

# **U.S. EXPERIENCE WITH NON-WATER-BASED AUTOMATIC FIRE EXTINGUISHING EQUIPMENT**

**John R. Hall, Jr.**

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**National Fire Protection Association  
Fire Analysis and Research Division**

## Abstract

Non-water-based automatic extinguishing systems were reported present in 2% of U.S. reported structure fires in 2005-2009. The percentage was higher in places where commercial cooking is common, including eating or drinking establishments (41%) and grocery or convenience stores (25%). Dry (or possibly wet) chemical systems were the specific type of system reported for most of these fires, and other special hazard systems were the systems cited for most of the rest.

Dry (or possibly wet) chemical systems in the area of fire failed to operate in 36% of reported structure fires large enough to activate operating equipment, and therefore operated in 64% (100% minus 36%) of these fires. For systems that operated, performance was deemed effective in 68% of the cases. For fires large enough to activate systems, systems operated effectively 44% of the time (64% times 68%).

Because the principal application of dry (and possibly wet) chemical systems is as area protection for commercial cooking operations, it may be more appropriate to limit the analysis to ranges and to include fires reported as confined fires in the analysis. If this is done, the likelihood of operating increases from 64% to 81%, the likelihood of effectiveness if equipment operates increases from 68% to 89%, and the likelihood of effective operation increases from 44% to 72%.

Keywords: wet chemical systems; dry chemical systems; fire statistics; automatic extinguishing systems; automatic suppression systems; halon

## Acknowledgements

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We are also grateful to the U.S. Fire Administration for its work in developing, coordinating, and maintaining NFIRS.

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National Fire Protection Association  
One-Stop Data Shop  
1 Batterymarch Park  
Quincy, MA 02169-7471  
[www.nfpa.org](http://www.nfpa.org)  
e-mail: [osds@nfpa.org](mailto:osds@nfpa.org)  
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## Executive Summary

Non-water-based automatic extinguishing systems were reported present in 2% of U.S. reported structure fires in 2005-2009.\* The percentage was higher in places where commercial cooking is common, including eating or drinking establishments (41%) and grocery or convenience stores (25%). Dry (or possibly wet) chemical systems were the specific type of system specified for most of these fires, and other special hazard systems were the systems cited for most of the rest.

There are some odd patterns in the Table 1-1 statistics. Fires involving carbon dioxide systems, halogen-type systems, foam systems, and to a lesser extent, other special hazard systems, are not reported primarily in the industrial locations where the first three systems are appropriate but are instead reported primarily in the properties with commercial kitchens, where most dry (or possibly wet) chemical systems are reported, or in residential properties and specifically homes. This suggests that most of these fires involve either miscoded dry (or possibly wet) chemical systems or possibly portable fire extinguishers, which are not automatic and so should not be reported at all.

Dry (or possibly wet) chemical systems in the area of fire failed to operate in 36% of reported structure fires large enough to activate operating equipment, therefore operated in 64% (100% minus 36%) of these fires.\*\* For systems that operated, performance was deemed effective in 68% of the cases. For fires large enough to activate systems, systems operated effectively 44% of the time (64% times 68%).

Because the principal application of dry (and possibly wet) chemical systems is as area protection for commercial cooking operations, it may be more appropriate to limit the analysis to ranges and to include fires reported as confined fires in the analysis. If this is done, the likelihood of operating increases from 64% to 81%, the likelihood of effectiveness if equipment operates increases from 68% to 89%, and the likelihood of effective operation increases from 44% to 72%.

Nearly half of dry (or possibly wet) chemical system failures (44%) were due to lack of maintenance. Other reasons cited for failure were as follows:

- 25% were because manual intervention defeated the equipment,
- 13% were because a component was damaged,
- 12% were because the system was shut off, and
- 6% were because the system was inappropriate for the type of fire.

\* These estimates are projections based on the detailed information collected in Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the NFPA's annual fire department experience survey. These statistics exclude buildings under construction and cases of failure or ineffectiveness because of a lack of automatic extinguishing equipment in the fire area and after some recoding between failure and ineffectiveness based on reasons given. Some fires after 1999 are coded as confined fires, which are fires confined to cooking vessel, chimney or flue, furnace or boiler, incinerator, commercial compactor, or trash receptacle. Confined fires permit limited reporting with most data fields not required and usually left blank. Because nearly all fires reported as confined fires are reported without automatic extinguishing equipment performance details or as fires too small to activate operating equipment, confined fires are not included in any analysis involving reliability or effectiveness of automatic extinguishing equipment. See Appendixes A and B for additional details of statistical methodology, including the distinction between confined and non-confined fires.

\*\* Fire incident reports refers only to dry chemical systems, not wet chemical systems, but wet chemical systems are the only systems now listed for use in commercial kitchens, the most common application of chemical systems. Therefore, we refer to this equipment as dry (or possibly wet) chemical systems.

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# NFPA's Fire Safety Resources

NFPA's wealth of fire-related research includes investigations of technically significant fire incidents, fire data analysis, and the Charles S. Morgan Technical Library, one of the most comprehensive fire literature collections in the world. In addition, NFPA's Fire Protection Research Foundation is a source of independent fire test data. Find out more at: [www.nfpa.org/research](http://www.nfpa.org/research)

Properly installed and maintained smoke alarms are necessary to provide a warning of any fire to all occupants. You can find out more information about smoke alarms here: [NFPA Smoke Alarm Information](#)

Home fire sprinkler systems provide even greater protection. These systems respond quickly to reduce the heat, flames, and smoke from a fire until help arrives. More information about home fire sprinklers may be found at: [www.firesprinklerinitiative.org](http://www.firesprinklerinitiative.org)

Research

Advocacy



Codes & Standards

Public Education

NFPA also develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. Among these are:

[NFPA12: Standard on Carbon Dioxide Extinguishing Systems](#)

[NFPA 17: Standard for Dry Chemical Extinguishing Systems](#)

[NFPA 2001: Standard on Clean Agent Fire Extinguishing Systems](#)

[For consumers:](#) NFPA has consumer safety information regarding causes, escape planning, fire & safety equipment, and many other topics.

[For Kids:](#) Sparky.org has important information for kids delivered via fun games, activities, and cartoons.

[For public educators:](#) Resources on fire safety education programs, educational messaging, grants & awards, and many other topics.