



Amy Beasley Cronin
Secretary, Standards Council

18 August 2011

To: Interested Parties

Subject:

Standards Council Decision (Final):	D#11-18
Standards Council Agenda Item:	SC#11-8-19-d
Date of Decision*:	10 August 2011
TIA No. 1028R on NFPA 13D, <i>Standard for the Installation of Sprinkler Systems in One-and Two-Family Dwellings and Manufactured Homes</i> , 2010 edition	

Dear Interested Parties:

At its meeting of August 9-10, 2011, the Standards Council considered an appeal on the above referenced matter.

Attached is the final decision of the Standards Council on this matter.

Sincerely,

A handwritten signature in cursive script that reads "Amy Beasley Cronin".

Amy Beasley Cronin
Secretary, NFPA Standards Council

- c: D. Berry, M. Brodoff, L. Fuller, M. Klaus, J. Goyette, E. Carroll
Members, Technical Committee on Residential Sprinkler Systems (AUT-RSS)
Members, Technical Correlating Committee on Automatic Sprinklers (AUT-AAC)
Members, NFPA Standards Council (AAD-AAA)
Individuals Providing Appeal Commentary

*NOTE: Participants in NFPA's codes and standards making process should know that limited review of this decision may be sought from the NFPA Board of Directors. For the rules describing the available review and the method for petitioning the Board for review, please consult section 1-7 of the NFPA Regulations Governing Committee Projects and the NFPA Regulations Governing Petitions to the Board of Directors from Decisions of the Standards Council. Notice of the intent to file such a petition must be submitted to the Clerk of the Board of Directors within 15 calendar days of the Date of Decision noted in the subject line of this letter.



Standards Council Decision (Final):	D#11-18
Standards Council Agenda Item:	SC#11-8-19-d
Date of Decision*:	10 August 2011
TIA No. 1028R on NFPA 13D, <i>Standard for the Installation of Sprinkler Systems in One-and Two-Family Dwellings and Manufactured Homes</i> , 2010 edition	

SUMMARY OF ACTION (for convenience only; not part of official decision): *The Standards Council voted to uphold the appeal to issue TIA No. 1028R.*

DECISION:

At its meeting of August 9-10, 2011, the Standards Council considered an appeal from James Golinveaux of Tyco Fire Protection Products regarding the issuance of proposed Tentative Interim Amendment (TIA) No. 1028R on the 2010 edition of NFPA 13D, *Standard for the Installation of Sprinkler Systems in One-and Two-Family Dwellings and Manufactured Homes*. The proposed TIA seeks to modify Sections 8.1.2 and associated annex, add new Sections 8.1.2.1, 8.1.2.2, 8.1.2.3 and associated annex, and revise Section 8.1.3. The effect of the TIA is to specify the number of residential design sprinklers for various sloped and beamed ceiling arrangements.

As background, the material proposed in TIA No. 1028R was accepted as Committee Proposal 13D-67 by the Technical Committee on Residential Sprinkler Systems (TC) and the Technical Correlating Committee on Automatic Sprinklers (TCC). NFPA 13D is in the Annual 2012 Revision Cycle, and is currently open for comment. The same material that was the subject of Proposal 13D-67 has also been balloted as a TIA No. 1028R in accordance with the *Regulations Governing Committee Projects*, to determine if it had the necessary three-fourths majority support on merit and emergency nature to establish a recommendation for issuance. The ballot passed the TC on technical merit, but failed to achieve the necessary support of the TC on emergency nature. The ballot passed the TCC on both merit and emergency nature. Where the ballot does not pass the TC and the TCC on both merit and emergency nature, the recommendation to the Council is to not issue the TIA.

The appeal requests that the Council overturn the action recommended by the codes and standards development process, and issue the TIA. The Council has reviewed the entire record concerning this matter and has considered all the arguments put forth in this appeal. On appeal, the Council generally defers to the responsible TC on technical issues, and here the TC supported the technical merit of the TIA and the TCC supported the correlation merit. The TIA, however, failed the TC ballot on emergency nature by one vote. The question of emergency nature is one on which the Council gives less deference to the judgment of the TC and TCC since evaluation of emergency nature often involves issues of a non-technical nature that the Council itself has an obligation to evaluate to ensure fairness in the treatment of subjects addressed by TIAs. The Council concludes the TIA meets the test of emergency nature and accordingly has voted to uphold the appeal and issue TIA No. 1028R.



