

Fire and Disaster Risk information <No.74>

Warehouse Fire Risk and Countermeasures

Introduction

Majority of the operations in warehouses are loading, storing, packaging and shipping, which do not involve potential fire sources such as usage of large amount of dangerous materials, operation of large machines and heating by open flame, etc.

On the other hand, warehouse is a facility where a considerable amount of combustibles, such as packing materials like cardboards, plastic pallets and stored materials themselves, are handled. According to the result of surveys on operation practices and statistics & case studies of accidents in the past, warehouses houses no fire sources which are seen in factories. However, there are fire risks inherent to warehouses. Especially, failure in initial firefighting in warehouses tends to result in significant damages.

The purpose of this report is to look into fire risks inherent to warehouses and provide statistics & case studies of accidents which occurred in the past to show keys to prevention of fires in warehouse properties and provide checklists of fire preventive measures to be utilized in your company.

1. Fire Risk in Warehouses

Following is the list of fire risks in warehouses.

(1) A large amount of combustibles

Warehouses generally contain a large amount of combustibles. Thus, if fire in the warehouse cannot be put out during the initial stage and grows, sprinkler system and internal hydrants cannot contain the fire due to intense combustion and radiant heat. If fire grows further, public fire brigade may not extinguish it.

Stored materials are one of the factors which significantly affect fires in warehouses. For instance, storage of dangerous materials is associated with risk of series of ignition and explosion. There is also risk of a disastrous fire even if stored materials are non-combustible materials such as metal and glass products due to a considerable amount of combustibles such as packing materials, wooden pallets and plastic cases.

(2) Risk associated with conditions of stored materials

Stored materials tend to be piled up in warehouses, which lead to operation failure of detectors of automatic fire alarm system, hinder water spraying from sprinklers, cause collapsing of piled materials and create a blind spot by water spraying.

Also, in case of increase in materials to be handled in a warehouse, those materials are sometimes temporarily kept in the vicinity of fire protection equipment and along emergency exit routes. Such materials cause obstruction to the accessing fire extinguishing equipment during firefighting or failure of fire protection system. Consequently, more damages are caused.

(3) Few openings (e.g. window, doorway) in warehouse buildings

Structures of warehouse buildings are characterized by few openings (e.g. doorways and windows)

compared to buildings for general use. This is because the occupancy of warehouses is to store materials, which requires no windows and only a few doorways to carry in and out materials. Having fewer openings is not only an advantage from the viewpoint of security, but also necessary for fixed temperature to be insulated from outside.

Followings are issues when fire breaks out from warehouses with such structures.

- ① In case of power failure by fire, it will be completely dark inside warehouse even during daytime due to a small number of openings.
- ② If exhaustion capacity is insufficient, warehouse will be filled with smoke from fire and smoke damages are caused.
- ③ When heat from fire builds up and increases temperature inside warehouse, flashover may occur as a result.
- ④ Poor accessibility for the public fire brigade

The above-mentioned features make it very difficult to extinguish the fire in warehouses. It is necessary for every personnel to be evacuated from warehouse if initial firefighting is not successful and fire may grow large.

(4) Small number of employees in a warehouse

With increased mechanization, number of employees in the warehouse gets less for the size of the warehouse. Furthermore, it is usual not being attended during nighttime. Consequently, in some cases, fire was not detected at an early stage, or initial firefighting/notification to the public fire brigade had failed because fire grew larger due to delay of employees notifying the alarm of automatic fire alarm system.

2. Summary of Fire Accidents in Warehouses

(1) Fire accidents (Domestic (Japan))

According to a white paper published by FDMA (Fire and Disaster Management Agency) of MIC (the Ministry of Internal Affairs and Communications), the number of fire accidents in warehouses is approximately 500-550 every year during 2013-2015 (Table 1). Although there are some cases where fire occurs more than twice in the same warehouse, if we simply divides the number of fire accidents by number of properties under fire prevention measures (“(a)/(b) ×100” in Table 1), shows about 0.15-0.17%. For the reference, under same analysis for factories and workshops is about 0.32-0.35% (Table 2).

Although the percentages should not be simply compared, fire accidents tend to occur less frequently in warehouses than in factories and workshops.

