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## Mixing of Sprinklers with Different Response Characteristics

NFPA 13 contains rules addressing the mixing of sprinklers with different response characteristics, and some rules relating to the mixing of sprinklers with similar response characteristics. There even appears to be an odd contradiction that allows quick response sprinklers to be mixed in with residential sprinklers, but prohibits residential sprinklers from being placed in a compartment with quick response sprinklers.

The basic distinction in sprinkler thermal sensitivity appears in Section 3.6.1 of NFPA 13 (2007 edition). In this section “fast response” sprinklers are designated as those with an RTI (Response Time Index) of  $50 \text{ m}^{1/2}\text{s}^{1/2}$  or less while “standard response” sprinklers are defined as those with an RTI of  $80 \text{ m}^{1/2}\text{s}^{1/2}$  or more. Sections 3.6.2.1, 3.6.2.8, 3.6.2.9 and 3.6.2.10 respectively define ESFR (early suppression fast response), QREC (quick response extended coverage), QR (quick response) and residential sprinklers as types of fast response sprinklers. All other types of sprinklers are presumably standard response sprinklers.

When quick response sprinklers were first allowed for use under the density/area criteria of NFPA 13 just over twenty years ago, consideration was given to the possible adverse effect of mixing QR sprinklers in among standard response sprinklers. Some modeling was done, and the Sprinkler Committee at that time was of the opinion that there was no need to prohibit such a practice. While it was possible for a QR sprinkler farther from the fire to activate prior to a standard response sprinkler that was closer to the fire, the standard response sprinkler could be expected to activate prior to a second QR sprinkler in the next ring. In this manner, the situation was similar to that of an intermediate or high temperature rated sprinkler located among ordinary temperature rated sprinklers. Sprinklers located near a unit heater but called upon to operate during periods when the unit heater is not in operation can be expected to be delayed such that they may not operate first even though nearest to the fire.

Over the decades since, however, rules have gradually crept into the standard to encourage uniformity of sprinkler response characteristics. Section 8.4.6.4.1 requires that where ESFR sprinklers are installed adjacent to systems with standard response sprinklers, a draft curtain of noncombustible construction at least 2 ft in depth must be provided to separate the two areas. Annex Section A.8.4 explains that, without the barrier, a fire occurring near the boundary might open ESFR sprinklers, which would not be contemplated in the standard response system design. An interesting question to pose to the Committee would be whether the barrier is needed if the standard response sprinklers and ESFR sprinklers are part of the same system, with the design area configured to accommodate the possible discharge of both types of sprinklers.

A more recent requirement, found in Section 8.4.5.3, states that where residential sprinklers are installed in a compartment as defined in Section 3.3.5, all sprinklers within the compartment must be of the fast-response type that meets the criteria of Section 3.6.1(a)(1), the subsection containing the definition of fast response sprinklers.

Beginning with the 2002 edition of NFPA 13, however, an additional Section 8.3.3.2 was added to require that, where QR sprinklers are installed, all sprinklers within a compartment must be quick response unless otherwise permitted in Section 8.3.3.3. That next section simply allows standard response sprinklers to be used where there are no listed QR sprinklers in the temperature range required.

Note the difference in wording between Sections 8.4.5.3 and 8.3.3.2. The section dealing with residential sprinklers allows other types of fast response sprinklers within the compartment. The section dealing with QR sprinklers does not allow other types of fast response sprinklers within the compartment, only QR sprinklers unless none are available in the necessary temperature range. It is difficult to justify the two different approaches, and 8.3.3.2 appears to be unnecessarily restrictive.

The most likely place where residential sprinklers and QR sprinklers would be mixed would be where a residential corridor meets a lobby or other light hazard area in a hotel, motel or nursing home. A prohibition against mixing the sprinklers would have the effect of requiring a lintel with a minimum 8-inch depth to separate the two areas into separate compartments. As explained in Section 3.3.5, if the doorway is no more than 36 inches in width the lintel would not be necessary to form the separate compartments, but a corridor with a doorway probably has the lintel anyway. Corridors without doorways would be expected to exceed 36 inches in width, and there is no good reason why the residential sprinklers and QR sprinklers would need to be separated in such a situation.

