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## A PERSPECTIVE ON BUILDING FIRE SAFETY: SPRINKLER SYSTEM STATISTICS

By Richard Schulte

A report published by the National Fire Protection Association (NFPA) in September 2010, titled "*U.S. Experience with Sprinklers and Other Fire Extinguishing Equipment*" written by John R. Hall, Jr. of the NFPA Fire Analysis and Research Division provides a multitude of interesting statistics on sprinkler systems and other types of fire extinguishing systems. This report not only provides statistics on fire extinguishing systems, but also provides a rather fascinating perspective on building fire safety in general. The following are a few excerpts from the NFPA report:

*"In 2004-2008, sprinklers were reported present in only 9% of reported structure fires . . ."*

*"Of reported 2004-2008 structure fires in health care properties, an estimated 57% showed sprinklers present, with higher percentages for hospitals (66%) and nursing homes (68%) and a much lower percentage for clinics and doctor's offices (29%). Sprinklers were also reported as present in half or more of reported fires in laboratories (58%), manufacturing facilities (51%), and theaters (50%). In every other property use, more than half of all reported fires had no sprinklers."*

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*"In 2004-2008, sprinklers were reported in only 6% of fires in homes (including apartments)."*

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*"Sprinklers are installed in 13.0% of housing units in buildings that were constructed no more than four years ago."*

*"To underscore the principal finding, more than 1 million single family detached dwellings now have fire sprinklers."*

“Wet pipe sprinklers out-numbered dry pipe sprinklers by roughly 10-to-1.”

“Manufacturing and storage both had 11% shares for dry pipe sprinklers.”

“Dry pipe systems are much more likely to open more than one sprinkler than wet pipe systems (38% vs. 22% of fires).”

“To underscore the principal finding, more than 1 million single family detached dwellings now have fire sprinklers.”

**“Table C. Reasons for Failure or Ineffectiveness as Number of Fires per Year and Percentages of All Cases of Failure or Ineffectiveness, for All Structures and Wet Pipe Sprinklers**

<b>Reason</b>	<b>Combined [Failure/Ineffectiveness]</b>
<i>Sprinkler system shutoff</i>	378
<i>Manual interruption defeated system</i>	140
<i>Water discharged but did not reach fire</i>	107
<i>Not enough water discharged</i>	73
<i>Lack of maintenance</i>	69
<i>Wrong type of (inappropriate) system for type of fire</i>	56
<i>System component damaged</i>	48
<b>Total</b>	<b>871</b>

Source: Calculated from percentages and numbers in Total lines of Tables 4B and 5B.”

**Editor’s Note:** The table above only displays a portion of the information included in Table C.

**“Table 7. Number of Sprinklers Operating 2004-2008 Structure Fires**

<b>Percentage of structure fires where that many sprinklers operated</b>		
<b>Number of Sprinklers Operating</b>	<b>Wet pipe [system]</b>	<b>Dry pipe [system]</b>
1	78%	62%
2 or fewer	89%	76%
3 or fewer	93%	81%
4 or fewer	95%	88%
5 or fewer	97%	90%
6 or fewer	98%	91%
7 or fewer	98%	91%
8 or fewer	98%	92%
9 or fewer	98%	92%
10 or fewer	99%	93%
20 or fewer	100%	96%

**“For 2004-2008 home fires, the death rate per 100 fires was 83% lower with wet pipe sprinklers than with no automatic extinguishing equipment.”**

*“For properties other than homes, deaths tend to be extremely rare, with or without sprinklers.”*

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*“Warehouses illustrate the statistical problem of analyzing impact when there are very few fatal fires. Total fire deaths in sprinklered warehouses in 2004-2008 are estimated from projections based on only two fatal incidents.”*

*“The 2010 edition of NFPA 13 adds a clarifying sentence to the scope section of the standards: “This standard is written with the assumption that the sprinkler system shall be designed to protect against a single fire originating within the building.””*

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*“Generalizing from the warehouse analysis and the long-standing NFPA statement about sprinkler effectiveness in preventing catastrophic multiple death fires, one can say that sprinklers cannot be expected to prevent large loss if the large loss was attributable to partial coverage, explosion or flash fire, system shutoff, or the loss of the system to collapse or collision before or early in the fire.”*

## **Analysis**

Of course, there are many, many more interesting statistics on sprinkler systems included in the report than just the few excerpts above. The statistics which got my attention in particular were the following:

- The percentage of structure fires which involved buildings protected by a sprinkler system.
- The number of detached single-family dwellings now protected by a sprinkler system.
- The (estimated) number of sprinkler systems which perform ineffectively on an annual basis.

Perhaps the most interesting (and intriguing) statement included in the report is the following:

*“For properties other than homes, deaths tend to be extremely rare, with or without sprinklers.”*

According to the statistics collected by the NFPA, the number of fire fatalities occurring in the United States in commercial (non-residential) buildings is estimated to be 105 in 2009. While the number of fire fatalities occurring in US commercial buildings is roughly twice the number of fatalities caused by lightning strikes in the US, when the number of fire fatalities is broken down by occupancy classification, the fire fatality numbers are almost shockingly low.

According to the statistics collected by the NFPA, the number of fire fatalities occurring in the United States in commercial (non-residential) buildings is estimated to be 105 in 2009.

The statement above suggests a number of things. One, if fire fatalities in non-residential buildings not provided with sprinkler protection are extremely rare, then it would seem reasonable to conclude that non-residential buildings protected by a sprinkler system are extremely safe buildings. Two, given the statement above, it would seem that the need for a “belts and suspenders” approach (*i.e.*, the “balanced fire protection” approach) to fire safety in buildings protected by sprinkler system is unnecessary.

That is not to say that multiple fire safety features should be totally eliminated in buildings protected by a sprinkler system, but that the “everything, but the kitchen sink” approach to building fire safety advocated by the lobbyists for the passive fire protection industry is totally unnecessary and is simply a waste of capital resources.

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**Editor’s Note:** Richard Schulte is a 1976 graduate of the fire protection and safety engineering program at the Illinois Institute of Technology (IIT) in Chicago. Schulte worked as the fire protection engineer for the San Jose (California) Fire Department from 1980-1982. Schulte was named as one of ENR’s “Top 25 Newsmakers of 2004” by Engineering News-Record for his work on critiquing the National Institute of Standards and Technology (NIST) investigation into the collapse of the World Trade Center towers on 9/11.