For reference, the number for properties under compulsory fire prevention measures in Table 1 is the number of facilities which are considered to be relatively large.

Table 1: Number of Fire Accidents in Warehouse

(Source: Created by IRRIC (InterRisk Research Institute & Consulting, Inc.) based on the white papers published by FDMA ¹⁾ ²⁾ ³⁾)

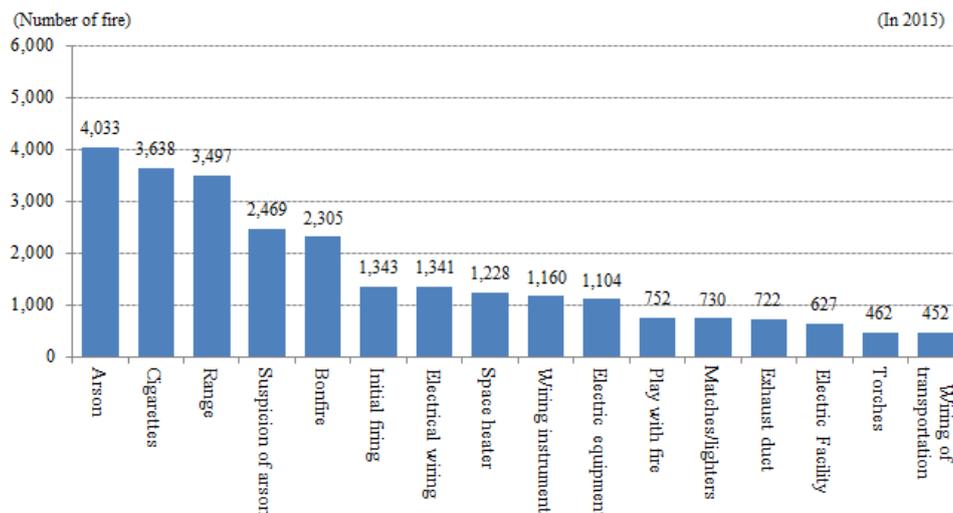
	2013	2014	2015
Number of fire accidents: (a)	558	530	502
Properties under fire prevention measures: (b)	324,813	325,223	325,086
Properties under compulsory fire prevention measures	10,055	10,067	10,054
(a)/(b)×100 (%)	0.172	0.163	0.154

Table 2: Number of Fire Accidents in Factories and Workshops

(Source: Created by IRRIC based on the white papers published by FDMA ¹⁾ ²⁾ ³⁾)

	2013	2014	2015
Number of fire accidents: (a)	1,750	1,714	1,598
Properties under fire prevention measures: (b)	499,333	496,345	492,981
Properties under compulsory fire prevention measures	40,995	39,978	39,775
(a)/(b)×100 (%)	0.350	0.345	0.324

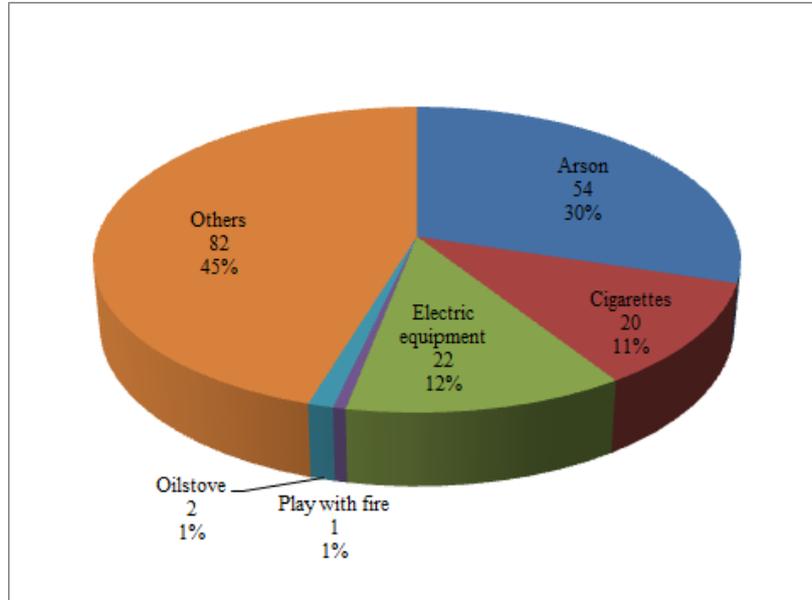
Graph 1 below shows the number of fire accidents in buildings including warehouses by cause of fire based on the white paper by FDMA. Arsons, cigarettes, electrical equipment and wiring devices are ranked high. Meantime, comparison to the similar data in the past indicates that this trend has not changed from the past.



