



# Participant Handbook

Sector  
**Logistics**

Sub-Sector  
**Warehousing (Storage & Packaging)**

Occupation  
**Storage**

Reference ID: **LSC/Q2105, Version 3.0**  
**NSQF Level 3**



Scan the QR code to access the ebook

## Warehouse Binner

**This book is sponsored by**

Logistics Sector Skill Council

Logistics Sector Skill Council Contact Details:

Address: No.480 A, 7th floor Khivraj Complex 2,

Anna Salai, Nandanam,

Chennai - 600 035.

Email: reena@lsc-india.com

Phone: 044 4851 4607

Under Creative Commons License: CC-BY –SA



This license lets others remix, tweak, and build upon your work even for commercial purposes, as long as they credit you and license their new creations under the identical terms. This license is often compared to “copyleft” free and open-source software licenses. All new works based on yours will carry the same license, so any derivatives will also allow commercial use. This is the license used by Wikipedia and is recommended for materials that would benefit from incorporating content from Wikipedia and similarly licensed projects.





**Shri Narendra Modi**  
Prime Minister of India

“ Skilling is building a better India.  
If we have to move India towards  
development then Skill Development  
should be our mission. ”



**COMPLIANCE TO  
QUALIFICATION PACK - NATIONAL OCCUPATIONAL  
STANDARDS**

is hereby issued by the

**LOGISTICS SECTOR SKILL COUNCIL**

for the

**SKILLING CONTENT: PARTICIPANT HANDBOOK**

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Warehouse Binner'** QP No. **'LSC/2102,V3.0 NSQF Level 3'**

Date of Issuance: 27/01/2022

Valid up to\*: 27/01/2025

\*Valid up to the next review date of the Qualification Pack  
'Valid up to' date mentioned above (whichever is earlier)

Authorized Signatory  
(Logistics Sector Skill Council of India)

## Acknowledgements

We thank the following organizations for endorsing the contents of this Participant Handbook, thus contributing towards skilling based on the Qualification Pack (QP) and National Occupational Standards (NOSS).



## About this Book

This Participant Handbook is designed to facilitate training to the Warehouse Binner Qualification Pack (QP). It provides learners with the necessary knowledge to major warehousing topics, such as loading, unloading, receiving, sorting, put away, picking, packing and binning, getting knowledge on various storage area in the warehouse. Its decision-making orientation provides a real-world approach focusing on large and small warehouse industry. The book elaborates how Individuals in this position to perform general physical activities for binning materials in the warehouse storage area and understand other operations. The handbook is divided into 4 NOSs. NOSs are Occupational Standards which have been endorsed and agreed to by the Industry Leaders for various roles. The NOSs are based on the educational, training and other criteria required to perform the job/role of a Warehouse Binner.

### Key characteristics of this handbook:

- (i) It discusses concept of warehouse binner in an easy to learn manner.
- (ii) It presents warehousing concepts in interactive and professional way.
- (iii) It gives opportunity to learners to visualize themselves in a professional warehouse set-up.

## Symbols Used



Key Learning  
Outcomes



Summary



Unit  
Objectives



Tips



Notes



Exercise

## Table of Contents

S. No	Modules and Units	Page No
1.	<b>Introduction</b>	<b>1</b>
	Unit 1.1 - Supply Chain Management	4
	Unit 1.2 - About the Course	9
	Unit 1.3 - Importance of Warehouse in Supply Chain	12
	Unit 1.4 - Roles and Responsibilities of a Warehouse Binner	23
2.	<b>Preparation for Binning (LSC/N2101)</b>	<b>27</b>
	Unit 2.1 - Receiving packages	29
	Unit 2.2 - Checking process for received packages	35
	Unit 2.3 - Pre-packing and storing	45
	Unit 2.4 - Safety, Security and Maintenance Aspects	48
	Unit 2.5 - Safety Importance of PPE	56
3.	<b>Perform Binning Activities (LSC/N2102)</b>	<b>59</b>
	Unit 3.1 – Storages and Equipment used	61
	Unit 3.2 - Understanding Labels, Technologies and Signages	72
	Unit 3.3 – Warehouse binning	78
4.	<b>Perform Post binning Activities (LSC/N2103)</b>	<b>82</b>
	Unit 4.1 - Perform Post Binning Activities	84
	Unit 4.2 - Understanding the Technical knowledge on Operations	93
	Unit 4.3 - Exposure to Documents	95
5.	<b>To Carry Out Housekeeping (LSC/N2104)</b>	<b>101</b>
	Unit 5.1 - To Carry Out Housekeeping	103
	Unit 5.2 - Occupational / Environmental Health and Safety	115
6.	<b>Employability Skills - 30 hours (DGT/VSQ/N0101)</b>	
	The book on New Employability Skills is available at the following location:	
	<a href="https://eskillindia.org/NewEmployability">https://eskillindia.org/NewEmployability</a>	
	Scan the QR code below to access the ebook	









**Skill India**  
कौशल भारत - कुशल भारत



सत्यमेव जयते  
GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT  
& ENTREPRENEURSHIP



**N · S · D · C**  
National  
Skill Development  
Corporation

Transforming the skill landscape



# 1. Introduction

Unit 1.1 - Supply Chain Management

Unit 1.2 - About the Course

Unit 1.3 - Importance of Warehouse in Supply Chain

Unit 1.4 - Roles and Responsibilities of a Warehouse Binner



## Key Learning Outcomes



**At the end of this module, participants will be able to:**

1. Describe Supply Chain and Logistics Management
2. Detail the various sub-sectors and the opportunities in them
3. Describe the organizational structure in warehousing industry
4. Explain warehousing industry and opportunities in it
5. Define your job roles and responsibilities as a Warehouse Binner
6. Explain the various operations in warehouse and their importance in effective logistics
7. Describe the various functions / operations of the warehouse
8. Explain the major activities that are performed inside a warehouse
9. Discuss the employment opportunities in the industry
10. Define the putaway activities

## UNIT 1.1 - Supply Chain Management

### Unit Objectives

**At the end of this unit, participant will be able to:**

1. Define Supply Chain Management
2. Define Logistics Management
3. Explain the important flows in Supply Chain Management

### 1.1.1 What is Supply Chain Management?

Supply Chain Management envelops all activities starting from point of origin through point of consumption till End of Life of the Product or Service. It includes Planning and execution part of satisfying the customers' demand.

**Supply Chain definition** The movement of materials as they flow from their source to the end customer. Supply Chain includes purchasing, manufacturing, warehousing, transportation, customer service, demand planning, supply planning and Supply Chain management. (Source:CII-IL)

Supply chain management is an integrating function with primary responsibility for linking major business functions and business processes within and across companies into a cohesive and high-performing business model. It includes all of the logistics management activities noted above, as well as manufacturing operations, and it drives coordination of processes and activities with and across marketing, sales, product design, finance, and information technology.

### 1.1.2 Introduction to Supply Chain Management

A supply chain is a network of facilities and distribution options that performs the functions of procurement of materials, transformation of these materials into intermediate and finished products, and the distribution of these finished products to customers. Supply chains exist in both service and manufacturing organizations, although the complexity of the chain may vary greatly from industry to industry and firm to firm.

Supply chain management is typically viewed to lie between fully vertically integrated firms, where the entire material flow is owned by a single firm and those where each channel member operates independently. Therefore coordination between the various players in the chain is the key in its effective management.

Below is an example of a very simple supply chain for a single product, where raw material is procured from suppliers, transformed into finished goods in a single step, and then transported to distribution centers, and ultimately, customers. Realistic supply chains have multiple end products with shared components, facilities and capacities.

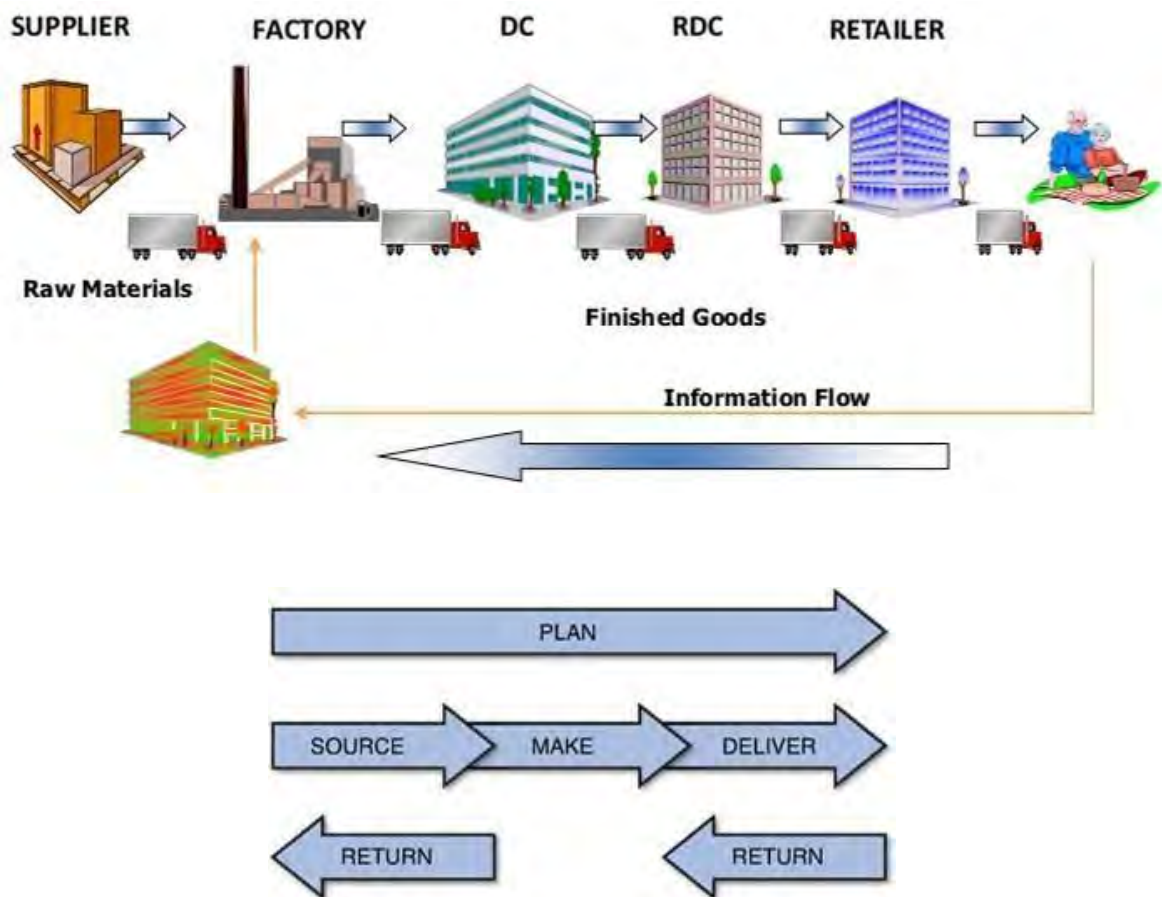


Fig 1.1.1 Components of Supply Chain Management

As per SCOR , the five important components of Supply Chain Management are -

**PLAN - SOURCE- MAKE- DELIVER- RETURN** sourcing Raw Material.

**SOURCE:** This is the step where we must

**PLAN:** This stage addresses how customer demand will be met through the supply. As can be seen in the picture, Plan function interacts with Customer to get demand forecast. This gets translated into Supply Plan and communicated to the Supplier for identify the various possible vendors for the raw materials required for the manufacturing. Just identifying suppliers will not be enough. It should also include the availability of products, the cost involved, ease in transporting goods and even the payment terms.

**MAKE:** The third component involves designing, producing, testing, packaging and then synchronizing all these activities for delivery. The raw material from suppliers is transformed into finished goods for the customer.

**DELIVER:** This stage involves delivering the right product at the right place at the right time in the right quantity and at the right price. Here the supply chain transports the Finished Goods from

Factory to the Warehouses, Warehouse to Distributors, Distributors to Retailers and finally Retailers to final consumer.

**RETURN:** This is the latest stage in supply chain, which is becoming increasingly important. Here the defective, damaged or even the rejected goods are returned by the customer. The supply chain must respond to the customer quickly and return the goods by optimizing the cost.

### Enterprise Resource planning (ERP)

Enterprise resource planning (ERP) is a suite of integrated applications that a company uses to connect its business activities across departments so that everyone is working with the same data and processes. Companies can use it to streamline and improve the efficiency of their operations, which saves time and money. In the course of implementing ERP, companies can also standardize and automate many business processes, which eliminates manual time and effort.

The ERP tools that a company selects often depend upon the specific business processes it wants to improve, and also upon whether it is selling products or services. Businesses that sell products often have manufacturing, supply chain and distribution functions that the ERP system must address. For organizations that sell services, ERP capabilities such as project management for service engagements and support for field services and sales operations are very important.



Fig 1.1.2: ERP system

### 1.1.3 What is Logistics Management?

**Logistics Management** is that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverse flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements. (Source: CSCMP)

Supply chain management essentially ensures three flows:

- Product flow / Service Flow
- Information Flow
- Finance/Money Flow

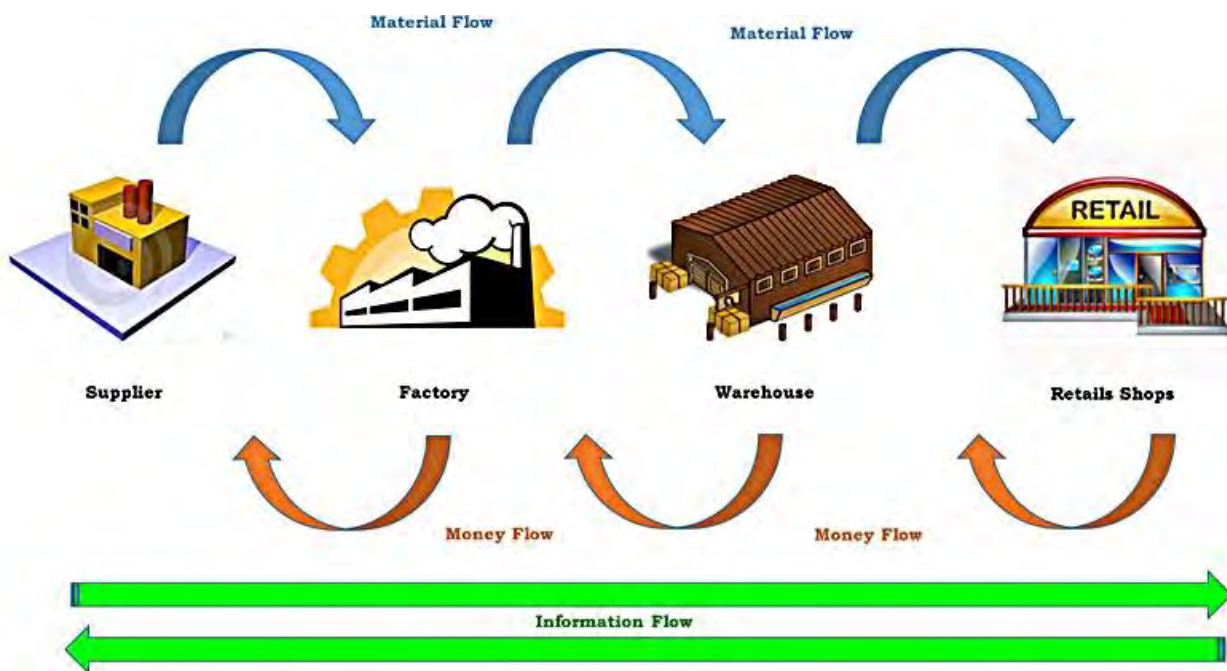


Fig 1.1.3: Supply Chain Flow

The product flow is the movement of goods from supplier to customers and customer to manufacturer in case of any customer returns or service requirements.

The information flow covers updating the status of the delivery as well as sharing information between suppliers and manufacturers. Information flow is supposed to happen on a real time basis, without any distortion and delay to ensure demand is met with correct supplies. The information flow in the supply chain includes the market signaling amongst the supply chain members regarding end-user preferences.

The finance flow is the result of first two flows that encompasses credit terms, payment schedules and consignment and title ownership arrangements. A Warehouse picker work in a warehouse environment where their prime duty is to pick up orders and deliver them to the delivery platform for the benefit of customers. They are expected to pick customer orders for shipment keeping in mind the quantity and type that is specified in the Pick list.

## Notes



---

---

---

---

---

---

---

---

## UNIT 1.2 - About the Course

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the importance of a Warehouse Binner
2. Describe the organisation structure and reporting protocols
3. Elucidate the main objectives of this course

### 1.2.1 Warehouse Binner

Bin is the smallest unit of space in a warehouse. It defines the place and position where the shipment is or can be stored. This is a main part of the supply chain controlling the movement and storage of goods and/or materials within a warehouse, while processing the associated transactions, including shipping, receiving, put away and picking.

The concept of binning is like storing material in our home refrigerator. There are different areas dedicated for different types of material. Deep freezer to store refrigerated material. Vegetable basket to store vegetables. Egg plates to store egg. Door shelves to store water bottle and inner shelves to store dairy products. Same is the concept of bins in warehouse.

