkler protection is a big management problem, and fire chiefs should get started on managing it.

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