It should be recognized that the listing categories don't always tell the whole story anyway. Some sprinklers that don't carry the QR or QREC designation contain the same 3 mm bulbs or fast response links, but require the faster thermal response in order to achieve extended coverage or other special characteristics. In one extreme case, an AHJ did not want to allow the use of the same sprinkler model throughout a compartment, because in some areas it was used at a spacing that allowed it to be considered QREC, but in other areas within the compartment it was being used at its full protection area and simply listed as EC.

Looking for sprinkler uniformity within a compartment is not an exact science, or even something that the NFPA 13 Committee believes is appropriate in all cases, as demonstrated by some of the guidance provided in Annex Section A.8.4:

“A.8.4 The selection of a sprinkler type will vary by occupancy. Where more than one type of sprinkler is used within a compartment, sprinklers with similar characteristics should be used (i.e. standard or quick-response). However, some hazards might benefit from designs that include the use of both standard and quick-response sprinklers. Examples include rack storage protected by standard-response ceiling sprinklers and quick-response in-rack sprinklers. Another case might include opening protection using closely spaced quick-response sprinklers with standard-response sprinklers in the adjoining areas.”

If a situation arises in which the AHJ is questioning whether residential sprinklers can be used in the same compartment as quick response sprinklers per Section 8.3.3.2, it would be worthwhile to suggest that you are actually using quick response sprinklers in the same compartment as residential sprinklers as allowed by Section 8.4.5.3.

## **Intermediate Rated Sprinklers to be Allowed Throughout Light Hazard**

A related change to Section 8.3.2.1 in the forthcoming 2010 edition of NFPA 13 will allow the use of intermediate temperature rated sprinklers throughout light hazard occupancies. Section 8.3.2.3 of the current 2007 edition allows intermediate and high-temperature sprinklers to be used throughout ordinary and extra hazard occupancies, but not light hazard. The Sprinkler Committee processed this change in recognition of the increased use of open ceilings, often painted black, where HVAC systems are exposed with numerous discharge

points near sprinklers. The use of intermediate rated sprinklers throughout will avoid the need to carefully identify the placement of individual sprinklers with respect to the HVAC outlets. In light hazard occupancies, this does not negate the Section 8.3.3.1 requirement for fast response sprinklers, nor does it prohibit the Section 11.2.3.2.3.1 area reduction allowance for quick response sprinklers.

## Upcoming "Business Thursday" Online Seminar – August 20th

**Topic:** *Impairment Procedures*

**Instructor:** *Karl Wiegand, NFSA Manager of Installation Standards*

**Date:** *August 20, 2009*

NFPA 25 spells out specific duties and responsibilities of impairment coordinators to minimize the length of impairments to fire protection systems and get the systems back up and running. The duties and responsibilities apply to both emergency and preplanned impairments. This seminar will explain the duties and responsibilities required of an impairment coordinator and offer cautions to fire sprinkler contractors that might want to fill this roll for the building owner. (Great study guide for NICET Work Element 43008)

## Upcoming "Technical Tuesday" Online Seminar – August 25<sup>th</sup>

**Topic:** *Field Identification of Sprinklers*

**Instructor:** *Russell P. Fleming, P.E., NFSA Executive Vice President*

**Date:** *August 25, 2009*

Various product recall and replacement programs have made it important to be able to identify particular types and brands of sprinklers, but field identification goes beyond this. Attributes such as temperature rating, orifice size, response sensitivity and orientation determine sprinkler system performance characteristics, and the need to properly replace sprinklers requires a complete understanding of all variations. (Great study guide for NICET Work Element 41017)

To register or for more information, contact Dawn Fitzmaurice at (845) 878-4207.

Additional training opportunities available through the NFSA engineering department include...

## Two-Week Layout Technician Training

**September 14-25, 2009**

**Baltimore, MD**

**October 12-23, 2009**

**Phoenix, AZ**

For more information on the above classes, contact Nicole Sprague using [Sprague@nfsa.org](mailto:Sprague@nfsa.org) or by calling 845-878-4200 ext. 149.

