

Warehouse fire prevention – management of change

Risktopic 2-5.003 October 2012

Managing change in a warehouse refers to a proactive evaluation of all modifications or alterations so that change does not allow hazards or exposures to increase beyond the design of the fire protection systems.

Introduction

Managing change in a storage area is not just limited to physical additions or major projects. Even small unintended changes can have a substantial impact. Industry experience has clearly shown that failure to control change in storage facilities can expose the facility to a total loss should a fire occur.

Discussion

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 to the right. This document will focus upon the category that addresses Management of Change, a process that requires an attention to detail.

Change is often introduced by deliberate and planned actions of management. Deliberate actions can be controlled by implementing a management of change process.

Change can also be introduced by unintended and unplanned actions. Unintended actions are more difficult to manage but can be controlled through routine oversight of the storage facility.

Whether change is planned or unintended, it must be controlled. It is essential to maintain a warehouse within its fire protection design limits at all times.

In 1988, an ad hoc committee comprised of fire service, warehouse owner, and insurer representatives met with the National Fire Protection Association to review seven major warehouse fires that occurred in the US between 1977 and 1987. The result of this meeting was a white paper titled "Before the Fire, Fire Prevention Strategies for Storage Occupancies". This white paper is available today as Annex B in NFPA 1620 "Recommended Practice for Pre-Incident Planning". The finding from this meeting indicated that for each large warehouse fire some form of change compromised the fire protection design of the facility. Whether it was the introduction of flammable liquids, a change in commodity class, an increase in storage height, or the presence of storage in aisles, the result was the total loss of a large, modern, fully protected warehouse.

When warehouse changes are planned, contact your local Zurich Consultant for advice. When unintended warehouse changes are detected, have them corrected immediately.

The following sections discuss examples of warehouse changes in further detail and provide guidance to aide in the development and implementation of a change management process.



Change by unintended actions – As mentioned above, changes brought about by unintended actions are 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:

- Indoor storage of 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

Employee training – Employees who manage stock should be trained on the appropriate location, placement, and limits for each commodity or class of commodity that they will handle. This is especially true for hazardous materials including flammable and combustible liquids, Level 2 and 3 aerosols, oxidizers, organic peroxides, explosives, or radioactive materials. These materials should never be maintained in general storage areas.

Employees should be trained to identify hazardous material placards displayed on packaging, and encouraged to question management regarding unusual materials that they have not been specifically trained to handle.

Received hazardous materials should be given priority attention for relocation from the point of delivery to the appropriate point of storage. Appropriate transport routes should be strictly followed.



Images of typical hazardous material placards used in the western hemisphere are contained in the [2008 Emergency Response Guidebook](#) developed jointly by:

- Transport Canada (TC)
- U.S. Department of Transportation (DOT)
- Secretariat of Transport and Communications of Mexico (SCT)
- CIQUIME (Centro de Información Química para Emergencias) of Argentina

This guide was developed for emergency responders to assist in the identification of hazardous materials. This or similar local guides should be used to support employee training. This guide can be downloaded from the following web page:

<http://www.phmsa.dot.gov/staticfiles/PHMSA/DownloadableFiles/Files/erg2008eng.pdf>

Floor markings and signage – Storage areas should be marked and placarded to guide appropriate employee practices. Floor markings can show location of aisles, pallet storage areas, or areas where storage is not permitted (e.g. near fire hose connections, space heaters, or battery charging stations). Rack cross members can be marked to show the location for transverse flue spaces that should be kept clear of storage. Placards can indicate stacking limits for piled storage, similar limits for the top tier of racked storage, and storage restrictions such as "no storage in aisles".

Management inspections and oversight – Routine inspections of storage arrangements and conditions should be conducted by management at more than one level of the organization. This may include the warehouse supervisor, warehouse manager, environmental health and safety personnel, risk management personnel, and others.

The Zurich "Warehouse management of change inspection checklist" can be used as a guide in establishing a checklist tailored to a specific facility.



Recorded inspections by the warehouse supervisor or manager should be conducted on a weekly basis; however, the scope and frequency can be modified to fit the needs of the specific warehouse.

Changes to construction or physical structure – Modifications, additions, and changes to buildings or building systems are always a fire protection concern. Below are some examples that illustrate how such changes can impact fire protection.