Tentative Interim Amendment

NFPA 13D

Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes

2010 Edition

Reference: 8.1.2, 8.1.3, A.8.1.2, and A.8.1.3

TIA 10-3

(SC 11-8-19/TIA Log #1028R)

Pursuant to Section 5 of the NFPA Regulations Governing Committee Projects, the National Fire Protection Association has issued the following Tentative Interim Amendment to NFPA 13D, *Standard for the Installation of Sprinkler Systems in One- and Two-Family Dwellings and Manufactured Homes*, 2010 edition. The TIA was processed by the Technical Committee on Residential Sprinkler Systems and the Technical Correlating Committee on Automatic Sprinkler Systems, and was issued by the Standards Council on August 11, 2011, with an effective date of August 31, 2011.

A Tentative Interim Amendment is tentative because it has not been processed through the entire standards-making procedures. It is interim because it is effective only between editions of the standard. A TIA automatically becomes a proposal of the proponent for the next edition of the standard; as such, it then is subject to all of the procedures of the standards-making process.

1. *Revise 8.1.2 and A.8.1.2 to read as follows:*

8.1.2* Number of Design Sprinklers.

A.8.1.2 All residential sprinklers have been investigated under a flat, smooth, 8 ft (2.4 m) high horizontal ceiling. Some residential sprinklers have been investigated and listed for use under specific ceiling configurations such as a horizontal beamed ceiling. The performance of residential sprinklers under flat, smooth, horizontal ceilings has been well documented throughout the life of NFPA 13D. Prior to 2010, several manufacturers of residential sprinklers had performed testing and received listings for residential sprinklers under certain slopes and in certain beam conditions. In 2010, the Fire Protection Research Foundation (FPRF) conducted a research project consisting of 76 FDS simulations and 12 full-scale fire tests. The results have been used to develop system design criteria in a generic manner in order to simplify the use of residential sprinklers. Some residential sprinkler listings still exist for situations beyond the scope of the generic design. See the FPRF report, *Analysis of the Performance of Residential Sprinkler Systems with Sloped or Sloped and Beamed Ceilings*, dated July 2010, for more information. Questions are frequently asked regarding the minimum two-sprinkler design when certain sprinkler performance statistics have indicated that in a majority of the cases (with residential sprinklers) the fire is controlled or suppressed with a single sprinkler. While these statistics may or may not be accurate, 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 discharge from a single sprinkler was sufficient to limit or suppress the heat generated from the fire. This concept is called "hydraulic increase." Hydraulic increase can also occur when a water supply's capabilities during the fire event exceeded that required by the minimum design requirements of the standard. Since none of the data used to generate the previously mentioned statistics captured the capabilities of the water supply in relation to the design requirements, the impact of the hydraulic increase on the number of single sprinkler activations cannot be determined. But if the minimum water supply requirement of the standard is reduced to only be capable of handling a single sprinkler, then there could be no hydraulic increase safety factor. When the first sprinkler opens, it will only get the flow and pressure that were originally designed for it, and the potential is significant for that to be insufficient to control the fire given any obstructions and the layout of the space where the fire starts. The National Institute for Standards and Technology (NIST), 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 (see NIST Report NIST GCR 05-875 prepared by Underwriters Laboratories with a publication date of February 2004). Unfortunately, the research did not support the

design of a sprinkler system with only the flow for a single sprinkler, even under conditions of small rooms with flat, smooth ceilings. Without the hydraulic increase associated with the two-sprinkler design, the fire scenarios were too many where the first sprinkler to open would have insufficient flow to control the fire and then multiple sprinklers would open, causing the room to reach untenable conditions and the water supply to be overrun. These same fire scenarios were easily controlled by a sprinkler system designed for a two-sprinkler water supply from the start. In addition to the NIST tests, the National Fire Sprinkler Association conducted a series of full-scale fire tests in simulated bedrooms that were 14 ft × 14 ft (4.3 m × 4.3 m) with an adjoining hallway, each with flat, smooth, 8-ft (2.4-m) high ceilings. 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, the sprinklers would never have been able to provide fire control. For examples of selecting a compartment for consideration, see Figure A.8.1.2(a) and Figure A.8.1.2(b), which show examples of design configurations for compartments based on the presence of lintels to stop the flow of heat.

