

Insight: Warehouse Fires

Recognizing the Risk

Risks of fire in a warehouse can be thought about in two ways – one is the non-storage hazards in the warehouse that are potential ignition sources such as smoking, hot work and electrical systems. Second is the hazards directly associated with the storage. These can include:

- the type of goods stored
- the amount of plastic (packaging, containers, pallets)
- the size of the warehouse and storage areas
- the arrangement of the storage e.g. whether an automatic storage and retrieval system (ASRS) is used
- the height of the storage – important!
- the susceptibility of the goods stored to smoke and heat



Photo Credit: iStock [petinovs](#)

Should an incident occur, the potential interruption to the business cannot be overlooked, especially for distribution warehouses constructed to meet the demand for more direct-delivered consumer goods.

- Protection plays a critical part in determining risk – non-sprinklered vs. sprinklered & the adequacy of the system.
- For non-sprinklered facilities, the risk is inherently greater should a fire break out. Building construction then plays a more vital role.
- For sprinklered properties, adequacy of the fire protection system(s) is critical. AIG's Risk Engineers consider system design, maintenance, water supply, goods stored and arrangement of the storage when determining adequacy.
- In a [National Fire Protection Association \(NFPA\) study](#) investigating why sprinkler systems fail, 6% are tied to an inappropriate type for the fire protection
 - And when looking at why sprinklers operated but were ineffective, 7% of these cases are tied to an inappropriate type of system for the fire. Other major causes include, declining water supplies, poor maintenance, and the lack of protection system re-evaluation when operations change such as arrangement, commodity or packaging changes
 - Understanding the complexities and demands on a fire protection system in newer, larger and taller storage configurations equipped with an ASRS show that specialized protection is required to ensure adequacy

Controlling the Hazard

There are several common ways to reduce warehouse fire risks tied to both human element controls (risk management) and physical prevention.

Human Element Controls | These relate to management procedures that can reduce the likelihood of a fire occurring by controlling or eliminating ignition sources and minimize the extent of damage should a fire occur by ensuring an effective fire response.

Physical Protection Controls | These relate to reducing or mitigating the size of the loss through protection systems.

Leading Causes of Warehouse Fires

The National Fire Protection Associations' Warehouse Fire Safety Fact Sheet* shows the leading causes of warehouse fires identified over a four-year period. Of those identified, four "cause" categories constitute over 50% of the fires reported:



Chart 1: The National Fire Protection Associations' Warehouse Fire Safety Fact Sheet shows the leading causes of fires. [1]

At a high level, a good maintenance program that includes electric and lighting and the hazards e.g., oil leakage from industrial equipment could go a long way in preventing an incident.

A Hot Work Program, such as the one offered by AIG, can potentially take the risk to zero and minimally reduce risk through the use of a permit and following simple NFPA recommendations.

These two activities fall into what is known as the Human Factor or Human Element as a contributing cause to an incident.

Human Element (Also known as The Human Factor)

The Human Factor covers both risk reduction management and individual/individuals' actions (or inaction) during/after a fire. It plays a very large role in whether a fire will occur as well as how large or small damage is should one occur. At least one source cites that 70%-85% of claim sizes are a direct result of action or inaction to a fire event i.e., small fires quickly grew out of control due to inaction or were quickly extinguished due to action.

A good human-element-focused risk management program can go a long way in reducing the potential for an incident to occur. The program should be written, implemented, readily available, communicated, and enforced. Elements of the program can include:

- Annual fire service "site familiarity" visits
- A pre-emergency response plan that covers site actions during a fire
- A pre-emergency response plan that covers site actions after the control of a fire such as the immediate evacuation of building smoke and water cleanup
- A tag-based hot work program (AIG's Hot Work Program & Permits are available in more than 10 translations)
- A tag-based fire protection system impairment management program (AIG's Impairment Tag Program)
- A comprehensive self-inspection program including:
 - General housekeeping
 - Flammable/combustible liquids use and storage
 - Fire protection systems
 - Sprinkler obstructions and sprinkler clearance
 - Electrical systems (including annual infrared thermography)

- Proper storage arrangements such as maintaining proper flue spacing in rack storage
- Strict no smoking policy for all warehouse areas
- Forklift driver safety

Physical Protection

Physical protection of the facility is dependent on a variety of factors, including the product being stored. If consumer packaged goods are in the mix, they may come with a li-based battery already installed and a plastic package. Both of these elements increase risk in the warehouse setting.

In general, fire protection is dependent on warehouse features, storage configuration and product being stored.

- Fire Protection designed per NFPA 13* for the specific storage type, arrangement, and building features with inspection, testing and maintenance per NFPA 25* (or international equivalents)
 - Consider the packaging for the goods being stored
 - Ensure the system is designed based on the commodities being stored and the storage configuration
- Fire protection system design re-evaluation before critical changes are implemented
- Regular evaluation of water supply
- Elevation of storage off the floor to minimize potential water damage
- Regular fire wall, fire door, and smoke exhaust system inspections, testing and maintenance per applicable NFPA standards (or international equivalents) to ensure proper working condition at all times
- Proper separation for hazardous storage and forklift charging/refueling
- The maintenance of idle pallet storage in neat, stable piles, preferably outside and away from the buildings. If pallet storage is required inside, the storage must be properly arranged and protected by an automatic sprinkler system designed to protect this commodity.

You may also be interested in AIG's Insights on Idle Pallet Storage and Lithium Battery Exposures for Recyclers.

References & Resources

National Fire Protection Association, "Warehouse Fire Safety Fact Sheet", <https://www.nfpa.org/News-and-Research/Publications-and-media/Press-Room/News-releases/2020/NFPA-releases-new-warehouse-safety-fact-sheet>, accessed November 8, 2021

National Fire Protection Association, "Holistic Protection Method of Top Loading Automatic Storage and Retrieval Systems", a webinar hosted by NFPA, Webinars from NFPA | NFPA Accessed November 8, 2021

Wikipedia, "Automated storage and retrieval system"
https://en.wikipedia.org/wiki/Automated_storage_and_retrieval_system, accessed November 8, 2021

BBC, Inside Ocado's burning robotic warehouse, <https://www.bbc.com/news/technology-47160448>, accessed November 8, 2021

AIG's Hot Work Program

NFPA 13 Standard for the Installation of Sprinkler Systems, <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=13> Accessed January 13, 2022

NFPA 25 Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=25> accessed January 13, 2022

<https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/Suppression/ossprinklers.pdf>

*While NFPA documents are the global standard used by AIG, international equivalents may be acceptable.

[For more information, contact your local AIG Risk Engineer.](#)

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