

## RECOMMENDED READING:

### NISTIR 7120

(Dormitory Fire Experiments-Sprinklered vs. Unsprinklered)

By Richard Schulte

The issue of the effectiveness of sprinklers in controlling fire is often the subject of debate at building code development meetings. A report titled "*Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments*" specifically addresses this issue. The report, referred to as **NISTIR 7120**, is authored by Daniel Madrzykowski, David W. Stroup and William D. Walton, Building and Fire Research Laboratory at the National Institute of Standards and Technology (NIST), and is dated June 2004.

The following are a few excerpts from **NISTIR 7120**:

*"As part of a U.S. Fire Administration (USFA) initiative to improve fire safety in college housing, the National Institute of Standards and Technology (NIST) conducted two series of full-scale fire experiments in abandoned dormitory buildings. The objective of the study is to compare the levels of hazard created by room fires in a dormitory building with and without automatic fire sprinklers in the room of fire origin." (Page 1)*

*"Each year there are approximately 1,300 documented fires in school and college dormitories in the United States [1]. Tragic fatal fires occur in these occupancies every year [2]. Buildings with an automatic sprinkler system have had excellent fire safety records. The chances of a fire causing or resulting in a fatality are significantly reduced with automatic fire sprinklers installed [3]. Yet the majority of the dormitories in this country, where a fire has occurred, did not have an automatic sprinkler system installed [3]." (Page 2)*

*"During the period from 1994 to 2000, 27 students died and 94 students were injured in campus housing fires [2]. The most common area of origin is a sleeping room, which accounts for almost 25% of the fires. Approximately 22% of the fires originate in hallways, corridors and lounge areas [2]. Paper is the leading material ignited in dormitory fires, accounting for approximately 32% [1, 2] of the fires. "One-third of the dormitory fires are reported as arson (incendiary/suspicious)" and this is the leading reported cause of dormitory fires [1]." (Page 2)*

*“Three full-scale fire experiments were conducted in an abandoned dormitory to examine the impact of sprinklers on reducing the thermal hazards generated by a day room fire. The fire scenario was designed to represent a realistic fire hazard, based on school dormitory fire incident statistics. The recommended thermal tenability levels from the SFPE Handbook of Fire Protection Engineering, 120°C (248°F) for temperature and 2.5 kW/m<sup>2</sup> for heat flux were used to compare the data against.”* (Page 10)

*“In the un-sprinklered experiments, the temperature tenability limits were exceeded in the corridor at locations remote from the fire, 22.9 m (75 ft) or more. Untenable conditions due to heat flux were also generated in the corridor in the un-sprinklered fire experiments. The untenable conditions began in the corridor as early as 3 minutes after ignition and spread through the corridor within another 3 minutes.”* (Page 10)

*“In the sprinklered experiment at no time did the temperatures in the day room or in the corridor exceed 120°C (248°F) at the 1.5 m (5 ft) level above the floor or below. No significant increases in heat flux above ambient conditions were measured in the corridor. The experiments demonstrate the significant improvement to life safety that an automatic sprinkler system can provide.”* (Page 10)

The results of this series of experiments in a dormitory does not provide any new revelations about sprinkler protection, but rather confirms what we have already known for years. The operation of sprinklers is capable of maintaining tenable environmental conditions in areas located away from the area of fire origin.

Other fire experiments (and experience) have also shown that sprinkler protection (where quick response sprinklers are utilized) is also capable of maintaining tenable environmental conditions in the room for fire origin and may also provide protection for occupants who are intimate with the fire.

Although these fire experiments confirm what we already know about sprinkler protection, a review of the data produced in these experiments is still of interest to those involved with the development of building code provisions.

An electronic copy of the NISTIR 7120 report can be found at the following internet address:

<http://fire.nist.gov/bfrlpubs/fire04/PDF/f04012.pdf>

\* \* \* \* \*

Copyright © 2011  
Richard C. Schulte