Graph 1: Number of warehouse fire in buildings by cause of fire (2015)

(Source: FDMA ³⁾)

According to Tokyo Fire Department, a total of 181 fires in warehouse occurred in Tokyo Metropolis during the period of eight years between 2008 and 2015. Following graph shows number of fire accidents in warehouses by cause of fire. It indicates that arsons, cigarettes and electrical equipment are the major contributor of fire caused in warehouses.



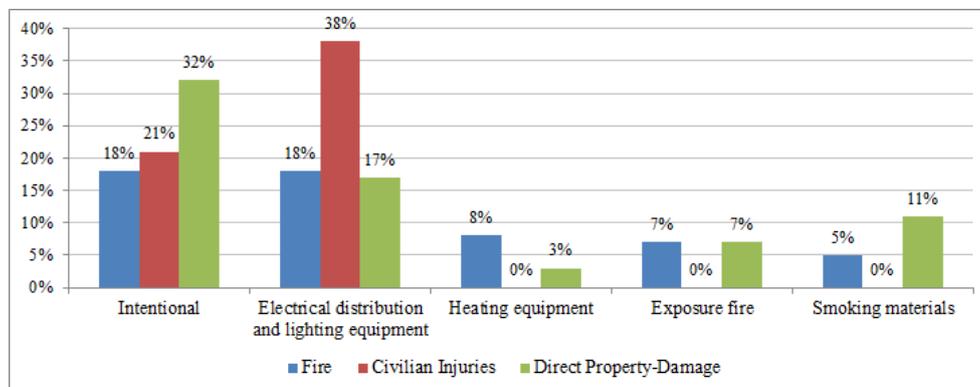
Graph 2: Number of warehouse fire in Tokyo by cause of fire (2008-2015)

(Sources: Created by IRRIC based on Actual Condition Survey of Fire Incident by Tokyo Fire Department ⁴⁾)

(2) Fire accidents in USA

According to the survey by NFPA (National Fire Protection Association), 1,210 fires in warehouses occurred on average per year during 2009-2013 with 3 people reported dead and 19 people injured. Direct property damages by fire in warehouses were USD 155 million.

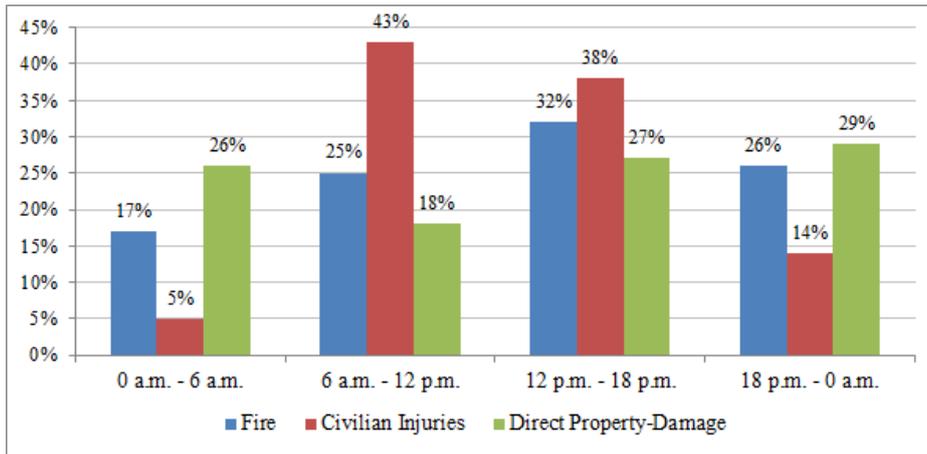
Graph 3 shows the number of fires in warehouses, injured and direct property damage on annual average by the five leading causes (2009-2013). Similarly to Japan, arsons, electrical equipment/wiring and cigarettes are the major causes of warehouse in USA. Meantime, “heating equipment” includes heater of laminators which are commonly used for packing operation and “open fire” includes welding and cutting sparks and heating equipment. Both of them should be handled with care.