2. Add 8.1.2.1, 8.1.2.2, 8.1.2.3, and A.8.1.2.3 to read as follows:

8.1.2.1 For each of the following situations, the number of sprinklers in the design area shall be all of the sprinklers within a compartment, up to a maximum of two sprinklers, that require the greatest hydraulic demand:

- (1) A flat, smooth, horizontal ceiling with no beams up to a maximum of 24 ft (7.3 m) above the floor.
- (2) A smooth, flat, sloped ceiling with no beams up to a maximum slope of 8 in 12. The highest portion of the ceiling shall not be more than 24 ft (7.3 m) above the floor. The highest sprinkler in the sloped portion of the ceiling shall be above all openings from the compartment containing the sloped ceiling into any communicating spaces.
- (3) A sloped ceiling with beams up to 14 in. (4.3 m) deep with pendent sprinklers under the beams. The compartment containing the sloped, beamed ceiling shall be a maximum of 600 ft² (56 m²) in area. The slope of the ceiling shall be between 2 in 12 and 8 in 12. The highest portion of the ceiling shall not be more than 24 ft (7.3 m) above the floor. The highest sprinkler in the sloped portion of the ceiling shall be above all openings from the compartment containing the sloped ceiling into any communicating spaces.
- (4) A sloped ceiling with beams of any depth with sidewall or pendent sprinklers in each pocket formed by the beams. The compartment containing the sloped, beamed ceiling shall be a maximum of 600 ft² (56 m²) in area. The slope of the ceiling shall be between 2 in 12 and 8 in 12. The highest portion of the ceiling shall not be more than 24 ft (7.3 m) above the floor.

8.1.2.2 For situations not meeting one of the conditions in 8.1.2.1, residential sprinklers listed for use in specific ceiling configurations shall be permitted to be used in accordance with their listing.

8.1.2.3* For situations not meeting one of the conditions in 8.1.2.1 and 8.1.2.2, the number of sprinklers in the design area shall be determined in consultation with the authority having jurisdiction as appropriate for the conditions. Sprinklers shall be installed in accordance with their listing where a type of ceiling configuration is referenced in the listing.

A.8.1.2.3 A number of variables exist that would influence the number of sprinklers that might open during a fire. In many of the fire tests that led to the development of the residential sprinkler, and in many of the subsequent tests including the testing conducted as a part of the previously referenced FPRF sloped ceiling research project, more than two sprinklers have opened during certain fire tests, but the water supply, sized for only two sprinklers, was still capable of controlling the fire for ten minutes and meeting the goals of NFPA 13D. While there is no guarantee that this would always happen, it is believed that the two sprinkler design criteria is appropriate for ceiling constructions and room configurations that are within the limitations referenced 8.1.2.1 and 8.1.2.2. For the ceiling constructions and room configurations that are beyond the scope of the two-sprinkler discharge criteria referenced in 8.1.2.1 and 8.1.2.2, a greater number of design sprinklers and/or higher discharge flows should be considered in the system design. As of this date, there is limited fire test data available to include specific design criteria in this standard. In these situations, sprinklers can be installed in a manner acceptable to the authority having jurisdiction to achieve the results specified in this standard. In making these determinations, consideration should be given to factors influencing sprinkler system performance, such as sprinkler response characteristics, impact of obstructions on sprinkler discharge, and number of sprinklers anticipated to operate in the event of a fire. For the situation of flat, smooth, horizontal ceilings with beams at the ceiling, there are a number of variables that could cause many sprinklers to open during a fire. Residential sprinklers used in accordance with all of the restrictions of their listing can be used to protect this circumstance.

3. Revise 8.1.3 to read as follows:

8.1.3 Sprinkler Coverage.

8.1.3.1 Residential Sprinklers.

8.1.3.1.1 Sprinklers shall be installed in accordance with their listing where a type of ceiling configuration is referenced in the listing.

8.1.3.1.2* Where construction features or other special conditions exist that are outside the scope of sprinkler listings, listed sprinklers shall be permitted to be installed beyond their listing limitations.

A.8.1.3.1.2 See A.8.1.2 and A.8.1.2.3.

Issue Date: August 11, 2011

Effective Date: August 31, 2011

(Note: For further information on NFPA Codes and Standards, please see www.nfpa.org/codelist)

Copyright © 2011 All Rights Reserved
NATIONAL FIRE PROTECTION ASSOCIATION