## In-Class Training Seminars

The NFSA training department also offers in-class training on a variety of subjects at locations across the country. Here are some upcoming seminars:

NFPA 13 Overview	Brighton, MI	Aug 19-20
Sprinklers for Dwellings	Brighton, MI	Aug 21
NFPA 13 Update 2007	Aurora, IL	Aug 26
NFPA 13 Overview	Aurora, IL	Aug 27-28
NFPA 13 2007 Update	Boardman, OR	Sept 1
Hydraulics for Fire Protection	Boardman, OR	Sept 2
Inspection, Testing & Maintenance	Boardman, OR	Sept 3
Introduction to Sprinkler Systems (1/2 Day AM)	Alexandria, MN	Sept 8
NFPA 13 2002 Update (1/2 Day PM)	Alexandria, MN	Sept 8
Plan Review Policies & Procedures	Alexandria, MN	Sept 9
Inspection, Testing & Maintenance	Alexandria, MN	Sept 10
Commissioning & Acceptance Testing (1/2 Day)	Seattle, WA	Sept 15
CPVC Piping (1/2 Day)	Seattle, WA	Sept 15
Hydraulics for Fire Protection	Seattle, WA	Sept 16
Standpipe Systems for Fire Protection (1/2 Day)	Seattle, WA	Sept 17
Fire Pump Layout & Sizing (1/2 Day)	Seattle, WA	Sept 17
NFPA 13 2007 Update	Dayton, OH	Sept 16
Sprinklers for Dwellings	Dayton, OH	Sept 17
CPVC Piping Installation Requirements (1/2 Day)	Dayton, OH	Sept 18
Commissioning and Acceptance Testing (1/2 Day)	Dayton, OH	Sept 18
NFPA 13, 13R, 13D 2007 Update	Anaheim, CA	Sept 22
Hydraulics for Fire Protection	Anaheim, CA	Sept 23
Underground Piping (1/2 Day)	Anaheim, CA	Sept 24
Basic Seismic (1/2 Day)	Anaheim, CA	Sept 24
Plan Review Policies & Procedures	Berlin, VT	Sept 22
Sprinkler Protection for Rack Storage	Berlin, VT	Sept 23
CPVC Piping (1/2 Day)	Berlin, VT	Sept 24
Basic Seismic Protection (1/2 Day)	Berlin, VT	Sept 24
NFPA 13 Overview	Menasha, WI	Sept 30-Oct 1
Hydraulics for Fire Protection	Menasha, WI	Oct 2
Inspection, Testing & Maintenance	Concord, NH	Oct 13
Residential Sprinklers: Homes to High Rise	Concord, NH	Oct 14
Sprinklers for Dwellings	Concord, NH	Oct 15
Underground Piping (1/2 Day)	Woodland, CA	Oct 20
Commissioning & Acceptance Testing (1/2 Day)	Woodland, CA	Oct 20
Sprinkler Protection for General Storage	Woodland, CA	Oct 21
Sprinkler Protection for Special Storage	Woodland, CA	Oct. 22
Pumps for Fire Protection	Edwardsville, IL	Oct 27
Sprinkler Protection for General Storage	Edwardsville, IL	Oct 28
Sprinkler Protection for Rack Storage	Edwardsville, IL	Oct 29
NFPA 13 Overview	Pembroke, MA	Oct 27-28
Plan Review Policies & Procedures	Pembroke, MA	Oct 29
Inspection, Testing & Maintenance	Irving, TX	Oct 27
Hydraulics for Fire Protection	Irving, TX	Oct 28
NFPA 13, 13R, 13D 2007 Update	Irving, TX	Oct 29
NFPA 13, 13R, 13D 2007 Update	Effingham, IL	Nov 10
Plan Review Policies & Procedures	Effingham, IL	Nov 11
Hydraulics for Fire Protection	Effingham, IL	Nov 12
Sprinkler Protection for Rack Storage	Marana, AZ	Dec 8
Sprinkler Protection for General Storage	Marana, AZ	Dec 9

Basic Seismic Protection (1/2 Day)	Marana, AZ	Dec 10
Advanced Seismic Protection (1/2 Day)	Marana, AZ	Dec 10

These seminars qualify for continuing education as required by NICET.

To register or for more information, contact Dawn Fitzmaurice at (845) 878-4207 or send an e-mail to [seminars@nfsa.org](mailto:seminars@nfsa.org)

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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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