Graph 3: Warehouse fire by leading cause (2009-2013) (annual average)

(Source: Created by IRRIC based on the data by NFPA ⁵⁾)

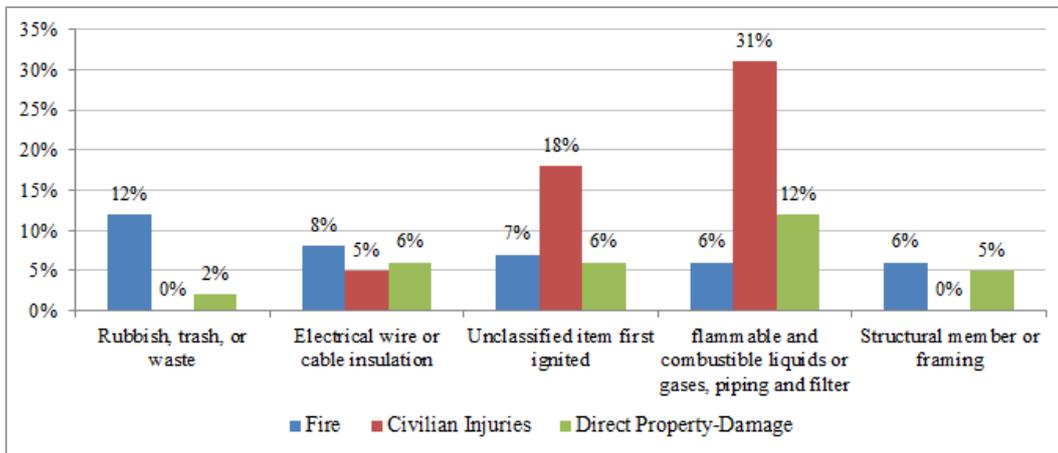
Graph 4 shows the number of fire accidents, injured and direct property damage on annual average by time zone. Fire accidents can occur during nighttime and midnight when there is nobody or only a few workers in the warehouse and result in higher percentage of direct property damage. Although there is difference of social security levels in Japan and USA, it is common that warehouses are located in isolated areas. Thus, it is necessary to be vigilant against suspicious fires such as arsons and it is necessary to take security measures.



Graph 4: Warehouse fire by time of day (2009-2013) (annual average)

(Source: Created by InterRisk Research Institute & Consulting, Inc. based on the data by NFPA⁵⁾)

Graph 5 shows number of fires in warehouse, injuries and direct property damage on annual average by item first ignited (2009-2013). While wastes and rubbish contribute most to the number of fire accidents, they do not cause much human and property damages. On the other hand, hazardous natures of flammable liquids and combustible gases cause more injuries and direct property damages. Thus, it is required to store and handle flammable liquids and combustible gases under strict control.



Graph 5: Warehouse fire by item first ignited (2009-2013) (annual average)

(Source: Created by InterRisk Research Institute & Consulting, Inc. based on the data by NFPA⁵⁾)

3. Case studies and lessons from the fire accidents in the past

In this chapter, we will look distinctive cases of fires in warehouses and explain lessons to be learned from these cases.

(1) Securing of continuous fire water supply

<<Case 1>>

Fire, which broke out in rack storage, seemed to be contained by sprinkler system and sprinkler control valves were shut off to reduce water damages. However, fire started again from the embers after a while. As the sprinkler control valves were closed and fire water was not supplied, fire spread and caused massive damages.

<<Case 2>>

There is the power cable for fire pump across the ceiling directly over the area of fire origin. Fire pump failed 10 minutes after fire broke out. Furthermore, it was found that standby diesel fire pump was not able to be activated, which caused a delay in firefighting and lead to major loss.

⇒ **Lesson**

Fire pump should be operable until fire is completely brought under control or contained by fire extinguishing equipment. In addition, it is necessary that fire pumps should be installed based on proper design. It is also required to conduct daily inspection and periodic startup test and repair according to the result of inspection and testing to maintain them in a good working condition.

