

GrassRoots

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Single Sprinkler Water Supplies Debated

As people look for ways to make NFPA 13D sprinkler systems even more affordable, it is natural to look at the water supply, which does make up a significant portion of the cost of residential sprinkler systems. Recently, a number of individuals have started to promote the concept of a water supply only designed for a single sprinkler. With such a reduced flow demand, the water supply would be much less expensive, as would the installation of the system because pipe sizes could be decreased. But there are concerns about what this would do to system reliability.

On July 16, 2007, the State of Maine issued a policy statement from the State Fire Marshal's office that indicated that they were willing to accept NFPA 13D sprinkler systems designed with water supplies for only a single sprinkler under some limited circumstances. The NFSA went to work immediately, making sure that the Maine Fire Marshal's office got better information on fire tests that had been conducted on the subject. By July 19, 2007, the State of Maine rescinded its original letter and went back to referencing NFPA 13D as it is written. The following is a summary of why the NFSA is opposed to the design of fire sprinkler systems with water supplies only capable of handling a single sprinkler.

Proponents of single sprinkler designs often cite sprinkler performance statistics that show that a large number of fires in residential occupancies are controlled or suppressed with a single sprinkler. While these performance statistics are correct, they are missing the very important point that the water supplies for the fire sprinkler systems under which these statistics were generated were designed for two or more sprinklers in the first place. When the fires occurred, the first sprinkler operated in excess of its individual design flow and pressure because the sprinkler system's water supply was strong enough to handle multiple sprinklers and only a single sprinkler opened. At these higher flows and pressures, the single sprinkler was sufficient to handle the heat from the fire. This concept is called "hydraulic increase".

But if the water supply is reduced to only be capable of handling a single sprinkler, then there will be no hydraulic increase for the first sprinkler that opens. When the first sprinkler opens, it will only get the flow and pressure that were originally designed for it, and there is a significant potential for that to be insufficient to control the fire.

The National Institute for Standards and Technology, under a grant from the United States Fire Administration, studied this concept several years ago in the hopes of being able to propose a single sprinkler flow for the 2007 edition of NFPA 13D. All of the NFPA Technical Committee members recognized the huge potential in being able to support the single sprinkler flow concept and wonderful reductions in cost that would happen if we could reduce the design flow to a single sprinkler. But Dan Madrzykowski (the chief researcher at NIST for this project) came

back to the committee and the Fire Administration with a negative report. Without the hydraulic increase associated with the two sprinkler design, there were too many fire scenarios where the first sprinkler to open would be insufficient to control the fire and then multiple sprinklers would open, causing the room to reach untenable conditions and the water to dribble out of multiple open sprinklers. These same fire scenarios were easily controlled by a sprinkler system designed for a two sprinkler water supply from the start.

In addition to these tests, the National Fire Sprinkler Association conducted a series of full scale fire tests in simulated bedrooms that were 14 ft x 14 ft with an adjoining hallway. The tests were performed to determine better rules for keeping sprinklers clear of obstructions like ceiling fans, but baseline tests were also performed without any obstructions at the ceiling. In nine out of the twelve tests, including the two baseline tests without obstructions at the ceiling, a sprinkler in the hall outside the room of fire origin opened first, followed by the sprinkler in the room of origin. Even though the room of origin met all of the rules of NFPA 13D as a compartment, a sprinkler outside of this room was opening first. All of these fires were controlled by the sprinklers, but if the water supply had only been sufficient for a single sprinkler, there would have been no way for the sprinklers to provide fire control.

For more than 100 years, fire sprinkler systems have had an exemplary record of both property protection and life safety. There has never been a multiple loss of life (from fire starting in a building) in a building that has been sprinklered correctly. Yet, this exemplary accomplishment is at risk if sprinkler systems are only designed to flow enough water for a single sprinkler, which will surely result in people questioning why they should install sprinkler systems at all.

People will accept fire sprinkler systems and the inconveniences that go with them because they know that their lives are being protected. But how long will people put up with the inconveniences of fire sprinkler systems when they see systems failing? And it is highly probable that the systems designed with a single sprinkler water supply will fail. As the fire tests have shown, when fires start in the middle of rooms or between sprinklers, more than one sprinkler is likely to open. If the water supply is only designed for a single sprinkler, and more than one sprinkler opens, then none of the sprinklers will receive sufficient water and the sprinkler system will be unable to control the fire.

We are glad that the State of Maine rescinded its letter and we hope that the other parties thinking about single sprinkler water supplies follow suit. The NFPA 13D committee is committed to make fire sprinkler systems affordable as well as effective. If new design concepts make the single sprinkler design a viable technical option in the future, the committee will certainly consider the evidence at that time. The committee can always issue a Tentative Interim Amendment to NFPA 13D to allow the use of such new technology immediately as long as the technical documentation exists to show that the single sprinkler water supply will be effective. Until then, the committee urges people to follow NFPA 13D and the requirement for the water supply to handle at least two sprinklers.