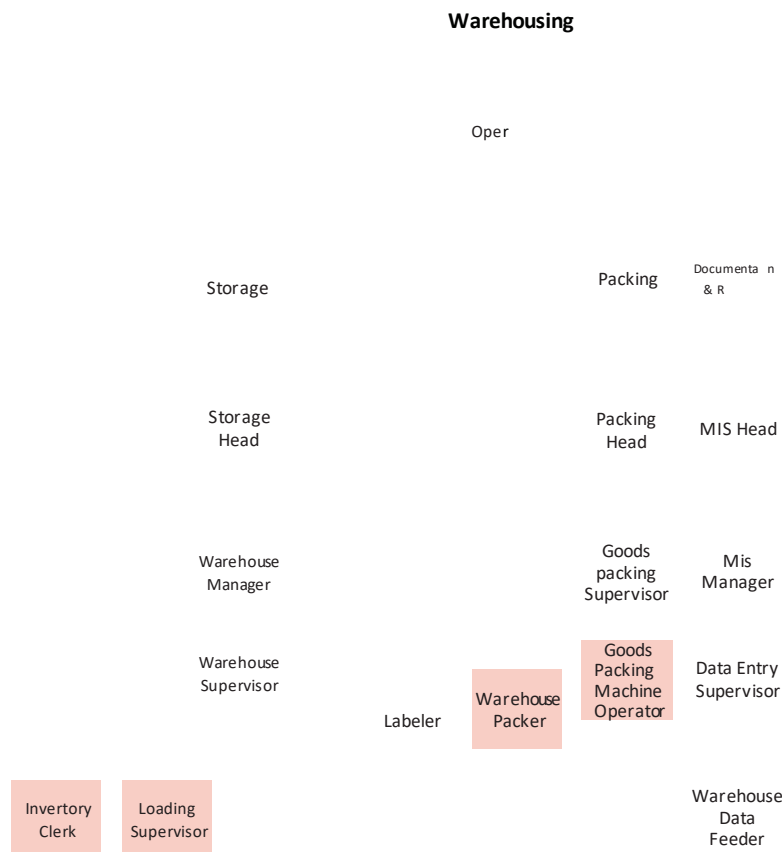


Fig 1.2.4: Warehouse Binner



Warehouse Binner in the Logistics industry is also known as Binner, Floor Staff, Warehouse Associate.

Individuals in this role need to bin items to put away into storage. Individuals are responsible for binning items according to an inventory list. Additional responsibilities could at times include moving cargo, repackaging items and documenting cargo that has been moved. The difference in tasks performed under the Binner role thus varies according to the volume of operations, however the core function of the role is to bin items and put away into storage.

### 1.2.2 Objective of the Course

- The main objective of this course is to make individuals to perform general physical activities in order to load, unload, sort, kit, bin and move products, materials by hand or using basic material handling equipment.
- Train individuals to perform tasks in multi-temperature environments and develop skills to read work orders or receive oral instructions for work assignments, understand various sign boards and other labels.
- Develop skills to read orders to ascertain catalog numbers, sizes, colors, and quantities of merchandise
- Understand how to fill orders from warehouse stock, complete order receipts, and assemble orders in shipping containers
- Educate on usage of technology like barcode scanning, printing and equipment to maintain computerized stock inventory

### 1.2.3. Warehouse processes

Of all warehouse processes, order picking tends to get the most attention. It's just the nature of distribution and fulfillment that you generally have more outbound transactions than inbound transactions, and the labor associated with the outbound transactions is likely a big piece of the total warehouse labor budget. Another reason for the high level of importance placed on order picking operations is its direct connection to customer satisfaction. The ability to quickly and accurately process customer orders has become an essential part of doing business.

The methods for order picking vary greatly and the level of difficulty in choosing the best method for your operation will depend on the type of operation you have. The characteristics of the product being handled, total number of transactions, total number of orders, picks per order, quantity per pick, picks

per SKU, total number of SKUs, value-added processing such as private labeling, and whether you are handling piece pick, case pick, or full-pallet loads are all factors that will affect your decision on a method for order picking. Many times a combination of picking methods is needed to handle diverse product and order characteristics.

Key objectives in designing an order picking operation include increases in productivity, reduction of cycle time, and increases in accuracy. Often times these objectives may conflict with one another in that a method that focuses on productivity may not provide a short enough cycle time or a method that focuses on accuracy may sacrifice productivity.

- **Productivity.** Productivity in order picking is measured by the pick rate. Piece pick operations usually measure the pick rate in line items picked per hour while case pick operations may measure cases per hour and line items per hour. In pallet pick operations the best measure is actual pallets picked per hour. Since the actual amount of time it takes to physically remove the product from the location tends to be fixed regardless of the picking method used, productivity gains are usually in the form of reducing the travel time.
- **Cycle Time.** Cycle time is the amount of time it takes to get an order from order entry to the shipping dock. In recent years, customer's expectations of companies to provide same day shipment has put greater emphasis on reducing cycle times from days to hours or minutes. Immediate release of orders to the warehouse for picking and methods that provide concurrent picking of items within large orders are ways to reduce cycle times.
- **Accuracy.** Regardless of the type of operation you are running, accuracy will be a key objective. Virtually every decision you make in setting up a warehouse will have some impact on accuracy, from the product numbering scheme, to the design of product labels, product packaging, the design of picking documents, location numbering scheme, storage equipment, lighting conditions, and picking method used. Technologies that aide in picking accuracy include pick-to-light systems, counting scales, and bar code scanners. Beyond the design aspects of an order picking operation, employee training, accuracy tracking, and accountability are essential to achieving high levels of accuracy.

## Notes

---

---

---

---

---

---

---

---

---

---

## UNIT 1.3 - Importance of Warehouse in Supply Chain

### Unit Objectives

At the end of this unit, participant will be able to:

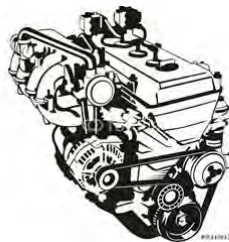
1. Explain the importance of a Warehouse in supply chain
2. Describe the various activities carried inside a warehouse
3. Identify the significance of policies and procedures

### 1.3.1. Why we need a warehouse?

A Warehouse is a place used for storage or collecting of goods, so as to make things available as and when required. There can be different types of goods stored inside a warehouse such as FG- Finished goods, WIP-Work in progress goods, RM-Raw materials etc. Below mentioned figure depicts the different types of goods stored inside a Warehouse and its forms



RM - Raw Material



WIP - Work in Progress



FG - Finished Goods

Fig 1.3.5: Inventory Types



Fig 1.3.6: Transportation Consolidation



Fig 1.3.7: Docking Services

### 1.3.2. Warehouse Activities

After goods are received and before goods are shipped, a series of internal warehouse activities take place to ensure an effective flow of inventories (goods) throughout the warehouse and to organize and maintain company inventories. The following list includes the activities found in most of the warehouses;

1. **Receiving** - Schedule Carrier, Unload Vehicle, Inspect for damage
2. **Put Away** - Identify Product, Identify Product Location, Move Products, Update Records
3. **Storage** - Storage location by popularity, size, cube etc., equipment storage
4. **Order Picking** - Information, Walk & Pick, Batch Picking
5. **Shipping** - Schedule Carrier, Load Vehicle, Bill of Loading, Record Update

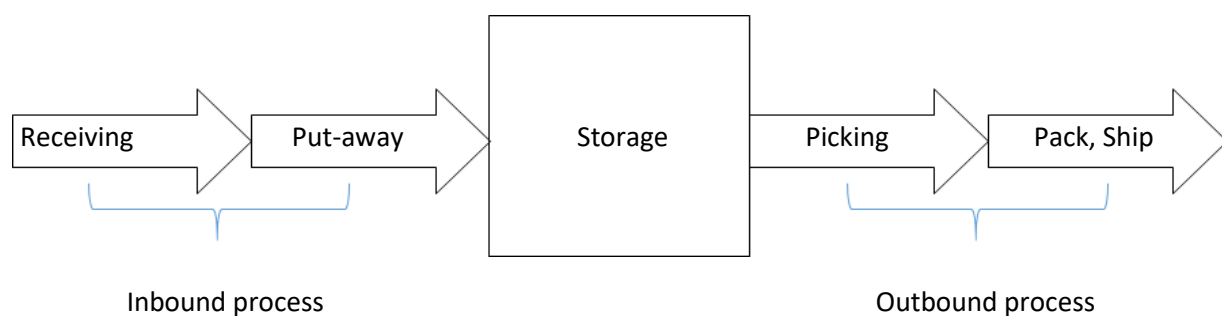


Fig 1.3.8: Warehouse Activities

### 1.3.1. Introduction to warehouse

A warehouse receives stores, reorganizes and repackages products. When products arrive at the warehouse, those will be in larger units such as pallets and when it shipped to customers has to be packed and sent in relatively smaller sizes as cases and individual units. So, the downstream activities are usually labor extensive. This is very true when the product is handled in individual units. For example, to move 10,000 individual boxes of paper clips, the involvement of labor force would be extensive. But, for moving 48 case boxes, the labor requirement is relatively low. It will be even lower for moving a pallet stacked with 24 cases. Ultimately warehouses receive bulk shipments, store them in order to facilitate faster retrieval and them picked, sorted and repacked to smaller units as per customer requirements.

The reorganization of a product involves the following processes.

#### 1. Inbound Processes

- Receiving
- Put-away

#### 2. Outbound processes

- Processing customer orders
- Order-picking
- Checking
- Packing
- Shipping

### 1.3.4. Warehouse Management System - An Introduction

A Warehouse Management System is software used to manage and track the warehouse activities. The primary purpose of WMS is to control the movement and storage of goods and to process the transactions associated with the material movement. This is generally built around an industrial strength relational database product such as Oracle, Informix, DB2, Sybase or other. The activities of WMS includes but not limited to directed picking, directed replenishment and directed put away. The basic logic will use a combination of item, location, quantity, unit of measure and order information to determine where to stock and in what sequence to perform these operations.

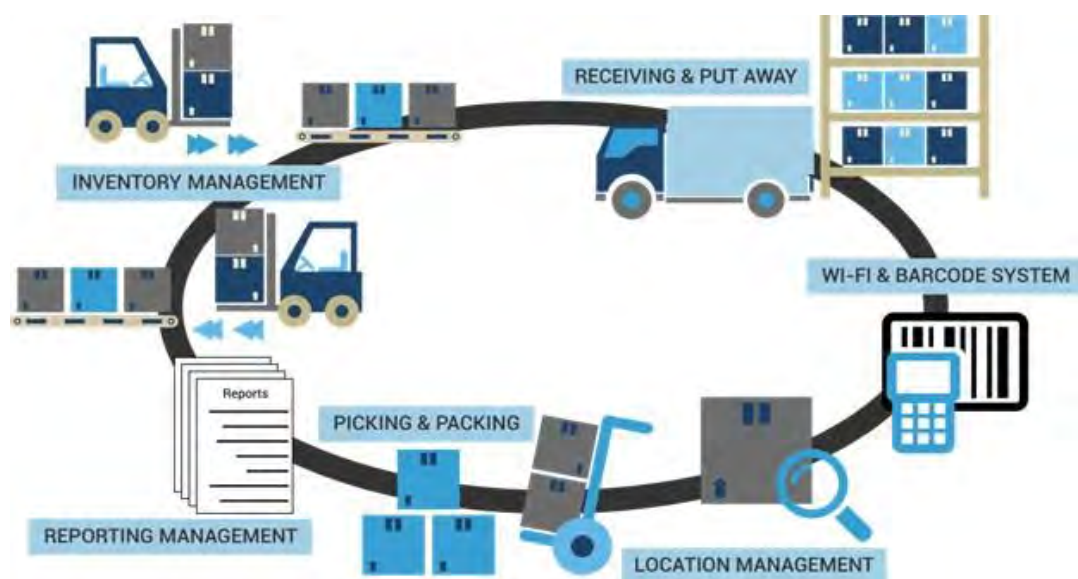


Fig 1.3.9: Warehouse Management System

WMS helps in reducing inventory costs while increasing overall efficiencies. WMS includes

- Warehouse capacity management
- Load Planning
- Cross docking
- Picking optimization
- ABC Stratification

The benefits of WMS includes

- Higher space utilization
- Transparency in storage and accuracy
- Reduction of Inventory carrying cost
- Decrease in shipping errors and thereby cost.

### 1.3.5. Prerequisites for WMS Implementation

WMS requirements are quite extensive. The characteristics of each SKU and their location must be maintained either at the detailed level or by grouping similar items and locations into categories. For example, each SKU characteristics at detailed level includes the weight of an unit and unit measure in which the item is stocked (cases, pallets) and information such as the possibility of mixed storage with other SKU s, feasibility of racking, maximum stack height, maximum quantity per location, hazardous classification, nature of the item (raw material or finished good), popularity of the item etc. But, only some operations require individual item information as mentioned above and most other operations will benefit by creating groups of similar products.

System will decide on the location from which the items are to be picked, replenish into and put-away to. These have to follow a specific logic that has to be assigned to various combination of item/location/order that is likely to occur. Let us have a look at few of such logics below.

**Location sequence:**

The flow through the warehouse is defined and each location is assigned with a sequence number. In order picking, the sequence numbers will help the movement inside the warehouse. But, in put-away the logic would look for the first location in the sequence in which the product can be stored.

**Zone Logic:**

Direct picking, put-away and replenishment to and from specific areas can be done by breaking the storage locations in to various zones. This logic has to be combined with some other logic to determine the exact location within the zone as zone logic can specify the area alone.

**Fixed location:**

Determining fixed locations for specific items that facilitates direct picking, replenishment and put-away. Fixed locations are often used as primary picking locations in piece or case picking.

**Random Location:**

Random locations are referred as the fixed locations that are not assigned with any items. However, some other logic has to be combined to point out the exact location.

**First-in-first-out:**

Picking directed to older inventories first.

**Last-in-first-out:**

This is appropriate for handling perishable products for exports. This logic is the opposite of the previous one; picking from the latest inventory first.

**Unit of measure or quantity:**

Picking based on the quantity or unit-of-measure mentioned in the order. For example, if the order is for 20 items, pick from the fixed locations and for more than 20 go to reserve storage locations.

**Fewest Locations:**

This logic concerns much around the productivity. Pick-from-fewest needs quantity information to allocate least number of locations to store the items. Ultimately the logic finds the fewest possible locations to store the entire quantity of items. Even though, it is attempting to reduce the put-away time and increase the efficiency, it does not hold good in terms of space utilization. Pick-from-fewest will leave small quantities of items scattered in the warehouse and put-to-fewest leaves small locations empty.

**Reserved locations:**

In case of requirement of predetermined specific locations to put-away or pick-from, this logic can be used. While attempting to cross dock, reserved locations can be used to move the specified items to inbound shipping or staging or directly to an awaiting outbound trailer.

**Nearest location:**

This logic looks for the closest location required to put-away or pick from. During setup, it is better to test whether the logic is choosing the shortest route or closest location. The logic always chooses a straight line route for calculating the shortest distance. The logic may suggest the binner a location (straight line calculation) that is 30 feet away, for which the binner has to move 200 feet up and down the aisle while there might be another location available at just 50 feet away in the same aisle. But, for the logic 50 is greater than 30.

**Maximum cube:**

Cube logic uses unit dimensions to calculate cubic inches per unit and then compares it with the cube capacity of a location to determine how much can the location hold. If all units are of equal size and if they can be stacked one over the other, cube logic will work. As it is practically rare, this logic is not relevant to the practical world.

**Consolidate:**

If a location has the same SKU as it appears in a put-away list, the same location can be used, so as to keep the like items consolidated.

**Lot sequence:**

This logic will use lot number or lot date to determine the locations to pick from or replenish into. Combination of logics can fetch good results. For example, if a warehouse has multiple locations with same receipt date, then one may employ pick-to-clear logic with first-in-first-out.

**Other Functionality and Considerations:**

The following are some more considerations for WMS.

- Wave picking / zone picking / batch picking: For high- volume oriented operations picking logic is a critical factor that determines the choice of WMS. Support for various picking logics differs from one system to the other.
- Task Interleaving: Mixing picking and put-away tasks to obtain maximum productivity by reducing travel time, energy cost etc.
- Automated data collection: This can be implemented in the form of RF portable terminals and bar code scanners. ADC hardware choice and WMS software selection determines the savings in setup time.
- Integration with Material Handling Equipment: Automated Material Handling equipment include carousels, ASRS units, AGVs, Pick-to-light systems or sortation systems that can be integrated with the WMS system.
- Advanced Shipment Notification: This helps in automating the receiving process through WMS.
- Cycle counting
- Cross docking
- Pick-to-carton: Selecting the shipping carton prior to picking and then filling the carton. This eliminates the formal packing activity and works well if the products are all of similar size and weight.

- Slotting: Slotting software generally use item velocity, cube usage and minimum pick face dimensions to determine the best location.
- Yard management: The function of managing inventories inside the trailers parked outside the warehouse (the empty trailers too).
- Labor tracking / Capacity Planning: Criteria such as standard labor hours, machine hours per task, available labor are set; using which the WMS determines the capacity and load.
- Activity-based-costing / billing: This allows the third-party logistics operators to calculate the billable amount upon specific activities.
- Integration with existing accounting / ERP systems to reduce cost and to facilitate addition of more modules such as full financials, light manufacturing, transportation management, purchasing and sales order management.