(2) Importance of recognition of fire and notification

<<Case>>

Fire broke out in the warehouse. A worker who happened to be at the scene used the nearby fire extinguisher and tried to extinguish fire with it. However, it was not successful. Thus, the worker went to find another fire extinguisher and tried the same thing again. Another worker recognized the situation and rush for help. However, the fire had already grown up and they couldn't contain the fire in time. Consequently, it developed into a large fire.

⇒ **Lesson**

Once fire spreads in warehouses where a large amount of combustibles is stored, it cannot be extinguished by initial firefighting using fire extinguishers and hydrants. Thus, it is important for personnel who spots fire to notify the public fire brigade and private firefighting team and ask for help. In order to prevent further damages by delay in notification, it is necessary to educate employees so that they will promptly notify the public fire brigade and private firefighting team when they spot the fire. It is required to establish emergency response procedures and conduct periodic training.

(3) Consideration about impact on surrounding environment by firefighting

<<Case 1>>

Fire broke out in the storage facility of chemicals for chemical plant. Public fire brigade conducted firefighting using a vast amount of water, which caused about 30-ton toxic chemicals flow into a river. It caused contamination about a-40km long in the river

<<Case 2>>

Fire occurred in a warehouse where paints etc. are stored. The warehouse was located directly above the groundwater layer and it was considered that fire water would cause negative impact on the groundwater if fire water was discharged. Thus, in order to prevent contamination of groundwater layer, use of water for firefighting was stopped and let fire to burn the warehouse completely. With collection of all discharged water from sprinklers, no contamination was caused to the groundwater layer.

⇒ **Lesson**

In a warehouse where hazardous substances are stored/handled, or a large volume of fire water is expected to be used for firefighting, it is critical to establish firefighting procedures taking into consideration of the impact on the surrounding environment (e.g. river, lake, swamp, sea, groundwater layer). If there are residential and commercial areas in the neighborhood, it is necessary to consider flying sparks and odor in case of fire.

(4) Proper installation of fire extinguishing equipment suitable for the characteristics of stored materials

<<Case>>

Fire broke out in a warehouse. Initial firefighting was conducted with sprinklers but it was not successful. Fire spread and developed to cause damages in a large area. Although it was requested to install sprinkler system which was suitable for the characteristics (e.g. heat of combustion, heat radiation, flame propagation) of the stored materials in the warehouse, combination of stored materials and sprinkler system was inappropriate.

⇒ **Lesson**

It is necessary to consider installation of the most suitable fire extinguishing equipment based on the fire characteristics of stored materials.

(5) Importance of fire compartmentation

<<Case>>

The warehouse was essentially segregated into two fire compartments (about 90,000m² and 20,000 m²) by fire walls. Fire occurred in the large fire compartment and spread. Fire walls effectively prevent fire spreading to the small fire compartment. The fire caused significant damage in the large compartment, but only minor smoke and heat damages in the small compartment.

⇒ **Lesson**

This is a good example of prevention of total loss of a warehouse by fire walls. Fire compartmentation with fire walls, fire doors and fire shutters etc. is effective to prevent not only spreading of fire but also spreading of smoke and propagation of heat. It is important to conduct housekeeping in the vicinity of fire doors and fire shutters, remove materials which cause obstruction to them and maintenance to ensure that they are operable all the time.

4. Important point for fire preventive measures

When fire breaks out in a warehouse and initial firefighting fails, there is a high risk of major loss due to characteristics of the use of warehouses. Therefore, fire prevention management should be conducted thoroughly. Followings are the list of key considerations for fire prevention measures in warehouses.

- Generally, high fire risk operations and handling are not conducted in warehouses. However, it is necessary to be careful about fire from electrical equipment/devices, electrical wires and suspicious fire such as arson during night time when there is no/a few personnel inside warehouse.
- It is important to practice good housekeeping of stored materials on a daily basis and maintain equipment/devices and fire protection system in a good condition.
- It is important to notify the public fire brigade and private firefighting team promptly and extinguish fire at an early stage when fire occurs.

In this chapter, in addition to the above items, key considerations for fire prevention in warehouses are listed as below. Please utilize the checklist at the back of this report as a reference.

