



RESEARCH FOUNDATION

RESEARCH FOR THE NFPA MISSION

Obstructions and Early Suppression Fast Response Sprinklers

Early Suppression Fast Response (ESFR) sprinklers are often installed in warehouses to avoid installation of in-rack sprinklers. However, since the discharge pattern of ESFR sprinklers is different from standard-spray sprinklers, obstructions near the sprinkler heads can greatly affect the distribution of water. NFPA 13, *Standard for the Installation of Sprinkler Systems*, allows obstructions that meet certain parameters. However, prior to this research program, there had been some successful tests conducted with obstructions that are not allowable by the standard.

Therefore, the Research Foundation undertook this research program to further investigate the impact of obstructions on ESFR sprinklers in a warehouse setting to inform the NFPA 13 technical committees. The research was conducted in four phases over the period from 2014 to 2020 and included a literature review, research plan development, 65 Actual Delivered Density (ADD) tests, and nine full scale tests. The result is a large set of data that was used to develop recommendations and a tool that simplifies the decision-making process for placement of ESFR sprinklers in relation to obstructions.

Project Goal & Approach

Develop a tool that can be used for providing reliable analysis of the impact of obstructions on ESFR sprinklers based on existing data and develop technical basis to the NFPA 13 technical committees for new requirements and guidance.

The final report is available [here](#).

Summary Observations

The project has made significant advancements in understanding how obstructions affect ESFR sprinkler performance. Significant findings of this work are summarized as follows:

- The obstruction created by an open web steel truss 22 - 36 inches in depth, located a minimum of 6 inches horizontally from an ESFR sprinkler (K14 or K17) will not significantly decrease sprinkler performance.
- The obstruction created by a bridging member or other obstruction 1.5 x 1.5 inches in size or less, located a minimum of 12 inches directly below an ESFR sprinkler (K14 or K17) will not significantly decrease sprinkler performance. This applies to a bridging member attached to open web steel trusses.
- The obstruction created by a flat or round obstruction less than or equal to 12 inches in width, located a minimum of 6 inches horizontally from an ESFR sprinkler (K14 or K17) will not significantly decrease sprinkler performance.
- The obstruction created by flat or round obstructions less than or equal to 24 inches in width, located a minimum of 12 inches horizontally from an ESFR sprinkler (K14 or K17) will not significantly decrease sprinkler performance.

Research by:



Sponsored by:

Property Insurance Research Group (PIRG): AIG, CNA Insurance, FM Global, Liberty Mutual Insurance, Tokio Marine America, Travelers Insurance, Verisk, Zurich Insurance Group

AXA/XL, Globe Fire Sprinkler Corporation, Johnson Controls, Inc., IKEA, National Fire Sprinkler Association (NFSA), P&G, Reliable Automatic Sprinkler Co., Target, Viking, Whirlpool