- Installation of any utilities at or near the ceiling can obstruct sprinkler discharge. The inappropriate placement of features including lights, fiber optic cables, conveyors, ducts, or electrical conduits can severely compromise the effectiveness of automatic sprinklers
- Mezzanine installation will require fire protection changes to provide protection for the space below the mezzanine. Additional fire protection may also be needed where storage is introduced under or above the mezzanine
- Air movement associated with fans can interfere with sprinkler response performance. Fans can include exhaust fans, supply air fans, circulating fans (e.g. High Volume Low Speed fans), and recirculating fans (e.g. refrigeration or heating fans). For additional information regarding the impact of air movement upon automatic sprinklers, refer to the Zurich Risktopic "Airflow in ESFR Protected Buildings"



Ceiling level high volume low speed circulating air fan

- HVAC equipment can obstruct sprinkler protection or possibly introduce a source of ignition
- Walk in coolers, freezers, or similar structures inside an existing building require fire protection
- Adding bracing to building frame or sprinkler systems can obstruct sprinkler discharge

Contact your local Zurich Consultant for guidance regarding fire protection needs that should be considered as part of the overall project scope.

Changes to fire protection – There will be times when existing fire protection systems will require modifications, additions, or repairs. Careful planning, engineering, and re-design may be needed to maintain adequate fire protection. Some factors to consider:

- Converting a wet sprinkler system to a dry sprinkler system (or vice versa) requires careful re-design. For example:
 - Some wet sprinkler systems (e.g. those using ESFR sprinklers) cannot be converted to dry systems
 - Wet system piping can be installed level; however, dry systems require pitching of pipes to avoid freeze damage
 - Dry systems have water delivery delays and will demand greater water flow and pressure than a corresponding wet system
 - Waterflow alarm monitoring of wet and dry systems are significantly different
- Changing or replacing sprinklers for any reason requires careful selection of the new sprinklers so that they are compatible with the system design
- New or rebuilt fire pumps must continue to meet the water flow and pressure requirements of existing fire protection systems. An acceptance test confirming the



performance of the new or rebuilt fire pump is essential

- Changes to water supplies (public or private) need to be tested to confirm they continue to provide an adequate water supply
- All fire protection system changes should include the use of listed or approved fire protection equipment by a recognized testing laboratory such as:
 - CNPP - Centre National de Prévention et de Protection
 - LPCB - Loss Prevention Certification Board
 - TÜV - TÜV Rheinland Group
 - UL - Underwriters Laboratories

Changes to storage arrangements – The fire protection systems in a warehouse are specifically designed for a given set of storage parameters. Any change in the way a product is stored can impact the adequacy of the automatic fire protection. Some typical examples of changes to storage arrangements include:

- Changing methods of storage. For example, switching from piled storage to rack storage, or changing from garments in boxes to hanging garments on pipe racks
- Reducing aisle width between racks
- Increasing the height of storage, regardless of storage arrangement
- Increasing the depth of the storage racks including changes from double-row to multi-row racks
- Eliminating required flue spaces in racks. Actions that can impact flue spaces include:
 - Changing to larger pallets
 - Adding solid shelves
 - Adding slatted shelves and not controlling the placement of stock to maintain flues
- Temporary storage. This includes storage in aisles and storage of hazardous materials in the general warehouse
- Introducing automatic storage and retrieval systems

Changes to product – One critical design parameter for storage fire protection systems is commodity classification. If the commodity classification increases in severity, fire protection systems need to be evaluated to confirm they will continue to provide an appropriate level of protection. Special hazards, such as aerosols and flammable liquids need to be segregated from general storage areas. It is important to consider the following:

- Identify new products stored in the warehouse and confirm they are properly classified and placed in an appropriate storage area
- Identify changes in the composition of existing product (e.g. metal to plastic)
- Segregate hazardous materials into areas with adequate fire protection
- Identify high value items that present a security risk. Exposure to theft can also increase the exposure to arson fires set to conceal a theft. Appropriate security measures should be instituted

Contact your local Zurich Consultant for guidance if there is any doubt on the handling or storage of any new or modified product.