(1) Stored materials

- Stored materials should not obstruct daily operation and various inspections in the warehouse. Passageways must have enough space which can also be used as evacuation routes.
- Stored materials should not be kept in the vicinity of switchboard and heater of the laminators for packing operation and heating equipment. Protective guards should be installed depending on the condition of installation of devices/equipment.
- Stored materials should be kept at least 0.5m away from lighting fixtures.
- Stored materials should be kept so that they do not hinder water spraying from sprinkler head.
- Stored materials should not be kept in the vicinity of fire doors and evacuation exits.
- When stored materials include dangerous materials such as flammable liquids, oxidizing agent and aerosol products etc., those should be appropriately stored separately in exclusive cabinet from other general stored materials.
- When stored materials include chemical substances, those should be stored appropriately as to avoid chemical reaction due to fire / firefighting.

(2) Electric facility/equipment, cable wiring

- Conduct periodic maintenance and inspection of electric facility/equipment to maintain the good condition.
- Prevent from plugging many leads into one electric outlet and temporary electric wiring.

(3) Battery charging for forklifts

- Prevent storing combustibles within 2m from forklifts and battery charger.
- Secure the battery charger by clearly indicating demarcation line on the floor.
- Locate battery charging in well-ventilated area where combustible gas will not accumulate or install exhaust system.
- When battery charge is carried out, always check that electric wire cabling (including switch, socket, plug, cable and etc.) and connecting point has no faulty part, deterioration and corrosion.
- Check the battery periodically for any abnormality.
- When battery charging is completed, pull out the charging cable and turn off the power.

- Store battery charging cable in the exclusive cabinet.

(4) Heating devices

- Avoid using portable heating devices (oil stove, electric stove etc.) inside warehouse.
- When installing a fixed heating device, protect it with suitable guards etc.

(5) Management of hot works and contractors

- Permit system should be adopted for hot works such as welding and fusion cutting for building/facility repair work etc.
- When carrying out the work, permit should be put up, cover the area with noncombustible material, provide fire extinguishers and a supervisor to be present at the site.
- Work site should be inspected for embers 1-2 hours after the completion of the work.

(6) Smoking control

- Prohibit smoking inside warehouses.
- Designated smoking area should be outside the warehouse, and any smoking enclosure should be of noncombustible construction.
- Prevent keeping dangerous/combustibles in the premises of smoking area.
- Use metal ashtray and provide water jug to extinguish fire on cigarettes completely.

(7) Housekeeping

- Conduct housekeeping and cleaning after work.
- Conduct periodic cleaning under shelves, lift shafts and conveyor belts as to prevent from unnecessary materials to be kept or from dust to accumulate in these areas.
- Conduct periodic cleaning around pipes, beams, ducts, machinery/equipment, and electric sockets.

(8) Inspection at end of the work day

- Conduct inspection throughout a warehouse after work and record the inspection result.
- Inspection should include followings.
 - ✓ No remaining of unnecessary materials and dusts
 - ✓ Power of machine/equipment are turn off except for necessary items.
 - ✓ Fire alarm system, fire protection system and security system are kept in good working condition.

(9) Firefighting plan

- Establish firefighting plan. Clearly state the procedure in case of fire and make all employees to follow the procedure.
- Conduct periodic training for evacuation/reporting so that appropriate action can be taken in case of fire.
- Conduct periodic training for usage of fire extinguisher and other firefighting equipment.
- Conduct periodic safety patrol to check on 5S situation, firefighting equipment maintained to operate appropriately and emergency procedure are understood among employees.
- Consider the impact on the surrounding environment from drainage of fire water due to firefighting and also to consider impact of flying sparks or odor for neighboring areas.

(10) Firefighting and prevention system/equipment

- Conduct inspection of firefighting equipment, fire alarm system and emergency evacuation equipment based on laws and regulations.
- When installing firefighting equipment it is necessary to consider installation of the most suitable equipment based on the characteristics of stored materials.
- Secure access pass for fire brigade coming in from outside.
- Secure spaces around following areas to ensure the smooth operation in case of fire. Also put up a clear signage (location mark) so that it can be found easily from a distance.
 - ✓ Firefighting equipment (sprinkler system, internal hydrant, external hydrant, fire extinguisher etc.)
 - ✓ Fire alarm system (Manual)
 - ✓ Evacuation equipment (evacuation ladder, emergency exit light, emergency lighting system etc.)
- Prevent keeping combustibles and other unnecessary items around fire door / shutter. Indicating demarcation line on the floor to prohibit material to be kept around these areas.

