WAREHOUSE FIRES
EXCLUDING COLD STORAGE

Marty Ahrens

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National Fire Protection Association
Fire Analysis and Research Division

Abstract

NFPA estimates that U.S. fire departments responded to an average of 1,350 reported structure fires per year in warehouse properties during the four-year-period of 2003-2006. These fires caused an estimated average of five civilian deaths, 21 civilian injuries, and $124 million in direct property damage per year. Cold storage, residential storage, and self-storage are excluded from these statistics.

The leading causes of these fires were 1) electrical distribution or lighting equipment; 2) intentionally set fires; and 3) heating equipment. Automatic extinguishing systems were present in 38% of the reported warehouse fires. These estimates are based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

Keywords: fire statistics, warehouse fires, storage

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Copies of this analysis are available from:

National Fire Protection Association
One-Stop Data Shop
1 Batterymarch Park
Quincy, MA 02169-7471
www.nfpa.org
e-mail: osds@nfpa.org
phone: 617-984-7443

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Executive Summary

Warehouse properties vary a great deal in size and contents. Some store a wide variety of goods; others contain only one or two types of items. In all cases, the primary purpose is to hold a large quantity of often flammable products or supplies until they are needed. Consequently, these facilities contain an unusually high fuel load. Some items should not be stored near each other due to potential interactions. Mishaps during transport can lead to spills that result in fire. Rack storage sprinklers and other specialized sprinkler configurations are frequently needed to protect stock on shelves and pallets. A fire in a facility storing hazardous materials can pose a serious threat to the environment. The fires described below illustrate these points.

- In August 2000, fire destroyed a sprinklered Arizona warehouse occupied by a home and garden supply company and a pharmaceuticals distribution firm. The fire started in the home and garden supply section. Although the initial cause of the fire was undetermined, investigators found that the oxidizers (pool chemicals) may have been stored too close to the hydrocarbon-based materials, the oxidizers were not kept in a proper storage configuration, and the sprinkler protection present was not adequate for the commodities stored.[1]

- An Ohio warehouse facility for paint and similar products was equipped with state-of-the-art fire protection systems when it was built. However, these systems were not updated when changes were made in the type of containers used or when the type, quantity, and storage height exceeded design limitations. The warehouse was destroyed in a 1987 fire that started when cartons of product fell off pallets raised by a lift truck. Some fell on the lift truck, spilling flammable liquid, while more spilled on the floor. Sparks from the truck ignited the fire. Because of concerns that runoff from firefighting could contaminate the community's water supply, minimal water was used and the fire was allowed to burn itself out. The fire ultimately caused $49 million in direct property damage (in 1987 dollars).[2]

- Water used to extinguish a 1986 fire in a Swiss warehouse containing roughly 1,300 tons of organic chemicals drained into and severely polluted the Rhine.[3]

U.S. fire departments responded to an estimated annual average of 1,350 reported structure fires per year in warehouse properties during the four-year-period of 2003-2006. These fires caused an estimated average of five civilian deaths, 21 civilian injuries, and $124 million in direct property damage per year. Cold storage, residential storage, and self-storage are excluded from these statistics. Property damage figures do not include indirect costs such as business interruption or environmental cleanup.

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[1] Robert F. Duval. *Storage Warehouse – Phoenix Arizona, August 2. 2000.* Quincy, MA: National Fire Protection Association. Fire Investigation Department, 2002.
[2] Michael S. Isner. *Flammable Liquid Warehouse Fire, Dayton, Ohio, May 27, 1987*, Quincy, MA: National Fire Protection Association Fire Investigations.
[3] Guy Marlair, Margaret Simonson and Richard Gann. "Environmental Concerns of Fires: Facts, Figures, Questions, and New Challenges for the Future," *International Interflam Conference, 10th Proceedings*. Volume 1, Edinburgh, Scotland: Interscience Communications Ltd., London, England, 325-337 pp, 2004.

While only 0.3% of the structure fires reported in 2003-2006 occurred in warehouse properties, these fires caused 1.4% of the direct structure fire property damage. The leading causes of these fires were 1) electrical distribution or lighting equipment; 2) intentionally set fires; and 3) heating equipment. Roughly one of every five (19%) of these fires began with trash or waste. This includes the 6% of incidents in which rubbish, trash, or waste was entered as the item first ignited as well as fires with incident types coded as confined trash or rubbish (11%), confined commercial compactor fires (3%), and confined incinerator fires (1%). Causal information is not required for these confined fires.

General warehouse fires fell 71% from 1980 to 2006, but most of the decrease was seen in the 1980s. These fires have essentially hit a plateau since 1992.

Working fire detection equipment was found in one-quarter of the reported warehouse structure fires.

In his 2009 NFPA report, *U.S. Experience with Sprinklers*, John Hall found that automatic extinguishing equipment was present in 38% of reported warehouse structure fires. Wet pipe sprinklers accounted for 81% of the automatic extinguishing systems found in these fires and dry pipe 17%. When present, wet pipe sprinklers operated in 85% of the warehouse fires that were large enough to activate the system. In 70% of the wet pipe sprinkler activations, only one or two sprinklers opened. When wet pipe sprinklers systems were present, the average loss per reported warehouse fire was $86,000, 16% lower than the $102,000 average loss in properties with no automatic extinguishing equipment.

In 91% of the warehouse fires in which wet pipe sprinklers failed to operate, the system had been shut off. A damaged system component caused 4% of the failures, 3% failed because a system component was damaged, and 2% failed because of a lack of maintenance.

In his analysis of narratives from fire sprinkler activations without fire in warehouses excluding cold storage, Hall concluded that in 50% of the incidents, water was definitely not released. This includes 44% in which no water was released except for the dry pipe system charging or releasing to a drain or outside, and 6% in which the sprinkler activated with no mention of water flow outside the system. He noted that water may have been released in the remaining 50%, including 38% in which a system component was broken or damaged, 6% due to freezing, 5% that mentioned water flow release outside of the system, 1% involving leaks, and 1% involving non-fire heat nearby. Impacts from forklifts, other large vehicles, or large doors, all frequently found in or around warehouses, were among the common factors associated with damaged components.

With the exception of analysis of narratives, the statistics in this report are national estimates derived from Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System and NFPA's annual fire department experience survey. The incident descriptions included in this analysis and in the Appendix show what can happen. They are not a source to learn about what typically occurs. Most of the fires in this collection were more severe than the typical incident.