

Risk Management in Warehouses

Prepared by N V Subba Rao and K. Ramesh Ramalingam,
Cholamandalam MS Risk Services Limited, Chennai
www.cholarisk.com

1.0 Introduction

Holistic approach to managing risk has gained prominence with advent of globalization, changing perceptions of stakeholders associated with enterprise. While this had great impact on managing facilities at plant level, the associated support functions are seldom subjected to risk management review process. While companies allocate resources to produce quality products, install latest Pollution control equipment and automate the process including use of Robots, little thought is given to the place where finished goods stored away from the manufacturing points – the warehouses. Huge losses suffered by some of the leading companies during the 2005 Mumbai floods and 2006 Surat floods stand a testimony to this aspect.

The location of warehouse at a lower level than adjoining areas, improper stacking practices, lack of drainage facilities, were the key causes behind the losses suffered. It is estimated that insurance companies settled warehouse claims close to 500 crores in the last year Mumbai floods. A study by leading international insurance brokers indicate that the number of fires originating in storage facilities which include warehouses and storage areas associated with manufacturing plants average around 15 % of total industrial fires reported. However, these incidents on an average represent a disproportionate 23% of total property damage reported.

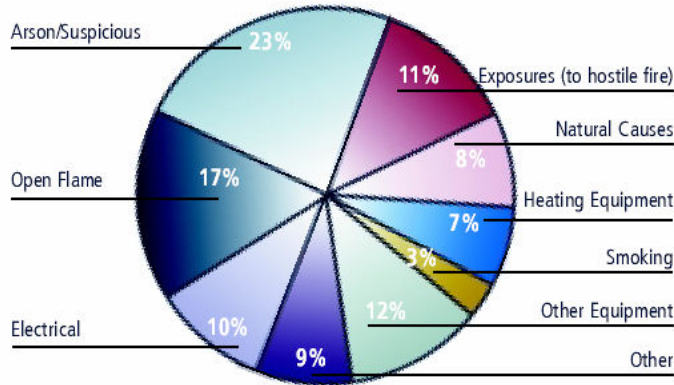
With the country poised for rapid expansion, logistics management in which warehouses are the vital link plays an important role. While there are risks such as floods and damage caused by other natural perils, fire still continues to be the most threatening. This paper aims to address the cause of fire in warehouses and the loss prevention recommendations.

2.0 Fire Risk in Warehouses:

A common misconception is that a warehouse full of non-combustible products does not pose a fire hazard. However, packaging materials commonly found in use today – plastic wrapping, cardboard boxes, wooden crates, plastic or wooden pallets – all contribute to the spread of fire. Indeed, fires involving low risk materials such as metal parts packed in cardboard will generate ceiling air temperatures in excess of 650 deg.C. Steel structures begin to lose strength at approximately 600 deg.C leading to the possible collapse of warehouse buildings within ten minutes of a fire taking hold. The threat of fire should therefore never be underestimated for any storage facility.

2.1 Causes:

Major causes of storage property fires (1993 - 1997)



Source: (2) National Fire Prevention Association (USA)

The above chart points that the top three causes for warehouse fires include, arson, Open flames and Electrical related causes.

3.0 Loss Prevention Recommendations:

3.1 Construction

IS 3594 – Code of Practice for Fire Safety of Industrial Buildings, General Storage and Warehousing including cold storages, recommends that Grade 1 construction be used for storage of hazardous and extra hazardous goods, while Grade 2 may be used for non-hazardous goods. These gradings correspond to fire loads of 6 hours and 4 hours respectively. Considering the stringent requirements of Grade 1 construction, relaxation may be made if the building is provided with appropriate fire protection system.

With respect to compartment size, the code recommends a limit of 1000 sq.m. floor space, while it is 500 sq.m for basement. For sprinklered buildings, the code permits doubling of these floor areas. The maximum height of storage building permitted is 25m and this is reduced to 15m if the building is used to store hazardous or extra hazardous goods. Warehouses should be provided with doors after every 45m, with a minimum of 2 doors to each compartment.

Code also recommends installation of vents for warehouses having floor area exceeding 750 sq.m. irrespective of whether they are compartmented or not.

3.2 Storage Practices

The method of storage can affect the rate of fire spread and its severity for the same material. For example, paper reels stored vertically can give rise to stack effect. For indoor storage the suggested maximum height of pile is 4.5m. The clearance from top of pile to the lowest point of roof members, electrical fittings or fire detectors should be a minimum of 1m. A colour band should be painted on the wall to indicate the maximum height to which materials can be stacked.

Another important aspect of storage is provision of aisles. The aisle should be wide enough for easy access of material and suggested width is atleast 2m. Where mechanical handling appliances are used, the minimum recommended aisle width is 2.5m. Wall aisles shall be of 1m width and they not only ensure access of personnel during fires, but also prevent the load of the stack acting on the wall, leading to structural collapse.