(11) Security

- Surround the premises with fence/wall etc.
- Install night lights around fences and buildings.
- Secure building entrance/exit doorways and windows thoroughly by lock.
- Conduct entrance management for any persons (including employees) entering the premises by biometrics authentication system etc.
- Install security cameras / infrared sensors etc. at gates and entrance/exit doorways.
- Conduct periodic patrol day and night by security guards or employees.
- Activate security system if premise is unmanned at night time.
- Unused pallets/plastic boxes which are stored outside of buildings should be kept well away from buildings and from boundary of the premises.
- Prohibit from putting combustibles around unloading/loading area and under sheds after working hours.
- Waste material storage should be located well away from buildings and boundary of the premise. If it is difficult to locate in such an area, waste material storage should be secured thoroughly by lock.

5. Conclusion

It is necessary to strongly keep in mind that when initial responses are delayed warehouse fire may result in a disastrous damage/loss. The impact would be incalculable as damage from fire will not be limited only to the property damage but it will cause additional losses due to business interruption, loss of customer due to interruption of logistics/supply chain and negative impact to surrounding premises and environment. It is important to always keep in mind the safety consciousness such as housekeeping and especially to properly understand the counter procedure in case of emergency.

Also as to conduct effective initial firefighting and to minimize the loss, it is important to consider appropriate designing and installation regarding firefighting equipment/fire compartment.

In recent years, due to growth of mail-order industry, warehouses are becoming large and at the same time unmanned automated operations are expedited. As a result warehouse fire may become more serious issue.

It is important to conduct loss prevention measures by thorough risk assessment taking into consideration the occupancy/characteristics of building structure etc.

Specialist engineers in our company conduct a fire risk survey. We provide various solutions to fire risks such as comprehensive fire risk assessment, water discharge pattern simulation of firefighting equipment based on the risk survey. Please kindly contact us if you need any support/assistance in considering loss prevention measures for your company.

Nobuhiro Yoshimura
Manager, Senior Consultant
Risk Engineering Department

<References>

- 1) Firefighting white paper 2014: Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications
<http://www.fdma.go.jp/html/hakusho/h26/h26/index3.html>
- 2) Firefighting white paper 2015: Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications
<http://www.fdma.go.jp/html/hakusho/h27/h27/index3.html>
- 3) Firefighting white paper 2016: Fire and Disaster Management Agency of the Ministry of Internal Affairs and Communications
<http://www.fdma.go.jp/html/hakusho/h28/h28/index.html>
- 4) Actual Condition Survey of Fire Incident 2009 – 2016: Tokyo Fire Department
<http://www.tfd.metro.tokyo.jp/hp-cyousaka/kasaijittai/>
- 5) Structure Fires in Warehouse Properties, January 2016, Richard Campbell, NFPA
<http://www.nfpa.org/~media/files/news-and-research/fire-statistics/occupancies/oswarehouse.pdf?la=en>