#### **Need for WMS:**

Apart from introducing best practices in warehouse like improving warehouse layout and minimizing travel time by having fast moving items closer to the dispatch area, a software technology in warehouse is likely to improve the warehouse efficiency even more. Customers have become highly demanding nowadays and with the reach of electronic communication technologies, they have started expecting real time response to all their queries. Even Finance, Sales and Marketing teams needs real-time information for their smooth operations.

A stock-control system will manage the inventory at stock location and quantity level but not the productivity of the warehouse. A WMS can process data and coordinate movements within the warehouse thereby increasing the competitiveness and response towards customer demands. Therefore, WMS is an invaluable tool for improving an organization's productivity and customer focus.

### **1.3.6. Storage Systems or Equipment**

Storage system means a region or part where the items are to be stored from which it has to be retrieved with the help of a handling equipment to serve the customer demand. The following are some basic storage modes that are widely used.

#### **Pallet storage:**

Generally in warehouses there are large sizes of packaging called pallets, which is a wooden or plastic base are generally 48 inches by 40 inches (1.22 meters by 1.02 meters). There are several other sizes also.

- 48 inches along one dimension (1.22 meters)
- 32 inches (0.81 meters) for pallets that go directly from the manufacturers to retail display.
- 42 inches (1.07 meters)
- 48 inches (1.22 meters) for transporting 55-gallon steel drums.
- Pallet rack is used for bulk storage and to facilitate full-case picking. As the pallet length and width are reasonably uniform, the pallet rack provides approximately sized-slots. The height of the pallet can very well be adjusted as the pallets may vary in height. The advantage of rack storage is that we can access each of the columns and so it provides greater access. More common types of rack storage are





Fig 1.3.10: Pallet Rack



Fig 1.3.11: Rack storage

- a) Selective rack or single-deep rack that stores in one deep. Each pallet becomes independently accessible because of the rack support and so the possibility of retrieving any pallet from any storage at any level of the rack. But, this requires more aisle space to access the pallets.
- b) Double-deep racks have two single deep racks located one behind the other and so pallets can be stored two deep. Each two deep lane is independently accessible. It is always better to dedicate one lane for one SKU to avoid confusion and so it is common to see free spaces that are unoccupied. The disadvantage is that it requires slightly more work while storing and retrieving the items. The warehouse can hold more products as only less aisle space is required. But, it requires double reach trucks to reach the first pallet position.
- c) Push-back rack is an extension of double deep that is extended 3-5 pallet positions. But, to access the pallets each lane can be pulled out like a drawer, so that all pallets get independently accessible.
- d) Drive-in or drive-through rack allows the lift truck to drive within the rack frame to access the interior loads. Through drive-in the put-away and retrieval functions are performed from the same aisle. Drive-through rack facilitates the pallets to enter at one end and leave at the other end following the policy of First-In-First-Out.
- e) Pallet flow rack is a deep lane rack in which shelving is slanted and lined with rollers. When a pallet is removed, the gravity pulls the remaining to the front. So storage and retrieval can happen at two different ends, so that they do not interfere with each other.

#### **Bin-shelving:**

This is nothing but simple and cost effective shelving mode which is also referred to as static rack. Shallow shelves of 18 to 24 inches are typical but for large cartons 36 inch deep shelf is also used. Since the shelves are shallow any significant amount of SKU can be spread across the pick face thereby increasing the travel time and reducing the SKU density, pick density and pick per person per hour.

A typical pick rate from the shelving system is 50-100 picks per person per hour. SKUs that occupy more than one shelf of bin-shelving can be shifted to some other storage system that results in high SKU density. As both picking and storing has to be done in the same pick face, it is highly

recommended to allot different timing for these two activities which means working an additional shift.



Fig 1.3.12: Bin-shelving



Fig 1.3.13: Bin-shelving

### Gravity flow rack:

Flow rack is a special type of shelving that are tilted, with rollers to bring the cases forward for picking. The shelves may be 3 – 10 feet deep which means that many SKU's can be kept available in a small area of pick face which increases the pick density and SKU density, reduces the travel time and increases the pick per person per hour.

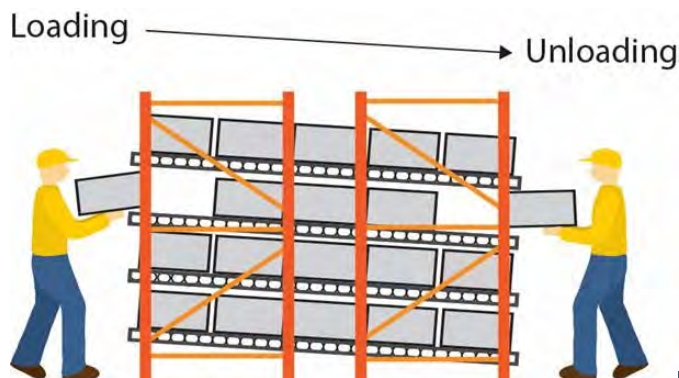


Fig 1.3.14: Loading and Unloading



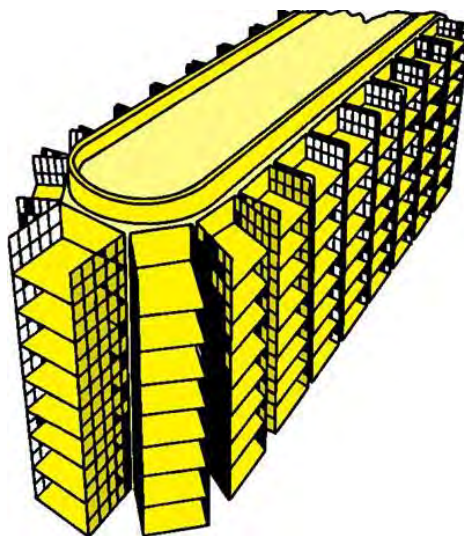
Fig 1.3.15: Gravity Flow Rack

The binning efficiency can be improved by employing the right technology such as pick-to-light system in which a centralized computer guides the picker/ binner by lighting those locations. Here the order picker is freed from handling the pick list and need not have to search for the next location as it is automatically guided by the system. After picking the right quantity from each location the picker can push a button and stop the signal. The typical pick rate from flow rack is

150 – 500 picks / person-hour. Flow racks can be stocked independently from back and therefore there is no inference of both the processes.

Carousels:

Carousels are motorized, computer-controlled, independently-rotating aisles of shelving. Generally they carry products to the picker and so there is no need for the picker to walk and search for locations. To maximize the space utilization carousels can be packed tightly with the products. Pick rates vary from 80 – 200 picks / person-hour. The disadvantage of carousels is that pick rate cannot be increased by employing more pickers as only one picker can use the carousel at one time. This may decrease the pace at which we would like to respond to the demand.



*Fig 1.3.16: Carousels*

Conveyors for unit load handling:

Conveyor systems are used for moving material between fixed points, for holding material as short-term buffer, for sortation and for industry applications such as separation, grading and cooling.

The general characteristics of the conveyor systems are:

- High through-put with few operators and low power requirement;
- Suitable for fixed routes, and floor surfaces are not critical as they are for fork trucks;
- Fast response and suitable for continuous or intermittent movements;
- Can utilize very sophisticated movement control.
- Conveyor systems now found both in conventional and automated warehousing.

The less positive aspects of conveyor systems include:

- High capital cost;
- Can obstruct working areas and access;
- Inflexibility for future change;
- Careful system design is required with safety features.

### 1.3.1 Introduction to Warehouse Layout

The process of laying out a warehouse is as critical as solving a puzzle. All pieces of a puzzle have to be defined and arranged for solving a puzzle. Similarly all pieces of warehouse activities has to be defined for the purpose of profiling, benchmarking, simplifying, computerizing and mechanizing the warehouse operations. In all those steps, we need to define the individual processes, type of storage and material handling equipment.

Material flow inside a warehouse can be planned as any of the following patterns.

U-Shaped flow:

Below mentioned figure illustrates a typical U-shaped material flow pattern. In a simple U- shaped flow pattern, goods that flow in to the receiving area are pushed to storage area that is located at the back of the warehouse. Then, for shipping the goods are moved to the adjacent area from where it exits to the truck for delivery. There are a number of advantages in this design.

Full utilization of dock resources (space, people and equipment) as receiving and shipping happens at the same dock door.

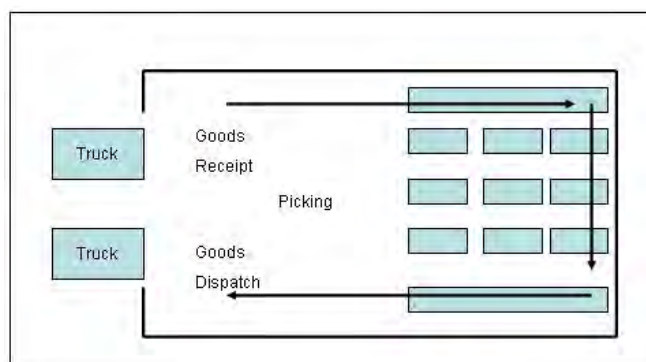


Fig 1.3.17: U-Shaped flow

- The structure facilitates cross-docking as both receiving and shipping happens at the same dock.
- The lift truck utilization rate will also be high as put-away and retrieval can be combined. As the storage locations are closer to the receiving dock, there will be easy flow of goods.

- Enables the expansion opportunities in three directions
- Enhances security as entry and exit happens at the same face

#### Straight-Thru flow design:

'Straight Through' flow happens when separate loading bay facilities for outbound and shipping are provided, often at opposite end of warehouse. Products flow in at receiving, move into storage, picking area and then the marshaling and dispatch area in a straight line. Items with a higher throughput level are located at the center of the warehouse because the total distance travelled would be shorter. An example of a 'Through' flow layout design is shown on the above figure. The major disadvantage is that it is difficult to take advantage of ABC storage and dual command trips.

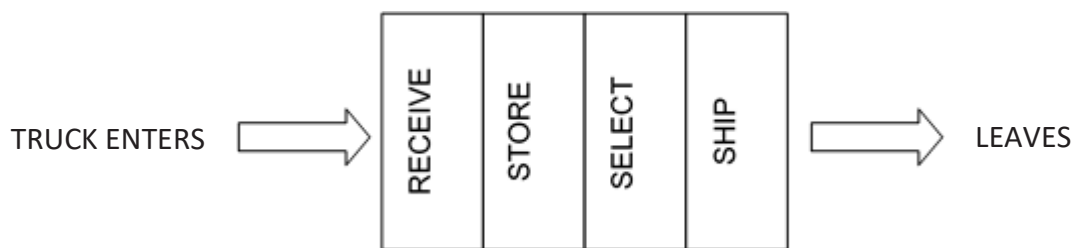


Fig 1.3.18: Straight-Thru Flow

#### Exercise

1. The three important flows in Supply Chain Management
2. The activities carried inside the warehouse

#### Notes

---



---



---



---



---



---



---



---



---



---



---



---



---



---



---



---

## UNIT 1.4: Roles and Responsibilities of a Warehouse Binner

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the roles and responsibility of a Warehouse Binner
2. Explain various work a warehouse binner will carry inside a warehouse

### 1.4.1 Warehouse People Management



Fig 1.4.19: Roles of Warehouse Binner

- Preparing and performing binning, post binning and carrying out housekeeping and post housekeeping activities
- Receiving all packages and checking them for errors
- Pre-packing packages before storing
- Locating bay area and binning products from the pick list and storing them on shelves
- Checking binned items for errors and reporting the status of binned inventory to the supervisor
- Complying with the safety, security and maintenance regulations

## 1.4.2 Put away activities

In a warehouse, putaway refers to all the processes that happen between receiving goods from vendors and having them all put away into their assigned places. Having a putaway system simplifies the process of storing items, reduces the risk of misplacing or losing items, and keeps your warehouse clean and organized. Learn more about putaway.

Any putaway system helps, but an efficient one is a lot better for your business. In this guide, we will be talking about what you should do to optimize your putaway process and get even better results.

Don't put off your putaway

Busy warehouses naturally tend to focus on major processes like picking, packing, and shipping, since they're the ones that actually get orders out the door and money coming in. Because of that, they leave their putaway process for a later time. But this only means that they end up with boxes of items lying around, unaccounted for.

A word of advice: take care of your putaway the same day that you receive a batch of goods from your vendors. Leaving it until later can result in a cramped warehouse, misplaced products or transaction errors, and even a higher chance of damage to the products, since you'll ultimately have to move them around more.

## Summary

The basics of Supply chain management is discussed at the ground level and the importance of Logistics linkage in managing an efficient supply chain. Three main flows of supply chain management is clearly explained in this unit. The participant will able to understand the main roles of the individual as a Warehouse Binner with the set targets. This unit also discusses the necessity of a Warehouse and different activities carried inside the warehouse.

## Exercise

1. What are the three important flows in logistics management?
2. The \_\_\_\_\_ flows in both direction in logistics management?
3. A warehouse binner reports to a \_\_\_\_\_?
4. What are the different types of goods stored inside a warehouse?
5. Binner need to bin items to \_\_\_\_\_ into \_\_\_\_\_

Notes 

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

Scan the QR code to watch the related video



Supply Chain Management

<https://www.youtube.com/watch?v=IzPO5RclZEo>



Logistics management

<https://www.youtube.com/watch?v=4QU7WiVxh8>







## 2. Preparation for Binning

Unit 2.1 - Receiving packages

Unit 2.2 – Checking process for received packages

Unit 2.3 - Pre-packing and storing

Unit 2.4 - Safety, Security and Maintenance Aspects



## Key Learning Outcomes



**At the end of this module, participant will be able to:**

1. Detail the various tasks to be performed before binning
2. Explain the importance of binning
3. List the different types of PPEs used while preparing for binning
4. Discuss the various safety standards pertaining to the industry
5. Explain the type of PPE required for the related warehouse environment
6. Allocate storage bays for binning
7. Identify Discrepancies such as damage/ misplaced items received
8. Prepare report about Quality and Schedule Variances

## UNIT 2.1 – Receiving Packages

### Unit Objectives

At the end of this unit, participant will be able to:

1. Demonstrate the receipt process
2. Elucidate unloading process

### 2.1.1 The Receipt Process

The warehouse activity flow starts with receipt of the goods. Conducting the first step right ensures that mistakes are not carried forward to subsequent steps. Receipt process starts with checking on the incoming shipment. Whether the shipment is destined for this warehouse or not. Unloading of the material to ensure zero breakages, during the process. Doing physical and quality check of the incoming material and finally put away of the material at the right location and updating the system on the quantities received. The following flow chart indicates the various steps in receipt process.

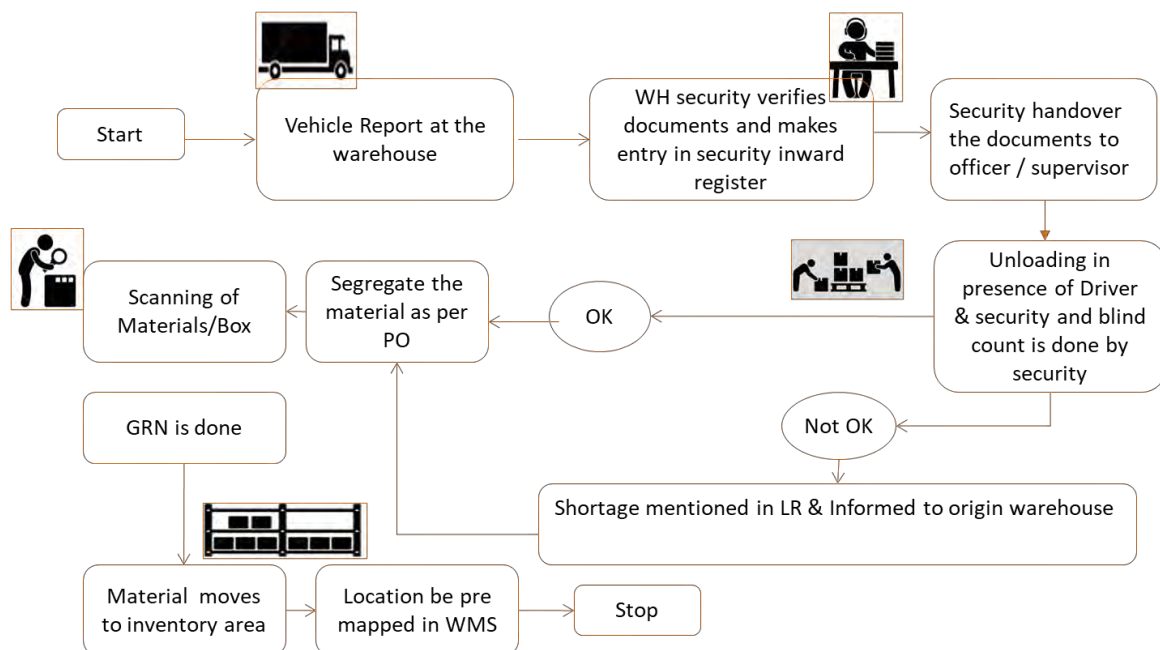


Fig 2.1.1.1: Receipt Process


## 2.1.2 Unloading


Unloading is the start of the warehouse operations. It brings in the cargo to be stored, processed and further dispatched. Being the step one of the cycle, it is essential that it is done in the right manner. The scope of unloading activities start from parking of the incoming vehicle, unloading, staging, quality check, scanning, put away to the right location and finally updating the records in the system to generate the GRN.


