

Automatic Sprinkler System Valve Tamper Supervision

by Dean K. Wilson, P.E.

***Question:* Our fire alarm and security installation and maintenance company has recently taken over the testing and maintenance of fire alarm systems installed in one of the national big-box-store chains. During the initial inspection, our technicians have consistently found that automatic sprinkler system valve tamper switches connect in series with the waterflow alarm initiating circuit for a particular sprinkler riser. When someone operates or tampers with the associated automatic sprinkler system control valve, the fire alarm system control panel receives a “trouble signal.” This seems wrong to me. How will someone taking note of the signal distinguish between a broken wire or failed power supply and a shut or partially shut automatic sprinkler system control valve?**

You have asked exactly the right question. The facts: the National Fire Protection Association fire alarm system installation standards, including NFPA 72-2010, *National Fire Alarm and Signaling Code*, have never—that’s right, *never*—permitted the connection of an automatic sprinkler system valve tamper supervisory switch in series with a fire alarm initiating device circuit in such a manner that the operation of the tamper switch will produce a “trouble signal.” And yet, this issue rises to the surface time and time again. It seems that this “easy way out” tempts many fire alarm installers.

To understand what's wrong with this approach to automatic sprinkler system valve tamper supervision, we need to look at a couple sections in the *Code*. First, let's look at the definitions of "signals" from NFPA 72-2010.

3.3.240 Signal. A status indication communicated by electrical or other means. (SIC-FUN)

3.3.240.1 Alarm Signal. A signal indicating an emergency condition or an alert that requires action. (SIC-FUN)

3.3.240.2 Delinquency Signal. A signal indicating the need for action in connection with the supervision of guards or system attendants. (SIC-PRO)

3.3.240.3 Evacuation Signal. A distinctive signal intended to be recognized by the occupants as requiring evacuation of the building. (SIC-PRO)

3.3.240.4 Fire Alarm Signal. A signal initiated by a fire alarm-initiating device such as a manual fire alarm box, automatic fire detector, waterflow switch, or other device in which activation is indicative of the presence of a fire or fire signature. (SIG-FUN)

3.3.240.5 Guard's Tour Supervisory Signal. A supervisory signal monitoring the performance of guard patrols. (SIC-PRO)

3.3.240.6 Supervisory Signal. A signal indicating the need for action in connection with the supervision of guard tours, the fire suppression systems or equipment, or the maintenance features of related systems. (SIC-FUN)

3.3.240.7 Trouble Signal. A signal initiated by a system or device indicative of a fault in a monitored circuit, system, or component. (SIC-FUN)

Notice that the definitions of "supervisory signal" and "trouble signal" have very distinctive meanings. A "supervisory signal" indicates the need for action in connection with fire suppression systems or equipment. This would, obviously, include signals from an automatic sprinkler system that indicate the operational readiness status of that system. So, a switch installed to provide automatic sprinkler system valve tamper supervision should initiate a "supervisory signal."

A “trouble signal” results from the initiation of a signal that indicates a fault in a monitored circuit, system, or component. In other words, any problem with the operational readiness status of the fire alarm system, itself—any of its components—should initiate a “trouble signal.”

Summarizing: “supervisory signals” originate from other systems monitored by the fire alarm system; “trouble signals” originate from components of the fire alarm system.

NFPA 72-2010, *National Fire Alarm and Signaling Code*, also contains requirements for the prioritization and distinctiveness of various types of specific signals. Please take note of these partial *Code* citations:

10.6 Signal Priority. The priority of signals shall be in accordance with Section 10.6.

10.6.2 Fire alarm signals shall take precedence over all other signals, except as permitted by 10.6.1 or 10.6.3.

10.6.5 Supervisory signals shall take precedence over trouble signals.

And, also please take note of these partial *Code* citations:

10.7 Distinctive Signals.

10.7.1 Priority alarms, fire alarms, supervisory signals, and trouble signals shall be distinctively and descriptively annunciated.

10.7.2 Audible alarm notification appliances for a fire alarm system shall produce signals that are distinctive from other similar appliances used for other purposes in the same area that are not part of the fire alarm or emergency communications system.

10.7.3* Audible signals on a control unit, or on multiple control units that are interconnected to form a system, or at a remote location, shall be permitted to have the same audible characteristics for all alerting functions including, but not limited to, alarm, trouble, and supervisory, provided that the distinction between signals shall be by other appropriate means, such as visible annunciation.

A.10.7.3 Control unit signals can be audible, visible, or both for any particular function. Some older systems used only audible indicators that had to be coded in order for users to know what the signal meant. Where a control unit uses both audible and visible indicators, the purpose of the audible signal is to get someone’s attention. In large system configurations, there might be multiple control units with

audible signals. Also, there might be several different functions requiring an audible alert as a part of the whole signal. Thus, there could be several different audible signals. It is not the intent of the code to have separate and distinct audible signals where there is clear visual distinction that provides the user with the needed information. Visible signals, whether a lamp with a text label, an LCD screen, or a computer monitor, are a better form of human interface.

10.7.4* Supervisory signals shall be distinctive in sound from other signals, and their sound shall not be used for any other purpose except as permitted in 10.7.3.

A.10.7.4 A valve supervisory, a low-pressure switch, or another device intended to cause a supervisory signal when actuated should not be connected in series with the end-of-line supervisory device of initiating device circuits, unless a distinctive signal, different from a trouble signal, is indicated.

10.7.5 Trouble signals required to indicate at the protected premises shall be indicated by distinctive audible signals, which shall be distinctive from alarm signals except as permitted in 10.7.3.

10.7.6 Fire alarm evacuation signals shall be distinctive in sound from other signals, shall comply with the requirements of 18.4.2.1, and their sound shall not be used for any other purpose.

In these citations, please pay particular attention to the explanatory material from the Annex, stated above as paragraph A.10.7.4.

The requirement of paragraph 10.7.4 from the main body of the *Code* requires a distinctive sound for supervisory signals. This requirement, when it relates to a fire alarm system control unit, may be satisfied by having a common audible sound with distinctive visible indication, as stated in paragraph 10.7.3.

Notice that Annex paragraph A.10.7.4 specifically addresses the situation you discovered at the big-box-store. Whoever originally installed the fire alarm system at this store took the easy way out. But, in so doing, he or she failed to meet a requirement of the *Code*.

Correcting this may well cost the owner a significant amount of money. But, if the owner does not correct this error, he or she will greatly impair the ability of his or her staff to properly

interpret and respond to the signals produced by someone closing or tampering with an automatic sprinkler system control valve.

Part of the “165 lines” of the *Standard Fire Insurance Policy* include a provision that the named insured must not do anything to knowingly increase the hazard at the insured property. Over the years, various court cases have dealt with whether or not impairments to automatic sprinkler systems represented an “increase in hazards.” It has been successfully argued that, if the fire insurance policy was written based on the protection provided by an automatic sprinkler system, the named insured has a responsibility to maintain that sprinkler system in service.

It is for this reason that many insurance companies require their named insureds to notify the insurance company whenever an automatic sprinkler system at an insured premises must be shut down for maintenance or repairs. Not to mention the increase in personnel hazard to anyone occupying the premises when the automatic sprinkler system is impaired.

In some ways, receiving a signal from a switch that monitors the operational readiness of an automatic sprinkler system represents one of the most important functions that a fire alarm system can provide. It is very important that this function operate properly and produce the correct signal.

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