(Reference) Loss Prevention Check Sheet

STORED MATERIAL		
Passageways in the warehouse have enough space for daily operation and various inspections. Also space is enough for it to be used as evacuation route.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
No stored materials are kept in the vicinity of switchboard and heating machine/equipment.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Stored materials are kept at least 0.5m away from lighting fixtures.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Stored materials are kept not to hinder water spraying from sprinkler head.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Stored materials are not kept in the vicinity of fire doors and evacuation exit.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
In case stored materials include flammable liquids and dangerous materials, those are stored separately in exclusive cabinets from other general stored materials.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
In case stored materials include chemical substances, those are stored appropriately to avoid chemical reaction due to fire / firefighting.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
ELECTRIC FACILITY/EQUIPMENT, CABLE WIRING		
Periodic maintenances and inspections are conducted for electric facility/equipment.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Plugging many leads into one electric outlet and temporary electric wiring are prohibited.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
BATTERY CHARGING FOR FORKLIFT		
Storing combustibles within 2m from forklifts and battery charger are prohibited.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Battery charging area is compartmented.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Battery charging area is located at well-ventilated area where combustible gas will not accumulate. Or installed with exhaust system.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
When battery charging is carried out, electric wire cabling (including switch, sockets, plug, cable etc.) and connecting point are checked.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Battery is periodically inspected.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
When battery charging is completed, charging cable is pulled out and power is turned off.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Battery charging cable is stored in exclusive cabinet.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
HEATING DEVICE		
Use of portable heating device is prohibited in warehouses.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Fixed heating equipment is protected by suitable guards when installed.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
MANAGEMENT OF HOT WORKS AND CONTRACTORS		
Permit system is adopted for hot works such as welding and fusion cutting.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
When hot work is carried out, permit is put up, the area is covered by noncombustible material, fire extinguishers are provided and a supervisor is present at site.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Work site is inspected for embers 1-2 hours after completion of the work.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
SMOKING CONTROL		
Smoking is prohibited in warehouses.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Designated smoking area is outside warehouses and any smoking enclosure is of noncombustible structure.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Smoking area is free of dangerous materials and combustibles.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Metal ashtray is used and water jug is provided to extinguish fire on cigarettes.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
HOUSEKEEPING		
Housekeeping and cleaning is conducted after work.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Periodic cleaning under shelves, lift shafts and conveyor belts are conducted.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Periodic cleaning around pipes, beams ducts, machinery/equipment and electric sockets are conducted.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
INSEPTION AT END OF THE DAY		
Inspection throughout a warehouse after work is conducted and the inspection result is recorded.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Following items are included in the inspection. <ul style="list-style-type: none"> ➤ No remaining of unnecessary materials and dusts ➤ Power of machine/equipment are turn off except for necessary items. ➤ Fire alarm system, fire protection system and security system are kept in good working condition. 	<input type="checkbox"/> Yes	<input type="checkbox"/> No
FIREFIGHTING PLAN		
Firefighting plan is established. It clearly states the procedure in case of fire and all employees well understand the procedure.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Periodic training for evacuation/reporting is conducted so that appropriate action can be taken in case of fire.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Periodic training is conducted for usage of fire extinguisher and other firefighting equipment.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Periodic safety patrol is conducted to check on 5S situation, firefighting equipment maintained to operate appropriately and emergency procedure are understood among employees.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
The impact on the surrounding environment from drainage of fire water due to firefighting and the impact of flying sparks or odor for neighboring areas are considered.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
FIREFIGHTING AND PREVENTION SYSTEM/EQUIPMENT		
Inspection of firefighting equipment, fire alarm system and emergency evacuation equipment is carried out based on laws and regulations.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Access pass for fire brigade coming in from outside is secured.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Spaces around firefighting equipment, fire alarm system and evacuation equipment are secured to ensure the smooth operation in case the fire. Clear signage (location mark) is put up so that it can be found easily from a distance.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Keeping combustibles and other unnecessary items around fire door / shutter is prohibited. Demarcation lines are indicated on the floor to prohibit material to be kept around these areas.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
SECURITY		
The premises are surrounded by fence or wall etc.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
There are night lights installed around fences and buildings.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Building entrance/exit doorways and windows are secured thoroughly by lock.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Entrance management for any persons (including employees) entering the premises is conducted by biometrics authentication system etc.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Security cameras / infrared sensors etc. at the gates and entrance/exit doorways are installed.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

Periodic patrol is conducted day and night by security guards or employees.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Security system is activated if premise is unmanned at night time.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Unused pallets/plastic boxes which are stored outside of the building are kept well away from building and from boundary of the premises.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Putting combustibles around unloading/loading area and under sheds after working hours is prohibited.	<input type="checkbox"/> Yes	<input type="checkbox"/> No
Waste material storage is located well away from buildings and boundary of the premise. If it is not located in such an area, waste material storage is secured thoroughly by lock.	<input type="checkbox"/> Yes	<input type="checkbox"/> No

This report is written based on information open to public (news and other medias). The purpose of this report is to provide our customers with the useful information and has no intention to criticize any individuals and parties etc.

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