Following are the details of the steps to be undertaken in unloading process.

Step 1		Daily Vehicle Plan				
<b>Step 1</b>	<b>Get the Vehicle unloading plan for the day from the supervisor.</b>	Date	07-02-2020			
		Vehicle Number	Bay	No. of Units	Material	Time
		UPL68A2199	4	1000	Detergents	10.30
		NLL68A2300	3	500	Multiple	12.00

Step 2		Duty Chart		
<b>Step 2</b>	<b>Check which Bay Associate Duty has been assigned by the Supervisor</b>	Date	07-02-2020	
		Associate Name	Bay	Shift
		Umang	4	9.30 to 6.00
		Munnial	3	9.30 to 6.00
		Ishwar	5	9.30 to 6.00

Step 3	
<b>Depending upon the material to be unloaded arrange for appropriate MHE</b>	

Step 4	
<b>Depending upon the material to be unloaded wear the appropriate PPE</b>	

Step 5	
<b>Park the incoming vehicle at the Dock. Use stoppers like tyres to ensure that it does not hits the bay.</b>	

**Step 6**

Make the entry of the incoming vehicle in the Gate Inward Register. This can be done either by the Associate or the Guard

INWARD REGISTER									
Contract No.	Vehicle No.	From Where	Entry to the Warehouse		TARE WT.	Date of Receipt	Qty.	Rate	Amount of Invoice
			Date	Time					

**Step 7**

Open the vehicle in the presence of the driver. See if there are any visual damages to the material on the opening of the vehicle doors

**Step 8**

Start Unloading the material. Use the MHE based on the cargo. Refer section.

**Step 9**

Unload the complete Cargo in the Staging Area. Do not move this inside the warehouse as yet.

**Step 10**

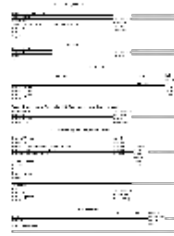
Let the security Guard or Supervisor complete the Count of the material unloaded. This should be blind without tallying with the documents.



**Step 11** Tally Blind Count with the number of boxes on the documents. The number should match.



**Step 12** Inform the supervisor about the completion of unloading and let him fill the complete Goods Receipt Check List (GRCL).



**Step 13** Inspect the material for any damages on the cartons, any damages, leaks or spillages.



**Step 14** In case of any exception found please inform the Supervisor



**Step 15** Once Supervisor confirms, start moving the cargo to the scanning area.



**Step 16**

There could be separate designated area for scanning or supervisor may provide the scanning gun for scanning at the staging area itself



**Step 17**

Confirm the putaway/Binning location with the supervisor.



**Step 18**

Move the cargo to the putaway location. In case it can be kept manually unload the material at Binning/Putaway location



**Step 19**

In case the material needs to be racked, call the MHE operator and ask to mount the pallet at the designated rack location.



**Step 20**

Handover the documents to the WH Executive confirming the completion of loading done, for him to create the GRN. Submit daily unloading report to the Supervisor.

GRN Details		GRN Particulars	
GRN No:	064-2-02	GRN Date:	06/01/2020
GRN Type:	Unloading	GRN Status:	Completed
GRN Category:	General	GRN Location:	Warehouse
GRN Sub-Category:	Material	GRN Qty:	1000
GRN Description:	GRN Description		
GRN Remarks:	GRN Remarks		

Scan the QR code to watch the related video



**Unloading Packages**

[https://youtu.be/2NqAZ\\_aoSvg](https://youtu.be/2NqAZ_aoSvg)



Notes



Lined area for taking notes, containing 20 horizontal lines.

## UNIT 2.2: Checking process for received packages

### Unit Objectives

At the end of this unit, participant will be able to:

1. Prepare documents for receiving goods.
2. Demonstrate checking of inward items before binning.

### 2.2.1 Documentation in receiving

#### Goods Receipt Check List (GRCL)

It is a check list to be followed at the time of receipt of material at the warehouse

Sample Goods Receipt Check List				
Date and Time of Reporting		To be filled by Warehouse Associate/ Supervisor		
Vehicle Number				
Consignor Name				
Invoice No.				
Allowed for Unloading	Yes / No - If no, why:-			
Remarks				
Name				
Signature				
Security				
Gate Entry #		To be filled by Security		
Signature				
Date				
Time				
Blind Count				
Item Name	Quantity		To be filled by the person did blind count	
		TOTAL QTY: -		
Blind Count Remarks				
Damage Remarks				
Name, Signature				
Date & Time				
Sample Quality and Compliance Check				
Legal Metrology Check	Yes / No			
Any Unit Damaged	Yes / No			
Any Unit Leaking	Yes / No			
Labels Check	Yes / No			
Packaging Check	Yes / No			
Sample Weight Check				
No. of Boxes				
Remarks				
Name, Signature				
Date & Time				
Scanning				
Qty.		To be filled by person who did Scanning		
Remarks				
Name, Signature				
Date & Time				
SAP Updation				
GRN		Date	Time	Filled by person who did Data entry
Remarks				
Sign and Signature				
(WAREHOUSE ASSOCIATE)			(SUPERVISOR)	

Fig 2.2.2: Goods receipt checklist

### Inward Consignment Register

This is a register which is being used to record all the incoming shipments into the Warehouse

Gate Inward Register										
Sl no.	Material Receiving Date	Invoice Number	Invoice Date	Supplier Name	Name of Place / City	Material Description	Qty Received	Qty Delivered	Material Deliver's name	Invoice Details

Fig 2.2.3: Inward Consignment Register

### Putaway List

This list also called as Binning list, guides Executive to the appropriate Bin of location where the incoming goods have to be kept.

Putaway List					
	Warehouse	_____		Date	_____
	Supplier Invoice No.	_____		Time	_____
Sr No.	Item Code	Item Description	UOM	Quantity	Bin Location

Fig 2.2.4: Putaway List

### Goods Receipt Note (GRN)

When the incoming shipment details are entered into the system, the computer system generates an documents Called Goods Receipt Note (GRN).

**eZee Technosys Pvt. Ltd.**

International Trade Center  
Majura Gate

**Goods Receipt Note**

<b>GRN #</b>	CSGRN20	<b>Vendor</b>	Seven Eleven
<b>Voucher No</b>	123	<b>Reg. No.</b>	12
<b>Date</b>	29-03-2019	<b>Print Date</b>	29-03-2019 12:27:39
<b>Receiving Store</b>	Central Store	<b>Print By</b>	Admin
<b>Purchase Order#</b>	CSON22		

Item Name	Quantity	Unit	Rate	Dis. Amount	Tax	Amount
Ajwaan	2.000	Kgs	120.0000	0.0000	48.0000	288.0000
Action	10.000	Pair	6.8100	0.0000	0.0000	68.1000
<b>Total</b>	<b>Amount</b>	<b>Tax</b>	<b>Discount %</b>	<b>DiscountAmount</b>	<b>Add/Less</b>	<b>Bill Amount</b>
	308.1000	48.0000	0.0000	0.0000	0.0000	356.1000 \$

<b>Purchasing Clerk</b>	_____	<b>Store</b>	_____
<b>Director / Manager</b>	_____	<b>Security</b>	_____

Fig 2.2.5: Goods Receipt Note (GRN)

**Stock Ledger**

This is a ledger which maintains the inwards and outward entries of various products and indicates the current stock level at any point of time.

STORE STOCK LEDGER								
								Facility Code
								Item code
								Unit of issue
		Delivery note/ Issue V. No.	Batch no.	Expiry Date	Qty Received	Qty issued	Stock balance	Signature
Date	Received From/Issued to:							

Fig 2.2.6: Stock Ledger

**Inventory Count Sheet**

This is a sheet used to count the physical stock of the warehouse, tally with the system stock and identify shortages or Excess.

STOCK COUNT SHEET									
Date									
Name of facility									
Sl No.	Product Code	Product Description	Unit of Measurement	Physical Good Stock	Physical Damage Stock	Total Physical Stock	Stock Balance as per System	Excess / Shortage	Remarks if Any
			A	B	C=A + B	D	C-D		10
Name & Signature of Associate			Signature Of Verifying Officer			Signature of WH Manager			

Fig 2.2.7: Inventory Count Sheet

## 2.2.2 Quantity Tallying

The first step in inspection of material is tallying the physical quantity with the quantity on the documents.

For the inbound shipment, lot of warehouses follow the system of blind count sheet. The security at the entry gate of the warehouse carries a blind count sheet. They will count the material as it is unloaded from the vehicle. When conducting the blind count, they have no clue on the total quantity expected or as per documents.

Once blind count sheet has been filled, it is tallied with the quantity as per documents. In case they match, next steps are taken, in case of any discrepancy, the physical material is counted again to check. If the discrepancy persists, then all the steps related with short receipt are initiated.

An alternate to blind count sheet is the tally sheet. For example, once the picker has picked the material for an outbound shipment, a supervisor or a security guard can count the material and check with the pick list or the tally sheet. If there is a discrepancy, then further steps are taken to correct it.

The usage of warehouse technology such as barcode scanners or RFID integrated with the Warehouse Management System (WMS) helps speed up counting and reduce errors.

## 2.2.3 Visual Inspection of the material

Visual inspection of the goods to check the physical condition of the material. The material incoming/outgoing products should be free from any dents, damages, leaks etc. In the case of packaged products, ensure to check if the packaging is proper and not mutilated.

The warehouse may also check the following during the visual verification process:

- Description of goods matching the documents
- Product Code,
- Batch/Lot number,
- The temperature in case of temperature-controlled cargo
- Labelling,
- Weight of the cargo and
- Condition of cargo – whether damaged, dented or leaking or not.

At times warehouses are required to verify weight and dimensions of the incoming cargo. In such

case, all the incoming cartons/pallets are weighed on the weighing scale before being moved inside. The actual weight is tallied with the documented weight to identify any discrepancies. At times, weight checking also highlights any theft or loss during transit to the warehouse. Weighing scales integrated with packet/pallet dimensioning systems and the warehouse management system are an excellent option for capturing all this information quickly and without errors.

One of the most time-consuming, labor-intensive, and critical tasks is counting and verifying damaged cargo. It is essential to keep a record of all missing and damaged cargo and its supplier and carrier. Once data has been collected, receiving supervisors will use this data to make these companies, suppliers, and carriers aware of the problem.

For companies needing to prove to their suppliers the state and way cargo was received, the use of digital cameras or CCTV cameras installed at unloading bays can help capture the cargo's images and lodge a claim with supplier or carrier in case of any damage or short received. The images may also be integrated with the WMS system.

### 2.2.4 Receiving Bay area activities

Warehouse binner needs to obtain shift schedule and relevant inward documents (inbound lists, inventory log etc.) from supervisor/team lead. He/ she needs to verify unloaded items against the inward documents and sign off the items as received. Binner needs to prepare report on quality, schedule variances if any and obtain binning list once GRN has been generated from the data entry operator (DEO)/system executive. In case location is not specified in the system, obtain list of items that need to be binned and locate appropriate/available storage bays for carrying out binning.

Check received packages for errors. Identify if there are any discrepancies such as damaged/misplaced items in the received load. Notify supervisor of any damages for potential fixes /issues. Notify administration/supervisor for any additional orders that need to be placed to replace misplaced/irreparable damaged items.

Pick List							
Warehouse		_____			Date	_____	
Order No.		_____			Time	_____	
Sr No.	Item Code	Item Description	UOM	Required Quantity	in Hand	Location	Picked Quantity
1	ABCD01234	Plastic Pots	No. s	7	84	BIN 365	
2	XYZ78910	Compost	Kgs	10	95	BIN 789	

Table 2.2.8 Pick List

The associate has to count the picked goods in the staging area and verify with the given pick list to ensure that the correct number of items are sent out. After verifying the picked goods, S/he needs to sign off on goods in the staging area so that they can be moved into the outbound area for shipping.

#### **Different forms of Pick List**

**A. Computer Generated Pick List:** This is the most common type of a pick list generated using a computer and printed using a printer. A copy is handed over to associate to perform a picking activity. Below mentioned is a sample form of such pick list.

Warehouse		Location	Item Code	Quantity
1		LOC1	PICK001	10
		LOC2	PICK001	20
		LOC3	PICK001	20
2		LOC1	PICK001	10
		LOC2	PICK001	20

Table 2.2.9 Computer generated pick list

**B. Automated Pick List:** The information regarding picking and the details of items to be picked will be communicated to an associate through a “Handheld Device”. The screen in the device will display the details of the pick list. The device and the computer will be connected through Wi-Fi connectivity (wireless). Below mentioned sample figure depicts an automated pick list using a handheld device.



Fig 2.2.10. Handheld device.

## 2.2.5 Labels & Signages

In a warehouse there are two categories of labels used - warehouse labels, and product labels. Warehouse labels enable the picker to pick the items accurately and at a greater speed.

Product label is a piece of paper, plastic film, cloth, metal, or other material affixed to a container or product, on which is written or printed information or symbols about the product or item. Information printed directly on a container or article can also be considered as labelling.

Product labels affixed on the items to give standard instructions about the handling of goods. The barcode label gives information about the serial number and pricing of the product.

After completing the picking process and selecting suitable packaging requirements, the items are handed over for suitable tagging and labelling.

There are two main categories of labels applied after picking and packaging:



- **Shipping Labels**
- **Safety Labels**



Fig. 2.2.11. Label Specimen

### **Shipping Labels:**

Shipping labels display the key information for a carrier to transport a package from their start destination (warehouse) to its end destination (the customer's hands).

Shipping labels may include some or all of the following information:

The consignee's name and address, the consignor's name and address (including postal code), date of shipment, package quantity as well as the weight, the description of material inside, number of pieces.

At times, a packing list of the products may also be pasted.

Labels also include information relating to the method of shipping (e.g. express, standard, etc.) for the carrier to ensure the service that was paid for is provided.

Following is an example of sample shipping Label.



Fig. 2.2.12. Shipping Label

### Safety and Handling Labels:

These labels contain headers, graphics, and messages that enable clear communication about hazards and handling instructions for the product being packed. Safety labels for consumer durables and machines are common.

These labels also convey a lot of information about handling of the cargo; what is the stacking level possible, if it is fragile and needs to be handled with care, what handling equipment can and cannot be used.

Following are some sample information carried on this kind of labels.

### Safety and Handling Labels

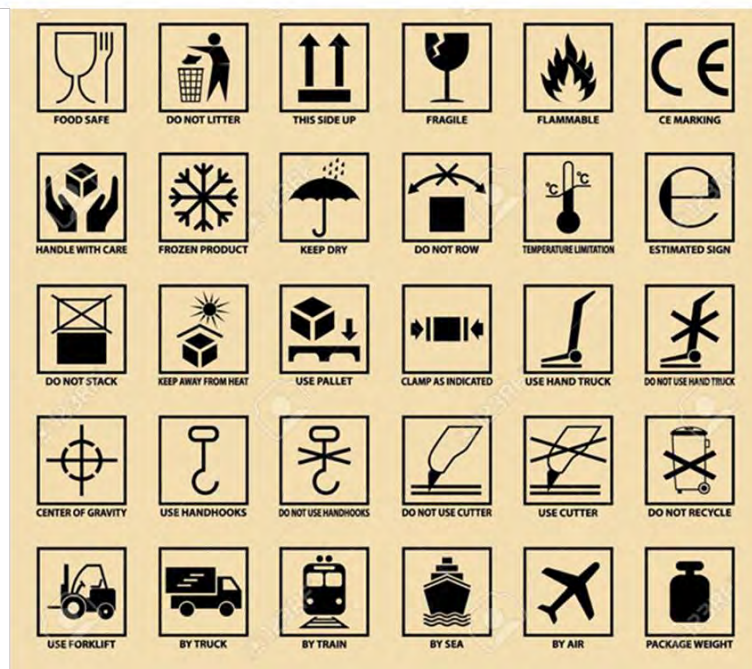


Fig 2.2.13 Safety and Handling labels

### Tips



- Be aware of the emergency number to call at the time of a workplace accident or mishap.
- Practice evacuation drills regularly to avoid chaotic evacuations.
- Keep an updated cleaning schedule. One of the most important aspects of maintaining a warehouse is keeping it clean on a daily basis.

## Summary

In this chapter we discussed the different types of processes in warehouse like picking, kitting, binning with pictorial examples and how to report, record each and every process and operations. Material handling equipment are the important tool for a warehouse operations, this will ease the work of the efficient operations. Some of the commonly used Material handling equipment and its advantages are clearly depicted in this unit. Different forms of labels and coding used inside the warehouse and various packing technologies used in the warehouse operations are explained in this unit.

## Exercise

1. What are details involved in the pick list?
2. Explain the process of setting up a computer for starting operations
3. Discuss the some of the steps which can be used to protect the integrity of information
4. List out the benefits of ERP?

## Notes

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

## UNIT 2.3 – Pre-packing and storing

### Unit Objectives

**At the end of this unit, participant will be able to:**

1. Describe about the objective of the packaging
2. Explore the various errors in picking and packing
3. Explain the different types of packaging used in logistics and its purpose

### 2.3.1 - Primary Objective of Packing

The primary task for packaging is to minimize damage that could occur after an item has left the production line. In the warehouse the item is subject to a variety of situations where damage could occur. Forklifts can drop materials, they can fall from conveyor belts, or fall from broken pallets.

