



Sprinkler Protection for Cloud Ceilings – Phase 2

Project Summary

Updated: 3 January 2014

Background

Cloud ceilings, which are panels separated by gaps that sit beneath the structural ceiling of a room or space, provide challenges to sprinkler protection and NFPA 13, *Standard for the Installation of Sprinkler Systems*, does not provide specific guidance. Cloud ceilings pose a challenge by allowing heat from the fire plume to pass through the gaps between panels and between walls and panels and develop a gas layer at the structural ceiling. If sprinklers are only installed at the cloud ceiling level, activation will be delayed. On the other hand, sprinklers installed on the structural ceiling may have their spray distribution blocked by the cloud panels. In most conditions NFPA 13 requires sprinklers at both the structural ceiling and cloud ceiling panel elevations.

In order to gain a better understanding of how cloud ceiling panels impact sprinkler actuation and provide a technical basis for sprinkler installation requirements for cloud ceilings, the Fire Protection Research Foundation undertook a [Phase 1 project](#) that focused on developing guidance on sprinkler installation requirements for large, contiguous cloud panels constructed of noncombustible materials. For this project, a large cloud was defined as a cloud that would require at least one sprinkler to be installed below the cloud when using normal flat ceiling sprinkler spacing.

However, many cloud panels found in buildings do not fit into this category. The Phase 2 effort would address small cloud panels where at least one sprinkler per cloud is not required based on the listed sprinkler spacing. This results in additional gaps between clouds and sprinklers and likely more limited conditions where sprinklers can be omitted in the structural ceiling.

Research Objective

The main goal of the research is to obtain an understanding of how cloud ceiling panels impact sprinkler actuation. The major focus of the project is small clouds with a specific objective to determine the maximum gap between walls and clouds to enable elimination of sprinklers at the structural ceiling level.

Project Tasks

1. Selected fire dynamics modeling of cloud ceiling configurations, exploring the impact of cloud and ceiling height, plenum height, gap distances, fire growth rates, and fire locations on sprinkler

actuation time and temperatures at the cloud and structural ceiling levels. Configurations of cloud ceilings will include multiple clouds with a range of gap distances between clouds as well as between clouds and walls.

2. Recommendations for appropriate sprinkler installation criteria for cloud ceilings constructed with smaller clouds based on these results.

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 June 2014.