

RISKTOPICS

Warehouse fire prevention
January 2013

Warehouses, distribution centers, and logistics facilities are becoming larger, taller and house more product than ever before. As facility size increases, efficiency needs drive automation in the form of automatic storage and retrieval systems, automated picking systems, and computerized conveyor networks.

INTRODUCTION

Together, the evolution of the storage facility presents challenges to traditional fire protection approaches and introduces the potential for large losses from even small controlled fires. Regardless of size, it is essential that each warehouse has an effective fire prevention program so that fires can be avoided before they can start.

DISCUSSION

Storage fires often require manual intervention to achieve final fire extinguishment. It is important to understand that automatic sprinklers are not designed to extinguish a storage fire, but instead, they are intended to control or suppress the fire. The expectation is that the fire service will enter the building, access the burning material, and effect final fire extinguishment.

Take time to consider this mission being assigned to the fire service. How will they reach a fire located deep in a storage array or high in the upper tiers of a rack? How far may they have to crawl from the nearest outside door? How will they determine that storage is stable and will not fall? With increasing use of automated storage systems aisle widths are reduced and tracks can be found between storage racks hindering access with ladders.



Photo source: FEMA

All things considered it is quite apparent that we ask much of the fire service if a fire occurs. The better alternative is to implement a comprehensive fire prevention program that will significantly reduce the likelihood of a fire taking place.

WAREHOUSE FIRE PREVENTION PROGRAM

A warehouse fire prevention program begins with management's commitment. The program must be formalized in writing, shared with all employees, and implemented with appropriate funding and resources. Employees quickly recognize and buy into initiatives that have management's support. Such programs will be accepted, assimilated, and implemented. Unsupported programs will quickly falter and become ineffective.

A Warehouse Fire Prevention program is actually a collection of programs that can be separated into three categories as shown in the Warehouse Fire Prevention triangle in the figure below.



MAINTENANCE STRATEGY

Although a maintenance strategy may not be viewed as a typical fire prevention activity, it is an essential component of maintaining a fire safe facility. According to 2006 data from the National Fire Protection Association, frequent causes of storage fires include electrical distribution systems, lighting equipment, and storage handling equipment. This data reveals the importance of an effective maintenance strategy that addresses utility systems as well as storage handling equipment such as industrial trucks, conveyors, and automatic storage and retrieval systems.

Maintenance strategies may be preventative or predictive. Preventive maintenance is a fixed schedule of planned actions aimed at keeping equipment in like-new condition so as to avoid breakdowns and failures of building, utility, or process systems. Predictive maintenance goes even further by using condition monitoring technologies to catch early failure modes and proactively repair or resolve the issue only when there is a problem and before it actually fails.

Some specific actions to consider include:

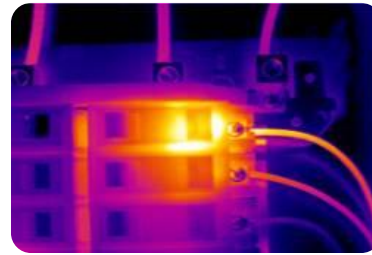
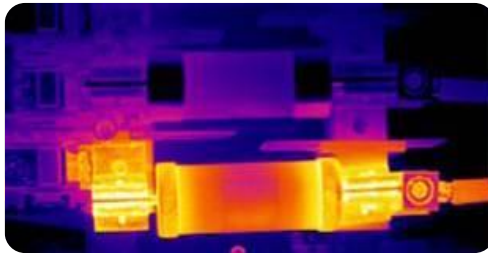
- Inspections - These are typically visual activities that allow the detection of unwanted conditions. Examples of typical inspection activities include verifying:
 - Electrical panel and equipment covers are in place
 - Clear space of at least 0.9 m (3 ft.) is provided around all electrical panels and other electrical equipment
 - Conveyor motors are maintained in a cool, clean, and dry environment and in accordance with the nameplate specifications
 - Industrial trucks batteries, controls, lift and tilt systems, brakes, and fuel systems are in good condition
 - Industrial truck battery charging stations are separated from combustibles and have adequate ventilation
- Testing - These are active evaluations of equipment or systems to verify condition or suitability for continued use and operation. Examples of testing include:
 - Annual infrared thermography scans of all electrical panels, transformers, conveyor drive motors, conveyor bearings, and other equipment that may be exposed to overheating



*Metal chain near battery terminals
Photo Source: Predictive Service*



*Infrared image of overheated battery
Photo source: Predictive Service*



*Infrared images. Overheated fuse (left). Overheated circuit breaker and connection (right)
Photo source: Predictive Service*

- Weekly de-energizing of high intensity discharge, Type "S" non-enclosed luminaries for 15 minutes to induce failure start-up, rather than possibly experiencing catastrophic failure that can occur during extended periods of use
- Maintenance – This is a routine action based upon manufacturer's recommendations or best practices to keep equipment in a serviceable state. Examples of maintenance includes:
 - Routine industrial truck maintenance by trained and authorized persons per manufacturer's instructions and frequencies
 - Lubrication and service of conveyor equipment in accordance with manufacturer's specifications

MANAGEMENT OF CHANGE

Managing change in storage occupancies can be a challenging task. Change can be introduced by deliberate or unintended actions occurring within or remote from the warehouse. Deliberate actions can be controlled by implementing a management of change process. This process should require a thorough analysis of any planned change that will impact the fire potential in the warehouse. For example, the process should include changes to:

- Materials in products
- Packaging material protecting products
- New products
- Pallets holding products
- Equipment that moves products
- Pile configurations or racking systems storing products
- Introduction of airflow due to circulation or exhaust fans

Any of these actions can increase the potential or severity of a fire in a warehouse. Careful consideration should be given prior to implementing any changes.



Changes brought about by unintended actions are more difficult to control. These actions occur outside of the management of change process, and require management vigilance and periodic warehouse inspection to allow prompt identification and correction. Unintended change can include actions such as:

- Concentrating idle pallets beyond allowable limits
- Storage in aisles
- Storage of unauthorized hazardous materials in the warehouse
- Placing stock into racks in a manner that obstructs vertical flues
- Exceeding allowable stock storage heights

Routine inspections of storage arrangement and conditions should be conducted by management at more than one level of the organization.

LOSS PREVENTION PROGRAMS

As with any occupancy, it is essential to implement standard property loss prevention programs in storage facilities. These programs include:

- Hot work permit program
- Smoking control program
- Fire protection impairment control program
- Emergency response program
- Surveillance and security program
- Housekeeping program
- Contractor control program

These programs provide the controls needed to manage sources of ignition, manage trash and debris that can be readily ignited, and secure the premises from unauthorized intruders. They provide additional controls to limit and manage outages of fixed fire protection and support appropriate response in the event of an emergency. These essential programs represent the foundation of the warehouse fire prevention triangle.

CONCLUSION

The foundation of the Zurich Risk Engineering philosophy is prevention. No loss can be smaller than the loss that is prevented, and any loss allowed to occur can grow into the worst-case disaster. To avoid the disruption of a small fire or the consequences of a major warehousing disaster, prevention is the key.

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