In each of these instances, the packaging has to be designed so that it will protect the item from damage, but light enough so that it does not increase the weight of the finished good so much that the shipping costs are significantly increased. In addition, the packaging must protect the item from environmental damage, such as extreme temperature, water damage, contamination with other goods, or damage from static, which is important for electronic items. In today's high-tech world and considering the complexities of designing an order fulfillment system, the packing area is often treated more as an afterthought.

### 2.3.2 Common Uses of Packaging Include

**Marketing:** The packaging and labels can be used by marketers to encourage potential buyers to purchase the product. Package graphic design and physical design have been important and constantly evolving phenomenon for several decades. Marketing communications and graphic design are applied to the surface of the package and (in many cases) the point of sale display.

**Convenience:** Packages can have features that add convenience in distribution, handling, stacking, display, sale, opening, re-closing, use, dispensing, reuse, recycling, and ease of disposal.

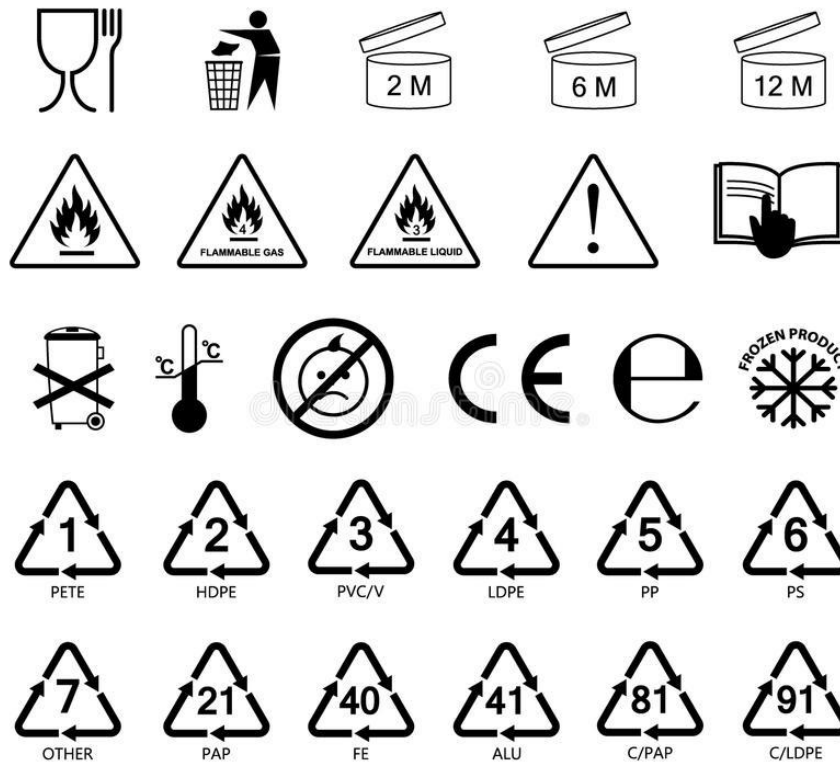


Fig 2.3.14: Packaging Information Examples



Fig 2.3.15: Marketing Packaging Example



Fig 2.3.16: Convenience packaging

**Barrier protection:** A barrier from oxygen, water vapor, dust, etc., is often required. Permeation is a critical factor in design. Some packages contain desiccants or oxygen absorbency to help extend shelf life. Modified atmospheres or controlled atmospheres are also maintained in some food packages. Keeping the contents clean, fresh, sterile and safe for the intended shelf life is a primary function.

**Security:** Packaging can play an important role in reducing the security risks of shipment. Packages can be made with improved tamper resistance to deter tampering and also can have tamper-evident features to help indicate tampering. Packages can be engineered to help reduce the risks of package pilferage.



Fig 2.3.17: Protection Packaging Example



Fig 2.3.18: Security Packaging Example

## UNIT 2.4 - Safety, Security and Maintenance Aspects

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the importance of the usage of Personal protective equipment
2. Identify the different types of PPEs
3. Get Clarity on the purpose of PPEs
4. Recognize the procedures to be followed for safety

### 2.4.1 Personal Protective Equipment

Personal protective equipment (PPE) is clothing and equipment worn by employees, students, contractors or visitors to protect or shield their bodies from workplace hazards.

After receiving the Picklist the Warehouse Picker needs to prepare for the next process which is usage of Personal Protective Equipment - PPE before entering into the picking area. Nearly 2 million disabling work related injuries happens each year across the world and more than 5 lakhs will involve head, eye, hands and feet. Using proper Personal Protective Equipment is a tool to do the picking job.

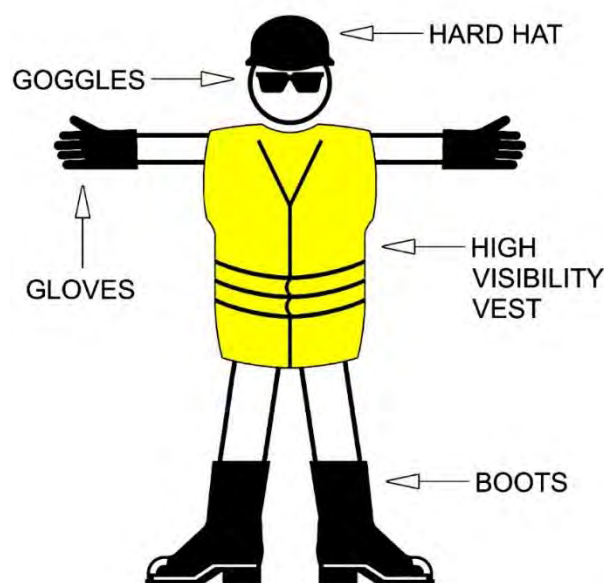


Fig 2.4.19: PPE

## 2.4.2 Types of Personal Protective Equipment

**Common Dust mask**



**Respiratory protection** for example, disposable, cartridge, air line, half or full face



**Eye protection** for example, spectacles/goggles, shields, visors





**Hearing protection**  
for example, ear  
muffs and plugs



**Hand protection**  
for example,  
gloves and barrier  
creams



**Foot protection**  
for example, shoes/boots



**Head protection**  
for example, helmets,  
caps, hoods, hats



**Working from heights**  
for example, harness  
and fall arrest devices



Table 2.4.20: Types of PPE

### 2.4.3 Warehouse Binner - Operating Safely at Height

As MHE are designed to operate at height, it is necessary to understand the extra operating procedures that will apply.



Fig 2.4.21: Operating Safely at Height

#### 1. Operating at more than 1 meter from the ground

If operating at more than 1 meter from the ground, the machine must be lowered to 600mm or lower before moving forward or reversing to the next location. This is important as the stability of the load at height may be affected when moving.

The machine must then come to a stop before being raised to the desired working height again. All order pickers are fitted with limit switches to prevent them from driving at height. These switches must never be tampered with.



*Fig 2.4.22: Operating at more than 1 meter from the ground*

### **2.Safe travel height**

The order picker MHE must be lowered to a safe travel height before turning a corner or exiting an aisle. A safe travel height is clear of the ground but below axle height. This will ensure the order picker does not tip over.

### **3.Wearing a harness**

When operating an order picker, a harness must be worn at all times and when moving, the handrail must be closed on the platform. This will prevent falls from the order picker



*Fig 2.4.23: Wearing a harness*

#### **4. Traffic management**

Traffic management is another important aspect of safety when operating an order picker. Making people aware of areas of operation is the easiest way to avoid risks and this can be done by:

- Posting signs
- Erecting barriers
- Using a flag person to control the flow of traffic

#### **5. Potential hazards**

It is extremely important to ensure all work areas are free of potential hazards. The safest path to take when moving a load and operating the order picker should always be considered in order to prevent any accidents, injury to other personnel or damage to machinery, equipment and stock.

What to watch out for in the work area:

- What hazards are present?
- Where will you be required to stop?
- Where should you slow down?
- Where should you sound your horn?
- Will you need to reverse?
- Is ventilation adequate?
- Is there adequate lighting?

- Do you have room to move?
- What is a safe speed?
- Is the ground surface suitable?
- What clearance do you have?

### Tips



A person (Warehouse Picker, Forklift driver, Warehouse employee, Guest from other industry etc.) whoever is entering into the warehouse floor/operation area (Storage location, Handling machine, equipment etc.) must wear Personal Protective Equipment all the time for his/her own safety. Usage of PPE is much important considering the safe workplace procedures, training and supervision to encourage people to work safely and responsibly.

**Note**



---

---

---

---

---

---

---

---

---

---

---

Scan the QR code to watch the related video



Types of Personal Productive Equipment

[https://youtu.be/ NyioZRt5wY](https://youtu.be/NyioZRt5wY)

## UNIT 2.5 - Safety Importance of PPE

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the importance of safety in the warehouse work environment
2. Realize the various safety standards pertaining to the industry
3. Explain the type of PPE required for the related warehouse environment
4. Describe the type of PPE to be used for the type of product handled

### 2.5.1 Importance of Safety

Why Safety is Important and the importance of personal protective equipment for a Warehouse Binner with some examples and depicted below for reference

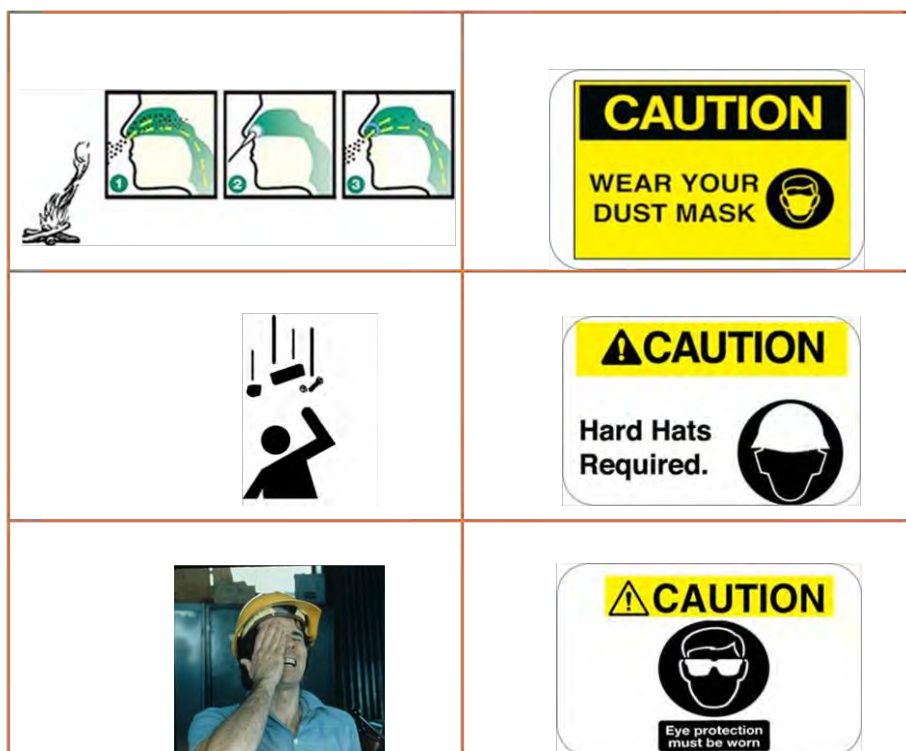


Table 2.4.24: Importance of safety

### Lab

1. Give practical demonstration for using Personal Protective Equipment

### Note

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---

---







## 3. Perform Binning Activities

Unit 3.1 – Storages and Equipment used

Unit 3.2 - Types of labels

Unit 3.3 – Warehouse binning



## KEY LEARNING OUTCOMES:



**At the end of this module, participant will be able to:**

1. Explain the nature of products and method of binning
2. Differentiate the various types of labels used in binning
3. Explain how to execute tasks within the scheduled time limit
4. Detail the difference between the barcodes and RFID

## UNIT 3.1 – Storages and equipment used

### Unit Objectives

At the end of this unit, participant will be able to:

- Explain the different types of storage systems
- Describe the difference between the various storage systems
- Recognize the binning requirements for the different storage systems
- Correlate the type of storage system to the product dimension
- Evaluate the different types of Material handling equipment used inside warehouse for picking
- Explain the operations and usage of HOPT
- Describe the operations and usage of BOPT
- Describe the operations and usage of Stackers
- Understand operations and usage of Forklifts
- Explain the importance and usage of other MHEs

### 3.1.1 Types of Storage

Once the Warehouse Picker is ready with the Picklist and adhere to safety standards by wearing the required Personal Protective Equipment, next comes the choosing of appropriate Material Handling Equipment - MHE to pick the product and locating the product. Let us discuss in brief how to choose MHE and tracing the product in this section.

In a Warehouse products may be stored in many different ways like

- Ground Storage
- Storage in Racks - Normal Racks, High Racks, Deep Racks etc.
- Bin storage - Plastics bins
- Storage in Sacks & Silos - like Wheat, Rice, Chemicals, Fertilizers etc..



Fig 3.1.1: Storage

### 3.1.2 Material Handling Equipment

There are different types of MHE-Material Handling Equipment are used for picking different materials. A Picker needs to identify which MHE is required for him to carry out the picking operations. Sometimes he may even require more than one material handling equipment to complete the job. In an organized warehouse there is a dedicated place given to place all the material handling equipment as shown below:



Fig 3.1.2: Material Handling Equipment



Let us see some of the MHE's used to pick different type of products in most of the warehousing industry.

### 3.1.3 HOPT-Hand Operated Pallet Truck

The HOPT is steered by a 'tiller' like lever that also acts as the pump handle for raising the jack. A small handle on the tiller releases the hydraulic fluid, causing the forks to lower. Most of the times pallet jacks are used to move and organize pallets inside a trailer, especially when there is no forklift truck access or availability.

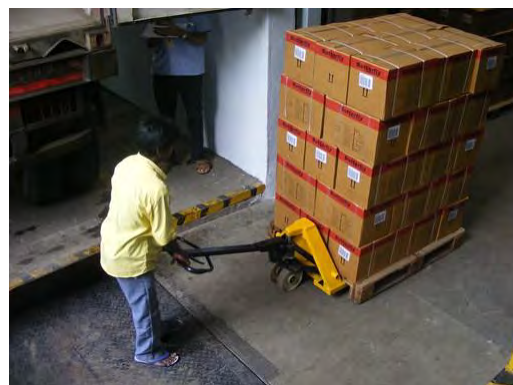


Fig 3.1.3: HOPT - Hand Operated Pallet Truck

### 3.1.4 BOPT - Battery Operated Pallet Truck

The BOPT offers a huge advantage over hand pallet truck with its quick and effortless loading and transporting features, the compact design with easy move in the most confined space and narrow aisle such as small warehouses and factories.



Fig 3.1.4: BOPT- Battery Operated Pallet Truck

### 3.1.5 Technologies in Warehouse Binning & picking

Order picking is the only warehouse activity where the three technologies can be directly compared so it's probably best to start there.

With Pick to Light, stock locations have light nodes connected to the main computer system. These light up indicating the number of items to be picked. When the binner has finished the task he notifies the system by pressing a button next to the node.

**RF Scanning and Voice Directed systems** link to the main Warehouse Management System via a Radio Frequency (RF) network. With the former, pickers use mobile barcode scanning units to communicate with the WMS. These indicate the location and number of items to be picked and the user confirms his pick by scanning a bar code on the item and/or location and keying in the number of items picked.

With Voice Picking systems the picker wears a small, portable computer and a head-set incorporating a microphone. He operates totally hands-free, receiving verbal instructions via the headset and confirming his actions to the Warehouse Management software through the microphone.

#### **Augmented Reality (AR) Picking**

Faster, hands-free picking is possible through augmented reality combined with wearable technology, most notably smart glasses.

Augmented reality (AR) picking using wearable technology combines the very best of vision- and voice-guided picking to produce a faster, hands-free solution for industrial environments.



*Fig 3.1.5: Technologies in Warehouse Picking*

Augmented reality picking uses smart glasses to merge virtual images and information with an operator's surrounding environment. The operator wears the glasses, follows the commands given, and scans product barcodes all within the glasses' display. The combination of real-world and virtual information provides speed and accuracy beyond previous warehouse picking technologies.

### **Put to Light - Replenishment**

A put to light system is similar to a pick to light system, only instead of picking product to ship to consumers, it is designed to replenish stock to a store. Like pick to light, put to light systems are typically mounted on shelving or carton flow rack, with the individual open store shipping boxes placed above or below the designated put to light device. Common configurations have two shelves of 'put' locations within a put to light setup.



*Fig 3.1.6: Put to Light*

**Benefits of Put-to-Light:**

- Same hardware devices and software technology as used for pick to light.
- Option to use a single put to light device for two locations (up and down) common in retail distribution layouts.
- If a SKU tends to get distributed to most of the stores, this method of distribution results in a high put density (lots of put opportunities with very little walking), and an efficient transfer of product.
- Put to light can also be used on the put side of flow rack in order consolidation areas.