Changes to packaging – Packaging changes can affect flammability as well as a product's susceptibility to non-thermal damage. It is important to monitor packaging changes since:

- Changes in the amount of packaging can increase combustibility and increase the commodity classification. A common issue is an increase in the volume of expanded plastics added to protect a product. When commodity classification increases, the fire protection demands increase as well
- Changes in packaging can increase exposure to non-thermal damages from sources such as smoke, water, and humidity. Reduced protection from non-thermal sources of damage can allow widespread damage from even small fires that are quickly controlled

Contact your local Zurich consultant for guidance regarding the impact of changes to product packaging.

Changes to storage aides – Storage aides are used to hold or contain a product while in storage. The design of the fire protection is affected by the type of storage aide used, and changes in storage aides can require an increase in fire protection. Changes in storage aides can include:

- Changing from wood to plastic pallets or composite pallets
- Introducing open top containers, which collect water from sprinkler discharge
- Introducing encapsulated storage. Plastic wrapping is often used to stabilize storage on pallets. Using plastic wrap on the sides of a pallet load is not considered encapsulation and does not affect commodity classification. When plastic wrap is extended across the sides and top of a pallet load, the load is now considered encapsulated. Introducing encapsulated storage requires a re-evaluation of the existing fire protection design. In most cases, encapsulation will require an increased level of fire protection

Contact your local Zurich Consultant for guidance regarding the impact of any plans to change storage aides such as pallets and totes.

Changes to mobile material handling equipment – Purchasing new industrial trucks (fork lifts) can be an expensive investment. The following should be considered to protect this investment, as well as preventing a fire:

- Industrial trucks may require a special rating depending upon the type of commodity handled. These commodities include flammable liquids and Level 2 or 3 aerosols. NFPA 505 can be consulted for guidance on the selection of industrial trucks
- New battery charging area or expanded battery charging area should be evaluated for adequate ventilation to remove hydrogen gas generated during the charging process
- Training should be provided for operators of new industrial trucks, especially if the new units are not the same as existing equipment
- Automatic storage and retrieval systems will generally require some special fire protection considerations

Consult the Zurich Risktopic "Warehouse fire prevention - preventative maintenance" for additional information on industrial truck maintenance.

Conclusion

The foundation of Zurich fire protection 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. By implementing and maintaining a comprehensive warehouse preventative maintenance program, you have taken a big step in avoiding disaster.

If you have questions or would like specific guidance on developing a warehouse management of change program in your facility, please contact your local Zurich consultant.

References

1. Warehouse fire prevention; Zurich, April 2009.
2. Warehouse fire prevention - preventative maintenance; Zurich, May 2009.
3. NFPA 505; Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operations; NFPA, 2006.
4. NFPA 1620; Recommended Practice for Pre-Incident Planning; NFPA, 2003.
5. 2008 Emergency Response Guidebook; developed jointly by Transport Canada (TC), U.S. Department of Transportation (DOT), Secretariat of Transport and Communications of Mexico (SCT), and CIQUIME (Centro de Información Química para Emergencias) of Argentina, 2008.

Related documents

1. Warehouse fire prevention: 2-5.001
2. Warehouse fire prevention - maintenance strategy: 2-5.002
3. Warehouse fire prevention - loss prevention: 2-5.004

Zurich Services Corporation

Risk Engineering

1400 American Lane, Schaumburg, Illinois 60196-1056

800 982 5964 www.zurichna.com

The information in this publication was compiled by Zurich Services Corporation from sources believed to be reliable for informational purposes only. All sample policies and procedures herein should serve as a guideline, which you can use to create your own policies and procedures. We trust that you will customize these samples to reflect your own operations and believe that these samples may serve as a helpful platform for this endeavor. Any and all information contained herein is not intended to constitute legal advice and accordingly, you should consult with your own attorneys when developing programs and policies. We do not guarantee the accuracy of this information or any results and further assume no liability in connection with this publication and sample policies and procedures, including any information, methods or safety suggestions contained herein. Moreover, Zurich Services Corporation reminds you that this cannot be assumed to contain every acceptable safety and compliance procedure or that additional procedures might not be appropriate under the circumstances. The subject matter of this publication is not tied to any specific insurance product nor will adopting these policies and procedures ensure coverage under any insurance policy.

©2012 Zurich Services Corporation

