



# e-TechNotes

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## Quick Response, Fast Response and Residential Sprinklers, What's the difference?



Frequently, the question is asked about the difference between the terms “quick response sprinklers” and “fast response sprinklers” and whether they are the same. Common corollaries to this question include, “Are ESFR sprinklers quick response sprinklers?” and “Are residential sprinklers quick response sprinklers?”

The answer to all of these questions is “no”! Quick response sprinklers are not the same as fast response sprinklers. ESFR sprinklers are not quick response sprinklers. Residential sprinklers are not quick response sprinklers.

In order to understand the three statements above, you need to go back to the early 1950's when the spray sprinkler was being developed. The concept of the spray sprinkler was to deliver a spray of water directed out and down from the sprinkler (with none of the spray going up against the ceiling as had been done with sprinklers for the previous 70 or 80 years). Spray sprinklers develop water droplets in three different sizes, small medium and large. The small droplets tended to stay up near the ceiling, creating a cooling effect that prevented fires from doing damage to structural members and racing above the sprinklers. The medium water droplets fall on combustibles near the fire and make it more difficult for the fire to spread to these combustibles (we call this “pre-wetting adjacent combustibles”). The large droplets penetrate the fire plume and contribute to fire control or suppression. Spray sprinklers produce combinations of these three water droplet sizes spread over an area of roughly 200 sq ft when they are intended for use in standard spacing situations. Variations of the spray sprinkler are available in extended coverage spacings up to 400 sq ft.

In the late 1970's, researchers developed the residential sprinkler. The residential sprinkler is extremely different from the spray sprinkler. Residential sprinklers don't develop large water droplets. Instead, residential sprinklers use small and medium size water droplets to maximize the surface area of water in contact with the heat of a fire, making it easier to absorb the heat from the fire. This combination of small and medium size water droplets is spread over a much larger area than spray sprinklers typically cover with a broader, flatter spray pattern that intentionally gets water much higher up on the vertical wall surface at the edges of the spray pattern (we call this a “high wall wetting pattern”). Since residential sprinklers typically cover rooms with relatively low ceilings, these sprinklers do not need the larger water droplets to penetrate vertical fire plumes because it is difficult for vertical fire plumes to form under 8 to 10 ft ceilings.



In order for residential sprinklers to perform their mission (control or suppress fires)

with lower flows than spray sprinklers, it is necessary to get the residential sprinklers to open early in the fire scenario. In order to do this, a faster responding sprinkler link was developed in the late 1970's and incorporated into the first residential sprinkler in 1981. Since that time, all residential sprinklers have incorporated some sort of fast acting link. Any sprinkler that uses this fast acting link can accurately be called a "Fast Response Sprinkler".

Right after the development of the fast acting link, the manufacturers of spray sprinklers began to realize the advantages to putting this fast acting link into the spray sprinkler. By getting the sprinkler to open sooner, the fire could be controlled with fewer sprinklers because it would be smaller. This regular spray sprinkler, with a fast acting link, was given the term "Quick Response Sprinkler".

The Quick Response Sprinkler is not the same as the Residential Sprinkler because their deflectors are different. The activating mechanism is similar between the two types of sprinklers, but they create water droplets in different sizes and put the water in different places. They are both part of the family of sprinklers with fast response mechanisms, but their terms are not synonymous.

Usually at this part of this discussion, someone asks, "Are you the only one that thinks this way or is this consistent with the rest of fire protection." To that we typically answer that there is a great deal of confusion on this issue, but the experts in the international community have decided that this is the terminology that they are going to use and we need to use the terms correctly in order to make sure that the correct devices are installed in the correct places. The following is a list of sources for this information:



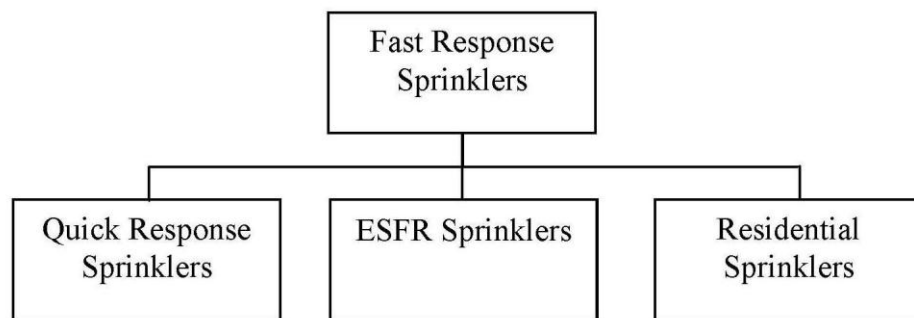
1. The definition of "Fast Response Sprinkler" in section 3.6.1(a)(1) in NFPA 13 says that Fast Response Sprinklers have, "a thermal element with an RTI of 50 (meters-seconds)<sup>1/2</sup> or less." The definition for "Quick Response Sprinkler" is in section 3.6.4.7 as, "A type of spray sprinkler that meets the fast response criteria of 3.6.1(a)(1)". By defining the sprinklers differently, NFPA 13 is recognizing that these are not the same types of sprinklers, although the quick response is a subset of the fast response.
2. The International Standards Organization (ISO) in developing the international standard against which sprinklers are tested all over the world agrees with the NFPA 13 terminology. ISO Standard 6182 – Part 1 Automatic Sprinklers, uses the term "Fast Response" to define the response characteristics of a family of sprinklers of which quick response sprinklers are a subset.
3. Underwriters Laboratories, in developing their test standards for different types of sprinklers agrees. Residential sprinklers are tested under standard UL 1626 and evaluated for spray patterns very different from the tests in UL 199 for quick response sprinklers, which are spray sprinklers.