**Put Wall**

A Put Wall is a goods-to-person system directed by a software to handle large volume of orders in a small footprint. This paperless process streamlines the supply chain by increasing efficiency and order accuracy. Put Wall applications decouple the picking and packing application of order fulfillment maximizing the efficiency of each applications



*Fig 3.1.7: Put Wall*

**Benefits of Put Wall:**

- 100% Paperless
- Modular & Scalable
- Increased Order Efficiency
- Increased Order Accuracy
- Ability to process single and multi-line orders
- Real-time Visibility



### RF Handheld Scanners

Access to data from anywhere is no longer a value add - it's a necessity. A software platform provides users with the access they need to keep warehouse operations on track.

The software platform is a group of software modules designed specifically for use on RF handheld scanners and mobile devices. The browser-based screens are configurable to deliver the most important information directly to operators. The software provides the ability to quickly and easily incorporate product images and can also be translated to support multilingual requirements.



Fig 3.1.8: RF Handheld Scanners

### 3.1.6 Stackers

The BOPT offers a huge advantage over hand pallet truck with its quick and effortless loading and transporting features, the compact design with easy move in the most confined space and narrow aisle such as small warehouses and factories.



Fig 3.1.9: Stacker



### 3.1.7 Forklifts

A forklift is a powered industrial truck used to lift and move materials short distances. There are two types of forklift available in the market, one is the diesel operated forklifts and battery operated forklifts. An important aspect of forklift operation is that most have rear-wheel steering, which increases maneuverability in tight cornering situations



Fig 3.1.10: Forklift



Many other Material Handling Equipment like Cranes, Conveyor belts, Industrial robot, ASRS- Automated storage and retrieval system etc. are used across the warehousing industry to some extent.

Ensuring all the required mechanism to carry out picking operations, now the picker needs to use his skill to perform picking operations efficiently.

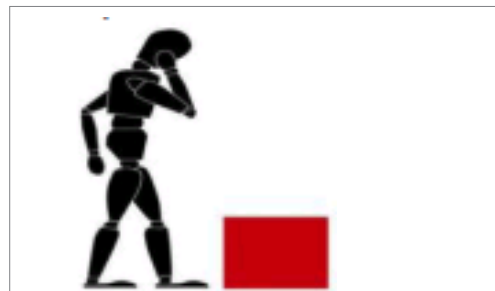
### 3.1.8 Manual Handling

Manual handling is defined as any activity requiring the use of force exerted by a person in lifting, lowering, pushing, pulling, carrying, holding or restraining a person, animal or thing. In general, the term manual handling is defined as moving anything by using force. Manual handling tasks are identified as the main cause of back injury. Therefore, it is important that manual handling training is given to reduce the risk of injury, especially back injury.

## Steps: In Proper Manual Handling Techniques



**STEP 1:** Plan the lift. Identify where the load should be transferred to and use appropriate handling devices, if available. Determine if the load can be transferred alone or if assistance is needed. Ensure that there is no obstruction along the way



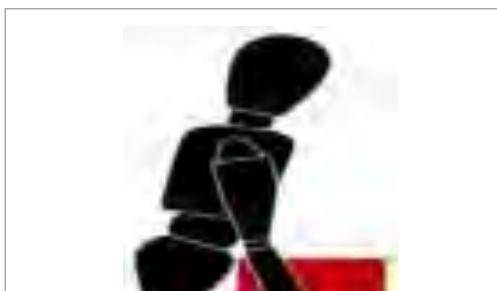
**STEP 2:** Place the feet apart and ensure you are totally balanced. The load should be as close as possible to your body. Bend your knee and not the back. Keep the back straight



**STEP 3:** Get a firm grip. Always consider the type of gloves used since certain gloves will require extra gripping force. The recommended gloves for manual handling activities are power grip gloves



**STEP 4:** Do not jerk and avoid sudden movement. Lift gently and keep control of the load. Move the feet and do not twist your body when turning to sides.



**STEP 5:** If precise positioning of the load is necessary, put it down first, and then adjust it according to a desired position..



**STEP 6:** Place It appropriately

Fig 3.1.11 Manual Handling Techniques

### 3.1.9 Type of Trolleys & Manual Handling Tools

#### Roll Cages

- Roll cages (also known as roll containers or roll pallets) are commonly used in warehousing, storage and distribution. Musculoskeletal and other injuries arise from:
  - Pushing/pulling loaded roll cages, especially up slopes, over steps or on uneven floor surfaces;
  - Trying to prevent roll cages overbalancing (and crush injuries where this was not successful);
  - Repetitive loading and unloading of roll cages;
  - Trapping hands while assembling/dismantling cages;
  - Trapping hands and other parts of the body between the roll cage and a wall, side of vehicle etc.;
  - Feet being trapped under the castors; and
  - Roll cages falling off lorries (e.g. from the tail lift) during loading and unloading, often causing the most serious injuries.

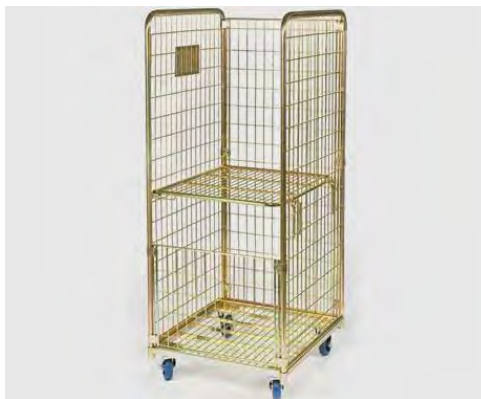


Fig 3.1.12: Trolley

#### Trolley

Employers need to select a suitable trolley designed for employees to use. Trolleys are designed to be used on level, even surfaces. If used on a gradient, there may be a risk of trolleys freewheeling out of control, causing injury to people. Trolleys should not be used on gradients unless a safe system of work is adopted to prevent such risks from occurring. Employers need to carry out a manual handling assessment on the use of trolleys and a system for inspection and maintenance of trolley.

- a) Platform truck



Fig 3.1.13: Platform truck

b) Adjustable Height Turntable



*Fig 3.1.14: Adjustable Height Turntable*

c) Mobile Conveyor



*Fig 3.1.15: Mobile Conveyor*

d) Vacuum Hoist



*Fig 3.1.16: Vacuum Hoist*

Scan the QR code To watch the relatable Video



**Material Handling Equipment**

<https://youtu.be/BBWPiByOEfI>

## UNIT 3.2: Understanding Labels, Technologies and Signages

### Unit Objectives



At the end of this unit, participant will be able to:

1. Describe the importance of labeling in warehouse
2. Evaluate the importance of barcoding in the warehouse
3. Brief about the importance and ease of usage in RFID
4. Explain the difference between the barcodes and RFID
5. Explain about Pick-to-Light systems
6. Recognize about Voice-picking
7. Know how to differentiate the various types of labels

### 3.2.1 The methods of managing Inventory Accuracy



Fig 3.2.17: Labels & Signage

### 3.2.2 Why are Warehouse Labels so Important?

Warehouse labels are essential in inventory management and in the picking process throughout warehouses. The use of warehouse labeling increase picking efficiency and decrease picking mistakes. Implementing the correct label structured designed to an individual warehouses needs can reduce time spent in picking and increase inventory location accuracy. Let us now see some of the commonly used Picking Label Combinations & Software technologies:

### 3.2.3 Barcodes

Bar code systems can track material through each step of the work and keep detailed records on each piece or batch. Using barcodes you can track your inventory, where items are located and how many items are in stock. A basic inventory tracking system consists of software and a barcode scanner or mobile computer.



Fig 3.2.18: Barcode



### 3.2.4 Radio Frequency (RF) scanners

RF scanners are the most commonly used order picking software by most of the warehouses across the globe. Bar code scanners were developed into mobile units, giving warehouse operators the ability to obtain data collection in seconds. Radio Frequency scanners are the most cost effective and flexible picking technology by being able to be used across most warehouse operations. The RF scanner operates by delivering text instructions to an operator, who in turn scans a barcode placed on a pallet, racking, aisle, bin or product. The barcodes allow the scanner to capture product or customer specific data.

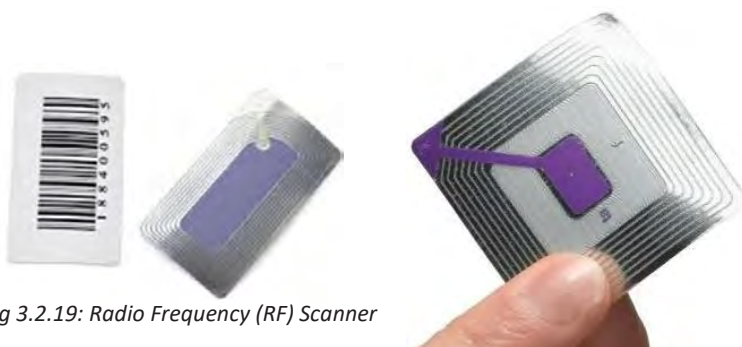


Fig 3.2.19: Radio Frequency (RF) Scanner





### 3.2.5 Pick to Light method

Similar to the previous picking strategies, a Pick to light method consists of light displays installed per each fixed location on racking or picking lanes. Tasks are uploaded to a system that lights up units as operators pick each order line. The light marks where the product location is and the task that is to be carried out at the pick area. Pick to light systems are better utilized for facilities that use reverse picking where goods received and transported into locations specific to customers' orders. This method supports high speed picking rates and increased accuracy.



Fig 3.2.20: Pick to Light

In addition, some of the benefits of P-T-L include:

- Paperless order picking. No printed pick lists or pull tickets.
- Eliminates the time and effort wasted on “looking around.”
- Workers can pick hands free.
- Allows computer-controlled picking.
- Can be applied to replenishment.
- Improved pick productivity and accuracy.

### 3.2.6 Voice Picking

The most advanced picking method yet. An operator is delegated picking tasks via a headset and can confirm picks via voice control. The operator is guided to picking location from the computer voice. The ability to use the headset enables operators to be hands free and the ability to pick heavier products. The application has become popular in cold storage facilities that require an operator to wear gloves in order to operate within the cooler or freezer. The labels required for voice picking ranged from simple digits, to barcodes. Voice picking cuts more time by simplifying the picking process.

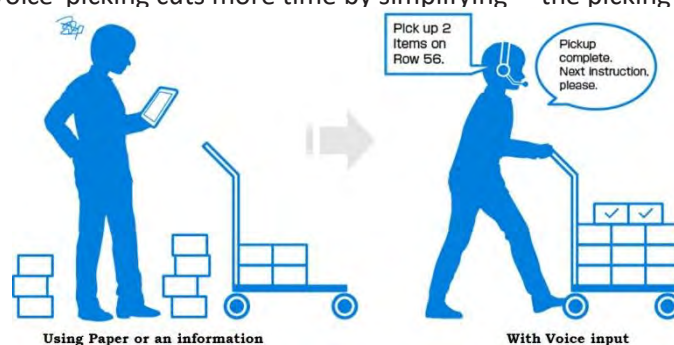


Fig 3.2.21: Voice Picking

### 3.2.7 Types of Warehouse Labels

Labels exposed to extreme temperatures require special adhesives that can withstand temperatures as low as -22F, without heating beams or increasing facility temperatures. The labels can be printed for any type of picking strategy from barcodes to voice picking. The labels are printed to be effective with a warehouses' current picking method.



Fig 3.2.22: Rack Labels



Fig 3.2.23: Shelf Labels



Fig 3.2.24: Floor Labels



Fig 3.2.25: Totes Labels



Fig 3.2.26: Shipping Labels

There are many other labels and signage that can be used throughout a warehouse. Three sided aisle signs with long range scanning reflective bar code labels can help when navigating to product within a facility. Dock door labels assist with the proper management of in-bound shipments and proper loading of trucks. Outdoor signage direct trucks to correct docking stations and correct entry/exit points of a building.

When considering a labelling solution, warehouses have to take into account the pick method used, pick path, and the SKU to be picked. If one label is miss printed, placed in the wrong position, or the wrong picking strategy is implemented, it can create major picking inefficiency, by causing the picking operation to become very labor intensive and drive up costs in the long run.

Scan the QR code to access the video



**Types of warehouse labels**

<https://youtu.be/tYYYIfkkjVQ>

## UNIT 3.3: Warehouse Binning

### Unit Objectives



**At the end of this unit, participant will be able to:**

1. Locate bay area from which packages are to be moved to storage
2. Bin products from pick list and store on shelves

### 3.3.1 Order Picking

Warehouse order picking is the process of pulling products/items from inventory (storage locations) in the warehouse to fill a customer order. In other words the process of retrieving products / items from storage locations in response to specific customer request.

A storage location is a place that you use to put away (store), pick (retrieve), or replenish (refill) items that you stock in the warehouse. The warehouse might consist of many locations, each with its own characteristics, such as:

- Length
- Width
- Height
- Weight capacity
- Proximity to other locations

Setting up locations is a major step in defining the warehouse. By setting up locations, you can match stock items to the locations based on this criteria:

- Item size and weight
- Maximum quantity by location
- Location characteristics
- Storage in an item's existing location
- Storage in an empty location

Picking is the most laborious in a typical warehouse which will be up to 55% of warehouse operating cost. The main reason behind this is because it involves direct influence on order accuracy and delivery time.

In many cases, the process is so straightforward, employees and supervisors only need a minimum of training. In some cases, order picking is entirely automated through the use of warehouse robots, and employees may not set foot on the warehouse floor unless there is a problem.

### 3.3.2 The Basic steps in Binning

#### Binning method:

- Refer to schedule and inward documents to locate the storage bays/bins for the packages
- In case locations are not defined in the Warehouse Management System (WMS) or the relevant Enterprise Resource Planning (ERP) software, note down binning location so it may be shared with the system executive or DEO
- Notify supervisor if current location is full and obtain alternate location
- Ensure bins/containers/shelves/pallets are clean for binning process
- Bin products from pick list and store on shelves
- Check binning list/inward documents obtained and if required collect new pick list for session
- Check nature of products (heavy items may require assistance of MHE operator) and determine method of binning
- Check if goods require any further pre-packing and hand over the same to packer and collect
- once packing completed
- Collect pallet trolley if required or request assistance of available MHE operator
- Apply binning methods specified by the organizational procedure for the type of goods and size of orders using equipment required and cover all items on pick list.
- Place the goods into the appropriate containers or onto pallets
- In case storage location has been changed due to overflow, inform supervisor once binning has been completed to ensure the accurate location is updated into the system.

### Summary



We have discussed the different types of storage systems in warehouse with pictorial examples and how storage location will help the binner to perform operations. Material handling equipment are the important tool for a warehouse binner, this will ease the work. Some of the commonly used Material handling equipment and its advantages are clearly depicted in this unit. Different forms of labels and coding used inside the warehouse and various technologies used are articulated in this unit.

## Exercise

1. In what different ways the products are stored inside a warehouse?
2. What is HOPT?
3. What is BOPT?
4. What is the most important aspect of a forklift?
5. What is the important usage of labels in warehouses?
6. Different software technologies used for generating labels?
7. Advantage of Pick to light system
8. Different types of Warehouse labels?
9. What are important parameters to be considered for a storage location?
10. Different steps in binning







**Skill India**  
कोशल भारत - कुशल भारत



सत्यमेव जयते  
GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT  
& ENTREPRENEURSHIP



**N S D C**  
National  
Skill Development  
Corporation

Transforming the skill landscape



## 4. Perform Post Binning Activities

Unit 4.1 - Perform Post Binning Activities

Unit 4.2 – Understanding the Technical knowledge on Operations

UNIT 4.3 - Exposure to Documents



**LSC/N2103**

## Key Learning Outcomes

**At the end of this module, participants will be able to:**

1. Describe the importance of handling instructions
2. Explain the importance of quality checking in binning
3. Differentiate between the manual stock recording and technological ways of stock recording
4. Describe KPIs and Dashboards
5. Get knowledge on the reporting structure
6. Explain the various channels of communication

## Unit 4.1: Perform Post Binning Activities

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the importance of post-binning activities
2. Explain the importance of safety in packing
3. Clarify the importance of handling instructions

### 4.1.1 Post Binning Activities

Once the binning is completed, the binner needs to submit all documents to the warehouse supervisor/manager so that he or she can record the quantities binned in the inventory records. Recording the binned quantities of an item in the inventory record is referred to as posting the binning activity. As a warehouse binner, you must ensure that inventory is accurately updated/posted in the inventory record.

There are two ways to update/post binning activity:

1. Without exceptions
2. With exceptions.

Updating the inventory record with no exceptions means that all binning activities done as per list completely. In other words, the quantities of all the items allocated to the order and listed on the list are exactly equal to the quantities physically binned.

S. No	Product code	Part Number	Product Description	Units of Measures	Storage Location	Required Qty	Picked Qty
1.	380200	AMW28	Bolt	Pack	A3C4R	100	100 <input checked="" type="checkbox"/>
2.	380110	OPL56	Nut	Pack	D4C2R	150	150 <input checked="" type="checkbox"/>
3.	380110	NMR89	Main cap	Each	E3C2R	10	10 <input checked="" type="checkbox"/>
4.	380130	BHM44	Side clamp	Each	G2C9R	1000	1000 <input checked="" type="checkbox"/>
5.	380140	DIV85	Engine Oil	mill Gram	G4C5R	10	10 <input checked="" type="checkbox"/>
6.	380140	AQS31	Gear box	Sets	K1C5R	5	5 <input checked="" type="checkbox"/>

Note: <sub>C</sub>-Column, <sub>R</sub>-Row

Table 4.1.1: Sample list showing Quantity tallied Without any Discrepancies

When the quantity of an item physically binned does not equal the quantity allocated to the order line and listed on the pick list, a binning exception occurs.