3.3 Electrical Equipment and Fittings

The ignition risk from electrical equipment can be minimized by ensuring that it is maintained through a formalized maintenance program. It may be noted that light fittings have proved to be source of ignition in many warehouse fires. Industrial type light fittings, which do not have exposed tubes / bulbs and chokes are to be installed. It is also preferable to route the electrical wiring in metal conduits.

Where High Intensity Discharge (HID) lamps are used, it may be noted that the inside temperature may reach 1000 deg.C. Violent failure of HID lamps can discharge hot fragments into vulnerable storage areas, resulting in fire. Such fixtures should be reviewed to ensure integral barriers are provided to prevent discharge of hot fragments.

Also, the maximum surface temperature of fluorescent lamp component is 90 deg.C. If positioned close to storage, or if dust is allowed to collect on the components, a fire can result. Furthermore, if the units are beyond their expected service life, electrical fires can cause arcing and overheating. It is always essential to have a central control switch to cut off power when warehouse is closed. Removal of one of the important ignition sources is a good risk management practice.

Lightning is the most common natural ignition source. Protection can be achieved via lightning conductors and grounding systems installed in accordance with IS 2309 – Code of Practice for Protection of Buildings and allied Structures against Lightning.

In places where mobile appliances are powered by petrol / diesel / LPG, the exhaust of such appliances shall be provided with spark arrestor. Also, where battery chargers are used for forklifts, the charging operation shall be carried outside the storage area. In many cases, the battery chargers have proved to be the source of ignition. It is also needs to be ensured that shrink-wrapping activities are segregated from storage.

3.4 Fire Protection Systems

While fire prevention aspects are to be given prime importance, installation of fire protection systems are also vital in managing fire emergencies. Portable fire extinguishers conforming to IS 2190 – Code of practice for Selection, Installation and Maintenance of First Aid Fire Fighting Appliances can be installed.

However, in case a warehouse is generally not attended, the use of such appliances may not be possible. Fixed fire protection systems are required in such cases. Sprinklers are possibly the most effective protection in warehouses as they detect and control fires automatically. IS 3594 recommends sprinkler protection for warehouses exceeding 1000 sq.m. It may also be advisable to have a private hydrant system for handling major fire eventualities.

If the contents of the godown do not permit the use of water for extinguishing fires, a fire detection system can be installed. Where the span of the godown is large, beam detectors are preferred.

In case of some commodities, it may be difficult for the extinguishing medium to reach hidden spaces. For instance, a high expansion foam total flooding system may be most appropriate for a tyre storage godown.

3.5 General Safety Provisions

3.5.1 Location and Layout of the warehouse

Location and Layout of the warehouse forms an important aspect of managing risk in warehouse. There were instances where the location of warehouse is such that fire brigade could not approach the warehouse. One of the important factors while selecting the warehouse is location of warehouse. The factors need to be considered are approach road, proximity to fire brigade, whether close to any water bodies, culverts and height of building or surroundings from neighbourhood.

3.5.2 Fire Emergency Plan:

The following details shall be readily available and displayed in prominent places:

- Nearest fire brigade – telephone number
- Action to be taken in case of fire
- Key Person Contact Details

3.5.3 Security:

Patrolling by security personnel round the clock will help in identifying the fire hazard and initiate appropriate corrective action. The security guards are to be well trained in the operation of fire fighting appliances.

3.5.4 Hot Work:

The use of naked flames inside the storage area is to be strictly prohibited. However where such activities are to be carried out a fire watch may be made available till the work is complete. Use of ceramic blankets to avoid fall of sparks on materials can be considered while carrying out welding / cutting operations.

3.5.5 Housekeeping Practices:

Good housekeeping is the first step towards fire prevention. In addition to material storage area, it may be ensured that the peripheral area of the warehouse is also kept free from any accumulation of waste as it increases the fire load and can lead to spread of fire. Housekeeping standards like 5S can be adopted to sustain good practices.

Case Study 1:

Basle, Switzerland, 1986:

Fire in a non-sprinklered mixed chemical warehouse created around 7500 cu.m. of firewater run-off containing 30 tonnes of chemicals, which polluted over 250km of River Rhine. The severe ecological damage created a huge public relations backlash and caused the company to discontinue sales of a range of products involved.

Case Study 2:

India, 1994:

Sparks from a fireworks display during a festival triggered an explosion and fire in a nearby fireworks warehouse. 22 people died in the incident.

4.0 Conclusion:

In present day world, warehouse forms the key in any product distribution system, whose role in business continuity is generally under-valued. Lack of attention has resulted in serious warehouse loses, damaging the reputation of the company.

Managing fire risk in a warehouse is best accomplished by a mix of hardware (e.g., safety features at construction stage) and software aspects (e.g., introduction of maintenance system for electrical equipment).

The proactive approach would be to address all the above aspects before occupying the warehouse. A risk rating shall be done to evaluate the warehouse's fire and safety features. Such an approach would help in mitigating the risk at the start up stage itself.