



# THE FIRE PROTECTION RESEARCH FOUNDATION

## Obstructions and ESFR Sprinklers – Phase 1

### Project Summary

Updated: 2 January 2014

### Background

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*, generally allows the following obstructions in Sections 8.12.5.1, 8.12.5.2, and 8.12.5.3:

- Sprinklers installed per the allowable distances from near or at ceiling obstructions in Table 8.12.5.1.1
- Isolated obstructions less than 2 feet wide and 1 foot or greater horizontally from sprinkler
- Isolated and continuous obstructions less than 2 inches wide and 2 feet or greater below deflector or 1 foot or greater horizontally from sprinkler
- Continuous obstructions 1 foot or less in width and located 1 foot horizontally from sprinkler
- Continuous obstructions 2 feet or less in width and located 2 feet horizontally from sprinkler
- Bottom chords of bar joists or open trusses located 1 foot or greater horizontally from sprinkler (upright sprinklers can be installed over the bottom chords of bar joists or open trusses that are up to 4 inches wide)

Two methods are available in NFPA 13 to resolve obstructions that do not fall into the categories above: eliminating the obstruction or adding sprinklers underneath the obstruction. However, there have been some successful tests that have been conducted with obstructions that are not allowable by NFPA 13 without taking these measures. The information from these tests as well as information gathered from further testing could help inform revisions to the NFPA 13 requirements.

## **Research Objective**

The overall goal of the project is to 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 objective of the first phase is to perform a gap analysis on the topic and develop a research plan.

## **Project Tasks**

### Phase 1: Literature Review and Gap Analysis

Task 1: Collect relevant literature and available test data (including data from tests conducted by XL GAPS) related to impact of obstructions on ESFR sprinklers. In addition to the obstructions that are not allowable per NFPA 13, the following issues should be considered:

- Impact of sprinkler heads installed under obstructions in addition to sprinklers installed at the ceiling above (e.g. how do these additional sprinklers impact activation and performance of ceiling sprinklers?)
- Impact of multiple obstructions – NFPA 13 only gives guidance on individual obstructions
- Impact of obstructions over two feet wide
- Impact of vertical obstructions
- Impact of isolated vs continuous obstructions (e.g. is there a difference?)
- Impact of obstructions (e.g. light fixtures) located 36 inches or more below sprinkler heads

Task 2: Based on the information found in Task 1, identify the knowledge gaps related to ESFR sprinklers and obstructions.

Task 3: Develop a research plan for full scale tests that will provide data for the tool development phase of the project, which would be handled as a separate Phase 2 project.

## **Reporting and Deliverables**

This research program will be conducted under the auspices of the Fire Protection Research Foundation under the direction and guidance of a Project Technical Panel. The final report will be issued in August 2014.