ESFR sprinklers are also very different from Quick Response Sprinklers. While ESFR sprinklers do deliver all of their discharge out and down from the sprinkler, they do so with much greater downward thrust than spray sprinklers and with a far larger percentage of large water droplets to penetrate the vertical fire plumes common to storage fires. ESFR sprinklers certainly incorporate a fast acting element into their

design, which makes them a type of fast response sprinkler. But ESFR sprinklers are not Quick Response Sprinklers, because they are not spray sprinklers.

Unfortunately, FM Global has blurred the lines in their Data Sheets. They use the term “Quick Response” when discussing the use of storage sprinklers that would more accurately be considered “Fast Response” in accordance with the rest of the world’s terminology including the ISO and NFPA standards.

The following chart can be used to show how the term “Fast Response” refers to a broad family of sprinklers that have specific operating characteristics while the terms “Residential”, “Quick Response” and “ESFR” all are different types of sprinklers with different deflectors and different orifice sizes that created different size water droplets and use different flows to control or suppress fires in different situations.



In summary, fast response sprinklers and quick response sprinklers are different. Residential sprinklers and quick response sprinklers are different. And ESFR sprinklers and quick response sprinklers are different. They are all a part of the big family of fast acting sprinklers. But they are all different in how they divide water streams up into droplets and where they send those droplets.

### **Upcoming NFSA “Technical Tuesday” Seminar – November 6**

***Topic: In-Rack Sprinkler Spacing and Location***

***Instructors: John Corso and Victoria B. Valentine, P.E.***

***Date: Tuesday, November 6, 2012- 10:30 am EST***

Rack structures in storage facilities often require sprinkler protection in the racks. However, there are many variations in the style and configuration of the racks as well as a range of commodities that can be stored on the racks. The type of sprinkler used to protect the space at the ceiling level will also impact where the in-rack sprinklers should be placed. This lesson will explore many variations for in-rack sprinkler locations and spacing.

To register or for more information, click [HERE](#) or contact Michael Repko at (845) 878-4207 or e-mail to: [seminars@nfsa.org](mailto:seminars@nfsa.org).

## Upcoming In-Class Training Seminars

The NFSA training department also offers in-class training on a variety of subjects at locations across the country, and in recognition of the current recession has adopted a new reduced fee structure. Here are some upcoming seminars:

Nov 5-7	Libertyville, IL	3-Day Inspection & Testing for the Sprinkler Industry
Nov 7	Indianapolis, IN	Inspection, Testing & Maintenance for the AHJ
Nov 13-15	Westbury, NY	3-Day Inspection & Testing for the Sprinkler Industry
Nov 29	Liverpool, NY	Inspection, Testing & Maintenance for the AHJ
Dec 11-13	Atlanta, GA	3-Day Inspection & Testing for the Sprinkler Industry

These seminars qualify for continuing education as required by NICET, and meet mandatory Continuing Education Requirements for Businesses and Authorities Having Jurisdiction.

To register for these in-class seminars, click [HERE](#). Or contact Michael Repko at (845) 878-4207 or e-mail to [seminars@nfsa.org](mailto:seminars@nfsa.org) for more information.

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### *About the National Fire Sprinkler Association*

*Established in 1905, the National Fire Sprinkler Association (NFSA) is the voice of the fire sprinkler industry. NFSA leads the drive to get life-saving and property protecting fire sprinklers into all buildings; provides support and resources for its members – fire sprinkler contractors, manufacturers and suppliers; and educates authorities having jurisdiction on fire protection issues. Headquartered in Patterson, N.Y., NFSA has regional operations offices throughout the country.*  
[www.nfsa.org](http://www.nfsa.org).

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