Building Sprinkler Systems – ITM

The National Fire Protection Association (NFPA) published a research article in 2017 that took an in-depth look at the U.S. Experience with Sprinklers. The research showed the death rate was 87% lower in properties with sprinkler protection. Sprinklers were effective in controlling the fire in 96% of the fires in which they operated. The research, however, also showed that sprinkler failures do occur. They either failed to operate (8% of the time) or they operated ineffectively (4% of the time).

The most common failure is caused by the system being shut off. In-house personnel must be trained to identify when the system is impaired so this can be immediately corrected. An ineffective system is one which was designed improperly from the outset or was rendered ineffective by a change in use or occupancy. These, and many other failures, can be avoided by following NFPA 25 and putting a proper inspection, testing, and maintenance (ITM) program in place.

According to NFPA 25, the property owner or designated representative bears the responsibility of properly maintaining a building sprinkler system and for determining the adequacy of the sprinkler system. A system can be maintained by hiring a qualified sprinkler contractor to complete most of the required maintenance and training in-house staff to handle the more frequent tasks. Any changes in occupancy (use or process, materials used or stored) requires a re-evaluation of the existing sprinkler system's adequacy. In most cases, this evaluation can be completed by the same sprinkler contractor; however, determining the adequacy of a sprinkler system is not within the scope of the normal ITM procedures.

A quick glance at NFPA 25 will reveal the complexity of an ITM program for sprinkler systems and their component parts. While the ITM requirements are complex, with a good sprinkler contractor, they don't have to be confusing. A qualified sprinkler contractor can help explain what tasks internal staff should do more frequently, as well as what to do during an emergency. They should also outline the scope of what they'll do annually and at longer intervals.

These four key testing protocols must be followed:

1. The annual inspection includes many items; the most observable is the water flow test. For a dry system, a partial flood of the system is allowed for two consecutive years and a full flood of the system lines is required every three years. The dry system must be completely drained and re-pressurized before it's considered back in service. Any deficiencies discovered during the annual inspection should be resolved quickly to ensure a fully-functioning system. It's important to maintain an annual inspection schedule to note significant changes in the water pressure/flow readings, as these might be a sign of larger issues.

2. Fire pumps are tested and inspected as part of the annual inspection. This is known as the fire pump flow test. In addition, a weekly churn (no-flow) test is required for diesel engine pumps. For electric-driven pumps, a churn test is required either weekly or monthly, depending on the type of pump, water source, and building environment. With the proper training, these more routine churn tests can be completed by in-house personnel.

3. Internal pipe inspections are required at varying intervals based on the type of system and environment. All systems must have an internal pipe inspection every five years. Dry pipe or pre-action systems passing through refrigerated spaces require an internal inspection annually for ice obstructions at the point where the piping enters the refrigerated area. Dry pipe valves are an example of a component that should be inspected annually when the trip test is conducted.

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4. Sprinkler heads are an extremely important component of a building sprinkler system. They hold back the water under normal conditions and trigger the water flow when needed. Unfortunately, they're also susceptible to breakage when unintentionally hit by forklifts and pallet loads. Part of the annual inspection is to verify that the correct type and quantity of heads are present. The sprinkler contractor should also advise the building owner when the heads are coming due for integrity testing. To determine a sprinkler head's acceptability or the need for replacement, a representative sampling of sprinkler heads should be sent to a recognized testing laboratory on this schedule:

    a. Extra high or greater temperature solder type heads—every 5 years
    b. Heads in harsh environments—every 5 years
    c. Dry system sprinkler heads—every 10 years
    d. Fast response (includes ESFR) heads—at 20 years and every 10 years thereafter
    e. All other heads—at 50 years and every 10 years thereafter until 75 years
    f. All other heads—at 75 years and every 5 years thereafter

A building owner should be able to rely on a competent, qualified sprinkler contractor to follow the NFPA 25 standard for sprinkler system inspection, testing, and maintenance. The most common contract is for an annual inspection. However, as noted earlier, there are more frequent tasks that must be completed to fully comply with the NFPA standard, and there may come a time when changes in occupancy prompt a need to re-evaluate the adequacy of the system. These items could be completed by the same sprinkler contractor under a separate contract.

In-house personnel should be trained on the general requirements of the standard, how to complete the more routine tasks, and what to do during an emergency. Staff should be able to recognize an impaired system, be able to drain the low points of a dry system, complete a churn test for a fire pump (if present), and know the locations of all shut off valves.

This information covers basic wet or dry systems with or without a fire pump. There are also specialty systems, and systems with specialty components that require their own ITM programs. For those additional requirements, please refer to these tables within NFPA 25.

NFPA 25 Inspection Testing & Maintenance Reference Tables

Table 6.1.1.2	Summary of Standpipe & Hose Systems ITM
Table 7.1.1.2	Summary of Private Fire Service Main ITM
Table 8.1.1.2	Summary of Fire Pump ITM
Table 9.1.1.2	Summary of Water Storage Tank ITM
Table 10.1.1.2	Summary of Water Spray Fixed Systems ITM
Table 11.1.1.2	Summary of Foam-Water Systems ITM
Table 12.1.2	Summary of Mist Systems ITM
Table 13.1.1.2	Summary of Valves, Valve Components, and Trim ITM

It's possible for local jurisdictions to have additional or different requirements. Some require the installation of back flow preventers and some allow backflow testing to replace a sprinkler main drain test. A backflow test, however, doesn't verify that the system is working properly so West Bend strongly encourages complying fully with NFPA 25 by completing an annual main drain test in addition to any local jurisdictional requirements.