S.No	Product code	Part Number	Product description	Units of measures	Storage Location	Required Qty	Picked Qty
1.	380200	AMW28	Bolt	Pack	A3C4R	100	100 
2.	380110	OPL56	Nut	Pack	D4C2R	150	125 
3.	380110	NMR89	Main cap	Each	E3C2R	10	10 
4.	380130	BHM44	Side clamp	Each	G2C9R	1000	1000 
5.	380140	DIV85	Engine Oil	mill Gram	G4C5R	10	10 
6.	380140	AQS31	Gear box	Sets	K1C5R	5	5 

Table 4.1.2: Sample list showing Quantity with discrepancies

Note: C-Column, R-Row

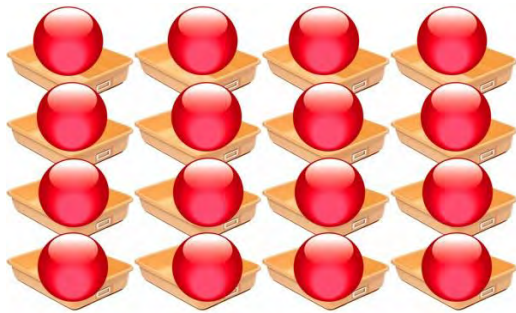
In case of any exception, communicate with the immediate supervisor/warehouse manager about the discrepancies for further actions.



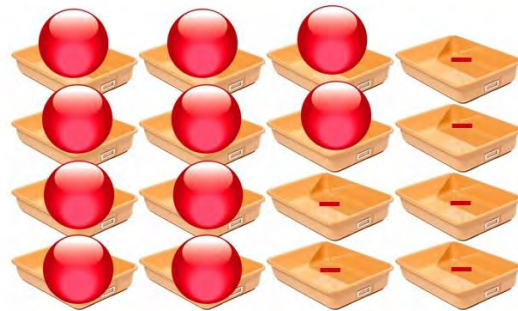
Fig 4.1.3: Reporting to Warehouse Supervisor

**There may be many reasons for exemption like;**

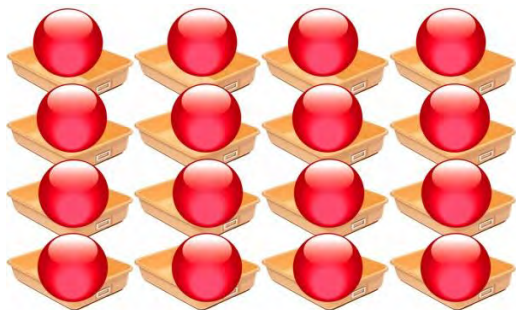
- 3.3.2.1 Shortage in quantity
- 3.3.2.2 Product damage
- 3.3.2.3 Product mismatch etc



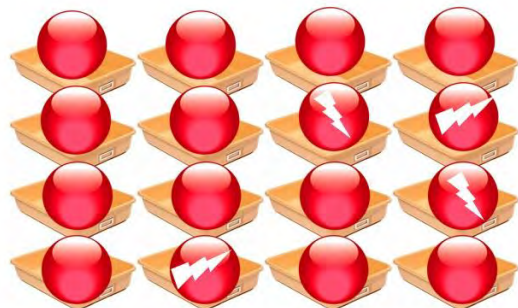
Pick Qty - 16pcs Red balls



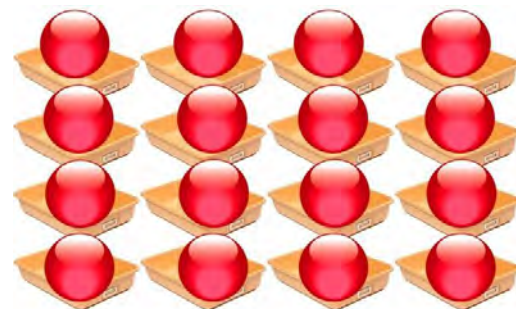
Quantity Shortage - 6pcs Red balls shortage



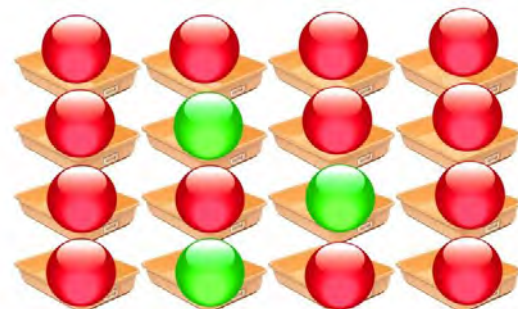
Pick Qty - 16pcs Red balls



Product Damage - 4pcs Red balls damage



Pick Qty - 16pcs Red balls



Product mismatch - 3pcs Green balls

Fig 4.1.4: Reasons for Exemptions

Based on the input provided by the binner on the discrepancies, the administration will plan for the replenishment and place new orders to fulfill the requirements and a purchase order will be released to respective vendors

## Activity

1. Perform binning with various discrepancies (shortage, damage and mismatch)

After communicating with the status of binning with the warehouse supervisor /warehouse manager, the next element is to identify the items that require further packing. This is because of two reasons;

1. In warehouses most of the products were stored in bulk carton or boxes to make use of warehouse space utilization
2. But the customer requires the products in various small quantity as per the demand flow - where breaking the bulk is required



Fig 4.1.5: Purchase Order



Fig 4.1.6: Different Package Size

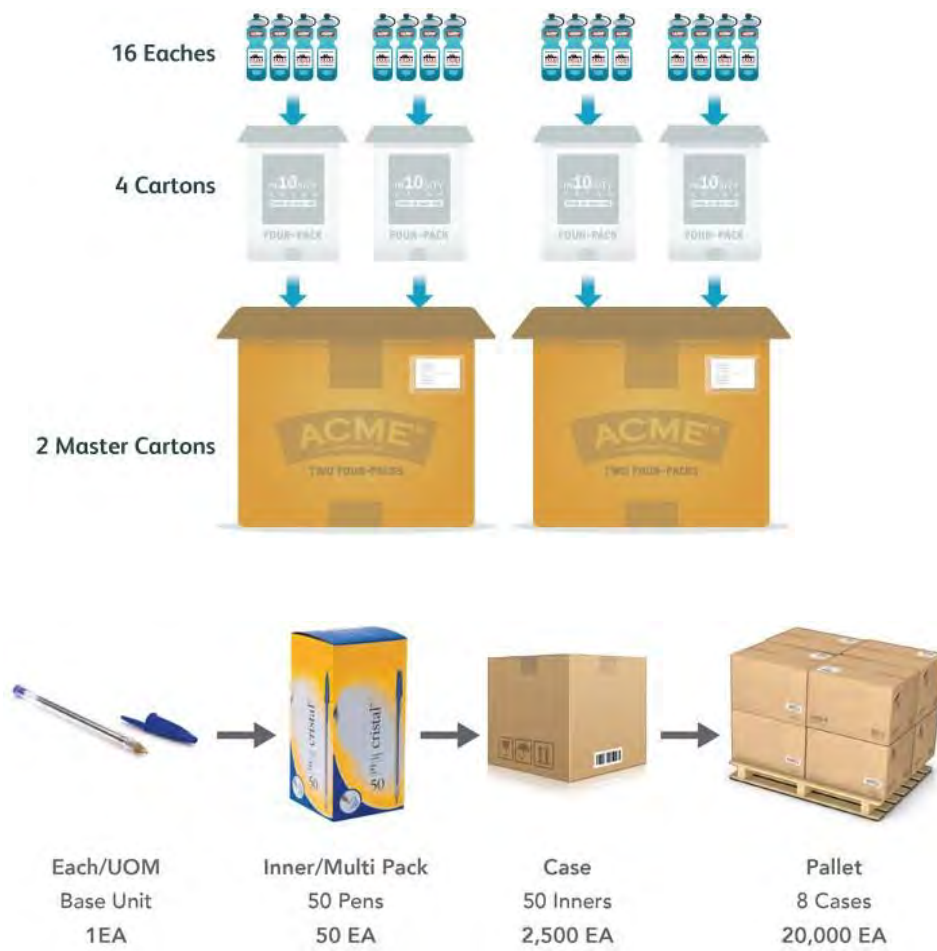




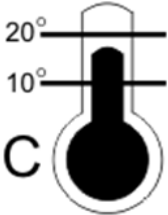


Fig 4.1.7: Different types of Packaging

The main aims of packaging are to keep the product in good condition until it is sold and consumed, and optimize space during transportation.

After completing the binning process and selecting suitable packaging requirements, hand over the items for relevant packing with required protection and safety labels. Below are a number of symbols often seen on packaging. Each has a specific meaning. The symbols are normally very simple and easy to understand.

	<p>This symbol reminds those handling the package to keep out of the rain and not to store it in damp conditions. It is normally found on card based packages which would be damaged if placed in contact with water.</p>
	<p>The broken wine glass suggests that the product inside the packaging could be easily damaged if dropped or handled without care and attention. The contents are fragile!</p>
	<p>The two hands holding or protecting the package is another reminder that the contents should be handled with care.</p>
	<p>The symbol seen opposite tells those handling the package that it must be stored the right way up. The arrows point towards the top of the package.</p>
	<p>The symbol showing the thermometer is found mainly on packages containing food and drink. The symbol clearly shows that the contents should be stored at a temperature between 10 and 20 degrees (centigrade).</p>








	<p>Chemicals that may cause damage to health.</p>
	<p>Chemicals that may catch fire in contact with air, only need brief contact with an ignition source, have a very low flash point or evolve highly flammable gases in contact with water.</p>
	<p>Chemicals that at low levels cause damage to health.</p>
	<p>Chemicals that may cause inflammation to the skin or other mucous membranes.</p>
	<p>Chemicals that may destroy living tissue on contact.</p>

Table 4.1.8: Safety in packing

Communicate with the immediate supervisor/warehouse manager regarding the status of inventory that has been identified as damage or misplaced during the binning. This will allow the supervisor/ manager to take corrective action immediately.



*Fig 4.1.9: Reporting to Supervisor on damages*

In the same way report the status of the inventory that has been successfully binned. Supervisor or the warehouse manager will turn update the correct list in the inventory record.

Incase of any challenging time limits or task loads encountered during the binning operations, inform the supervisor about the problems encountered and also in consultation with the supervisor or manager find out the way to overcome such challenges in the future. This will helps to improve binner productivity and in continuous improvement processes.

### 4.1.2 Binner Reporting to Supervisor

Warehouse binner might come across lot of challenges and may identify problems during the binning operations like

- Product mismatch during put away
- Storage rack damages
- Packaging problems
- Problems with material handling
- Equipment
- Shortage, over stocking etc.

A binner has to clearly understand his/her roles and responsibilities in dealing with such problems, how and to whom he/she needs to communicate regarding the same. This is what is called as escalation matrix and regardless of the challenges or identified problem, a picker has to communicate with his immediate reporting i.e. to a 'Warehouse Supervisor', who in turn will communicate with the management to resolve the same.

## Summary

Binner needs to identify if there are any discrepancies such as damaged/misplaced items in the received load and notify supervisor of any damages for potential fixes. He/ she should notify administration for any additional orders that need to be placed to replace. Update on misplaced/irreparable damaged items.

Binner should also report the status of all the inventory. In case storage location is not specified in the binning list, convey the noted location of binned items to system executive/data entry operator. Inform supervisor of any difficulties in task or time limits. Report any damages/accidents that occurred during binning and fill out administrative forms for the same.

## Exercise

1. Explain the importance of inventory checking?
2. Describe the reporting process for exceptions?
3. Detail the usage of symbols in warehouse?
4. What are the uses of pre packing?

## Notes

---

---

---

---

Scan the QR code to watch relatable video



**Perform Post Binning Activities**  
[https://youtu.be/urjlro\\_4Ydo](https://youtu.be/urjlro_4Ydo)

## Unit 4.2: Understanding the Technical knowledge on Picking Operations

### Unit Objectives

At the end of this unit, participant will be able to:

1. Explain the importance of stock recording
2. Explain the importance of quality checking
3. Distinguish the difference between the manual stock recording and technological ways of stock recording
4. Explain the different types of stock control techniques

### 4.2.1 Technical knowledge on Operations

One of the key job role of a warehouse binner is on stock recording. Stock recording, otherwise known as inventory control, is used to show how much stock you have at a time and how you keep track of it. Different organization has different methods for stock recording, as a responsible person for picking activity, one should know how to keep records on the inventory.

Efficient stock control should incorporate stock tracking and batch tracking. This means being able to trace a particular item backwards or forwards from source to finished product and identifying the other items in the batch.

Goods should be checked systematically for quality, faults identified and the affected batch weeded out. This will allow you to raise any problems with your supplier and at the same time demonstrate the safety and quality of your product. With a good computerized stock control system, this kind of tracking is relatively straightforward. Manual stock control methods can also use codes to systematize tracking and make it easier to trace particular batches. Sales Report-Distributor wise -Cluster wise-MT

Stock item: Classic Coffee Machine		Product code: CCM4300								
Supplier: Gilly Buyatt		Valuation method: FIFO								
Date	Ref	IN			OUT			BALANCE		
		Qty	Cost	Value	Qty	Cost	Value	Qty	Cost	Value
May 27	Inv.43255				5	40	200	25	40	
								28	42	2,176
28					2	40	80	23	40	
								28	42	2,096
30					4	40	160	19	40	
								28	42	1,936
31	Stock gain	2	42	84				19	40	
								30	42	2,020

Fig 4.2.10: Stock Control Method

There are different types of stock control methods followed based on the ageing and some of them are as follows;

- **FIFO** - First In First Out (Based on Manufacturing/Incoming date)
- **LIFO** - Last In First Out (Based on Manufacturing/Incoming date)

**Procedure for recording damages, breakages etc.:** If a product/item has been identified as damage or breakage during the binning, the binner has report the details of the same and submit it to the quality department or to the supervisor for further analysis. Further process has to be taken only after the inspection and getting it certified by the quality team.



Fig 4.2.11: Quality Control

## UNIT 4.3 - Exposure to Documents

### Unit Objectives

At the end of this unit you will be able to:

1. Explain the various documents that are used by a picker
2. Describe the role of Return to vendor form
3. Differentiate the entry between Inventory list and Material request form
4. Explain the use personal protective equipment forms
5. Explain the KPIs and Dashboards
6. Use and fill Damage report form

### 4.3.1 Documents used in Operations

Though the core job role of a binner is to bin the items/products to the storage location, there are also certain other documents which he might be known to and some of the important documents used by the binner in most of the warehouse are as follows

#### a) Inventory List Form

**Inventory List**

Inventory ID	Name	Description	Unit Price	Quantity in Stock	Reorder Level	Reorder Time in Days	Quantity in Reorder	Discontinued?

Fig 4.3.12: Sample Inventory list







## e) Damage report form

<b>LOSS / DAMAGE REPORT</b>						
Format No.:		<input type="checkbox"/> <b>Loss Report</b>		Report No:		
Rev. No. :		<input type="checkbox"/> <b>Damage Report</b>		Report Date:		
Rev. Date. :						
<i>Internal References</i>						
Shipment Ref. No.	Shipped Date	Order No.	Material ID	Material Qty	Values	BL No.
Description of Shipment						
Destination	Nos. of Days	Insurance No.	Description of Insurance on Loss / Damage			
Loss / Damage Date & Time	Responsible person	Authority	Details			
<b><i>Description of Loss / Damage</i></b>						
<i>Item Loss / Damage</i>						
Particulars	Item Name	Qty	Value	Repair / Recovery / Loss / damage status		
<i>Investigation / Impact – Corrective Actions / Preventive Actions</i>						
Nature of Loss / Damage	Responsible Agency	Current Location of Material		Contacts		
Remarks						
				Prepared by		
				Approved by		

Fig 4.3.16: Sample Loss/Damage Report Form







**Skill India**  
कौशल भारत - कुशल भारत



सत्यमेव जयते  
GOVERNMENT OF INDIA  
MINISTRY OF SKILL DEVELOPMENT  
& ENTREPRENEURSHIP



**N S · D · C**  
National  
Skill Development  
Corporation

Transforming the skill landscape



# 5. To Carry Out Housekeeping

Unit 5.1 - Carry Out Housekeeping

Unit 5.2 - Occupational / Environmental Health and Safety



**LSC/N2104**

## Key Learning Outcomes



**At the end of this module, participant will be able to:**

1. Explain the importance of housekeeping after picking
2. Describe various common work hazards in warehouse
3. Describe on Occupational/ Environmental Health and Safety
4. Explain the importance of safety
5. Identify the consequence of non-compliance with safety standards
6. Describe the difference in safety requirements for different types of materials
7. Get knowledge about firefighting standards and prerequisites
8. Recognize about assembly points and evacuation plan

## UNIT 5.1: Carry Out Housekeeping

### Unit Objectives

**At the end of this unit, participant will be able to:**

1. Describe the importance of safety
2. Identify the consequence of non-compliance with safety standards
3. Explain the difference in safety requirements for different types of materials
4. Brief about the importance of housekeeping in warehouse
5. Identify the appropriate PPE for housekeeping
6. Get knowledge on the dos and don'ts in the usage of housekeeping materials

### 5.1.1 Housekeeping

Why housekeeping activity is required for a warehouse binner?

Good housekeeping is a foundation of safety in every work space of every workplace. However, it's particularly important in the warehouse where a variety of workers are doing a variety of jobs with a variety of equipment.

A warehouse binner is a person who spends most of the time walking around the warehouse area and maneuver between the storage location all the time. Thus as a responsible person a binner has the chance to inspect the area which need attentions.

#### **Workplace Housekeeping - Basic Guide**

#### **Why should we pay attention to housekeeping at work?**

Effective housekeeping can eliminate some workplace hazards and help get a job done safely and properly. Poor housekeeping can frequently contribute to accidents by hiding hazards that cause injuries. If the sight of paper, debris, clutter and spills is accepted as normal, then other more serious health and safety hazards may be taken for granted.

Housekeeping is not just cleanliness. It includes keeping work areas neat and orderly; maintaining halls and floors free of slip and trip hazards; and removing of waste materials (e.g., paper, cardboard) and other fire hazards from work areas. It also requires paying attention to important details such as the layout of the whole workplace, aisle marking, the adequacy of storage facilities, and maintenance. Good housekeeping is also a basic part of accident and fire prevention.

Effective housekeeping is an ongoing operation: it is not a hit-and-miss cleanup done occasionally. Periodic "panic" cleanups are costly and ineffective in reducing accidents.

**What is the purpose of workplace housekeeping?**

- Poor housekeeping can be a cause of accidents, such as:
- Tripping over loose objects on floors, stairs and platforms
- Being hit by falling objects
- Slipping on greasy, wet or dirty surfaces
- Striking against projecting, poorly stacked items or misplaced material
- Cutting, puncturing, or tearing the skin of hands or other parts of the body on projecting nails, wire or steel strapping

To avoid these hazards, a workplace must “maintain” order throughout a workday. Although this effort requires a great deal of management and planning, the benefits are many.

**What are some benefits of good housekeeping practices?**

Effective housekeeping results in:

- Reduced handling to ease the flow of materials
- Fewer tripping and slipping accidents in clutter-free and spill-free work areas
- Decreased fire hazards
- Lower worker exposures to hazardous substances (e.g. dusts, vapors)
- Better control of tools and materials, including inventory and supplies
- More efficient equipment cleanup and maintenance
- Better hygienic conditions leading to improved health
- More effective use of space
- Reduced property damage by improving preventive maintenance
- Less janitorial work
- Improved morale
- Improved productivity (tools and materials will be easy to find)

**What are the elements of an effective housekeeping program? Dust and Dirt Removal**

In some jobs, enclosures and exhaust ventilation systems may fail to collect dust, dirt and chips adequately. Vacuum cleaners are suitable for removing light dust and dirt. Industrial models have special fittings for cleaning walls, ceilings, ledges, machinery, and other hard-to-reach places where dust and dirt may accumulate.



*Fig 5.1.1: Dust and Dirt Removal*

Special-purpose vacuums are useful for removing hazardous substances. For example, vacuum cleaners fitted with HEPA (high efficiency particulate air) filters may be used to capture fine particles of asbestos or fibreglass.

Dampening (wetting) floors or using sweeping compounds before sweeping reduces the amount of airborne dust. The dust and grime that collect in places like shelves, piping, conduits, light fixtures, reflectors, windows, cupboards and lockers may require manual cleaning.

Compressed air should not be used for removing dust, dirt or chips from equipment or work surfaces.

## 5.1.2 Employee Facilities

Employee facilities need to be adequate, clean and well maintained. Lockers are necessary for storing employees' personal belongings. Washroom facilities require cleaning once or more each shift. They also need to have a good supply of soap, towels plus disinfectants, if needed.



*Fig 5.1.2: Employee Facilities*





Fig 5.1.3: Employee Facilities

If workers are using hazardous materials, employee facilities should provide special precautions such as showers, washing facilities and change rooms. Some facilities may require two locker rooms with showers between. Using such double locker rooms allows workers to shower off workplace contaminants and prevents them from contaminating their “street clothes” by keeping their work clothes separated from the clothing that they wear home.

Smoking, eating or drinking in the work area should be prohibited where toxic materials are handled. The eating area should be separate from the work area and should be cleaned properly each shift.

### Surfaces

Floors: Poor floor conditions are a leading cause of accidents so cleaning up spilled oil and other liquids at once is important. Allowing chips, shavings and dust to accumulate can also cause accidents. Trapping chips, shavings and dust before they reach the floor or cleaning them up regularly can prevent their accumulation. Areas that cannot be cleaned continuously, such as entrance ways, should have anti-slip flooring. Keeping floors in good order also means replacing any worn, ripped, or damaged flooring that poses a tripping hazard.



Fig 5.1.4: Surfaces

**Walls:** Light-colored walls reflect light while dirty or dark-colored walls absorb light. Contrasting colors warn of physical hazards and mark obstructions such as pillars. Paint can highlight railings, guards and other safety equipment, but should never be used as a substitute for guarding. The program should outline the regulations and standards for colors.



*Fig 5.1.5: Walls*

### **Maintain Light Fixtures**

Dirty light fixtures reduce essential light levels. Clean light fixtures can improve lighting efficiency significantly.

### **Aisles and Stairways**

Aisles should be wide enough to accommodate people and vehicles comfortably and safely. Aisle space allows for the movement of people, products and materials. Warning signs and mirrors can improve sight-lines in blind corners. Arranging aisles properly encourages people to use them so that they do not take shortcuts through hazardous areas.



*Fig 5.1.6: Aisles and Stairways*

Keeping aisles and stairways clear is important. They should not be used for temporary “overflow” or “bottleneck” storage. Stairways and aisles also require adequate lighting.

### Spill Control

The best way to control spills is to stop them before they happen. Regularly cleaning and maintaining machines and equipment is one way. Another is to use drip pans and guards where possible spills might occur. When spills do occur, it is important to clean them up immediately. Absorbent materials are useful for wiping up greasy, oily or other liquid spills. Used absorbents must be disposed of properly and safely.



Fig 5.1.7: Spill Control

### Tools and Equipment

Tool housekeeping is very important, whether in the tool room, on the rack, in the yard, or on the bench. Tools require suitable fixtures with marked locations to provide orderly arrangement, both in the tool room and near the work bench. Returning them promptly after use reduces the chance of being misplaced or lost. Workers should regularly inspect, clean and repair all tools and take any damaged or worn tools out of service.

### Maintenance

The maintenance of buildings and equipment may be the most important element of good housekeeping. Maintenance involves keeping buildings, equipment and machinery in safe, efficient working order and in good repair. This includes maintaining sanitary facilities and regularly painting and cleaning walls. Broken windows, damaged doors, defective plumbing and broken floor surfaces can make a workplace look neglected; these conditions can cause accidents and affect work practices. So it is important to replace or fix broken or damaged items as quickly as possible. A good maintenance program provides for the inspection, maintenance, upkeep and repair of tools, equipment, machines and processes.

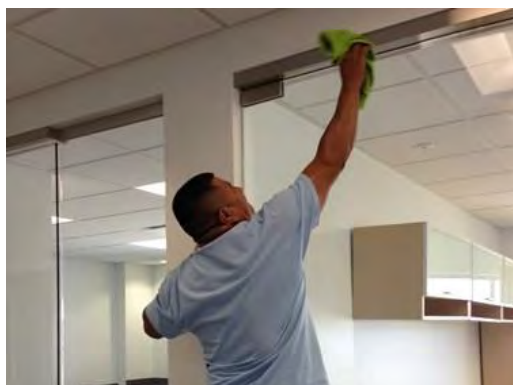


Fig 5.1.8: Maintenance

### Waste Disposal

The regular collection, grading and sorting of scrap contribute to good housekeeping practices. It also makes it possible to separate materials that can be recycled from those going to waste disposal facilities.



*Fig 5.1.9: Waste Disposal*

Allowing material to build up on the floor wastes time and energy since additional time is required for cleaning it up. Placing scrap containers near where the waste is produced encourages orderly waste disposal and makes collection easier. All waste receptacles should be clearly labelled (e.g., recyclable glass, plastic, scrap metal, etc.).

### Storage

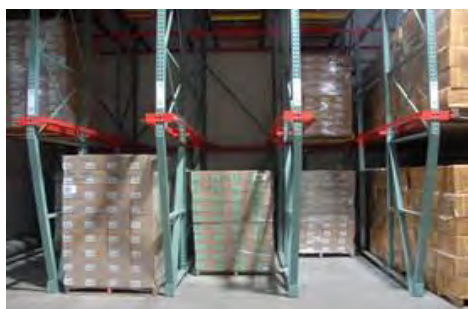
Good organization of stored materials is essential for overcoming material storage problems whether on a temporary or permanent basis. There will also be fewer strain injuries if the amount of handling is reduced, especially if less manual materials handling is required. The location of the stockpiles should not interfere with work but they should still be readily available when required. Stored materials should allow at least one meter (or about three feet) of clear space under sprinkler heads.

Stacking cartons and drums on a firm foundation and cross tying them, where necessary, reduces the chance of their movement. Stored materials should not obstruct aisles, stairs, exits, fire equipment, emergency eyewash fountains, emergency showers, or first aid stations. All storage areas should be clearly marked.

Flammable, combustible, toxic and other hazardous materials should be stored in approved containers in designated areas that are appropriate for the different hazards that they pose. Storage of materials should meet all requirements specified in the fire codes and the regulations of environmental and occupational health and safety agencies in your jurisdiction.

Some of the common risks that are identified by a warehouse binner are as follows

Storage rack beam damage – This may be due to poor maintenance or may be due to a forklift arm hitting the beam



Storage rack beam damage



Wet floor accidents



Overhanging boxes and pallets – Improper put away and picking results in such storage and there might be a chance of box falling and cause material and man power damages






<p>Rope obstructing workforce and causing accidents</p>	
<p>Maintenance material or items dropping on the floor may leads to accidents</p>	
<p>Scrap materials on the floor may also leads to accidents</p>	

Table 5.1.10: Common Risks

One have to ensure that all the machines, materials and the work place surface are in good conditions and safe for working. For industrial usages there are number of housekeeping materials are available. Some of them are given below for reference



Fig 5.1.11: House Keeping Material

Different materials have different form of nature, like some might be very sensitive to electricity and other chemical agents might have other effect while using them. In such case it is mandatory to use required personal protective equipment while handling it.

After equipping yourself and while carrying out the housekeeping activity, inform other people on the shop floor that cleaning process is on progress by placing some caution signages.

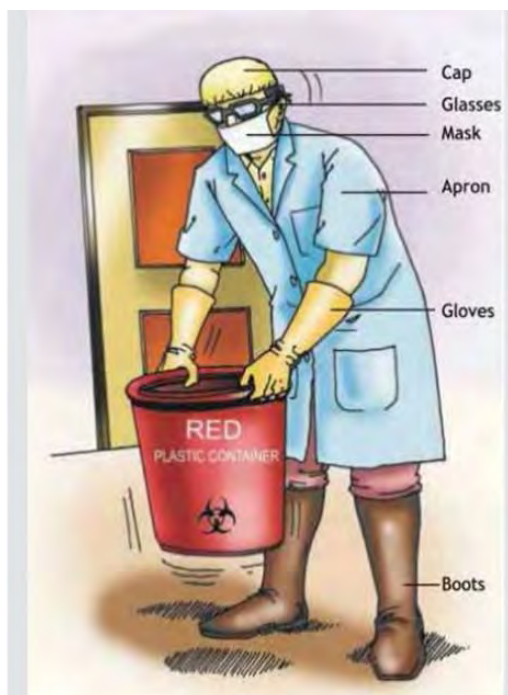


Fig 5.1.12: PPE for House Keeping



Fig 5.1.13: Safety Signages

Use correct cleaning methods for the respective work area, the type of soiling and the surface because sometime even incorrect housekeeping might cause risks.

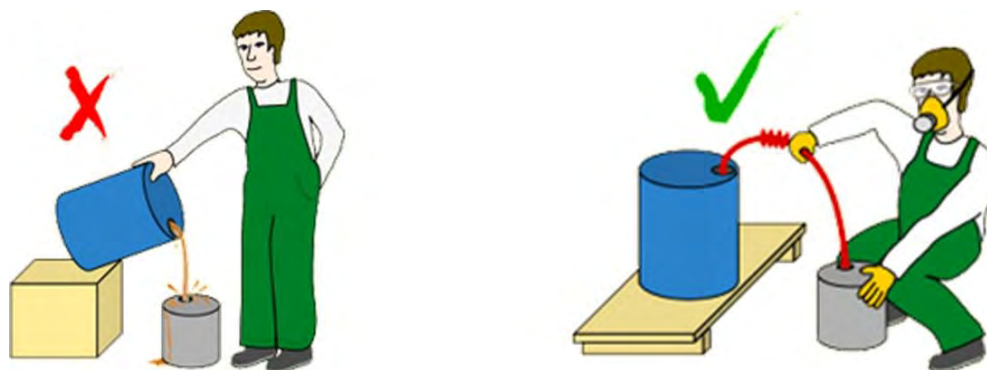


Fig 5.1.14: Do's and Don'ts in Housekeeping

A binner should be well prepared to deal with accidental damage if any caused while carrying out the work. Report to the appropriate person any difficulties in carrying out your work and if any additional cleaning is required that is outside ones responsibility.



Binner

Supervisor

Fig 5.1.15: Do's and Don'ts in Maintenance

It is most important to know that certain cleansing products, which are safe when used alone, can sometimes cause unsafe fumes or other chemical reactions when mixed with other products. It is never recommend mixing two different drain cleaners or even using one right after the other. Please read the direction given for mixing particular products with another before using it.



Fig 5.1.16: Do's and Don'ts in Housekeeping

The most important thing is to dispose the collected waste in a proper place that doesn't affects environments and to human in appropriate manner. Also it is equally important to dispose the used and unused solutions according to the manufacturer's instructions in a safe place.





Fig 5.1.17: Best Practices in Disposal

Finally after completing the cleaning process the picker should return the equipment, materials and personal protective equipment that were used to the right places allocated for storing housekeeping materials making sure they are clean, safe and securely stored for future uses.



Fig 5.1.18: Returning House Keeping Material

## Notes



---

---

---

---

---

---

---

---

## UNIT 5.2 - Occupational / Environmental Health and Safety

### Unit Objectives

At the end of this unit, participant will be able too:

1. Describe about firefighting standards and prerequisites
2. Recognize about assembly points and evacuation plan
3. Explain the importance of First aid mock drills

### 5.2.1 Health and Safety

Warehouse operations can present a wide variety of potential hazards for the people working in the warehouse. There are several health and safety issues to be concerned with if you are working in a warehouse and each staff member should be well aware of all the safety and evacuation procedure in case of any accidents or disasters.

**Evacuation plan and fire extinguishers:** Emergency evacuation is the immediate and urgent movement of people away from the threat or actual occurrence of a hazard. Examples range from the small scale evacuation of a building due to a storm or fire to the large scale evacuation because of a flood, threat because of terror attack or approaching weather system.

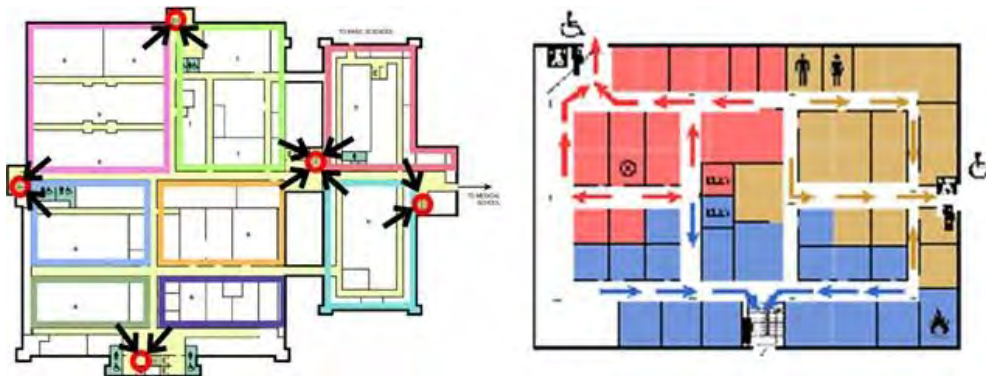


Fig 5.2.19: Evacuation Plan

The staffs/workers in the warehouse have to be familiar with the warehouse section of Safety and Security plan. The supervisor needs to ensure that warehouse personnel have read the warehouse evacuation plan and are trained in fire safety.

**Safe Assembly point:** An Assembly Point is a predetermined safe location outside the building. It is at this location that all occupants of the building must report to upon evacuating the building in case of an alarm of fire or any other emergency. All occupants should evacuate the building by the nearest exit to the outside of the building and then proceed to the Assembly Point.



Fig 5.2.20: Emergency assembly point

**First Aid Mock Drills:** Caring for injured or ill persons in the work place until they can receive professional medical care is an important skill for every person. With some knowledge of first aid, a person can provide immediate care and assistance to someone who is hurt or who becomes ill. First aid drills can help prevent infection and serious loss of blood. It could even save a limb or a life.



Fig 5.2.21: First Aid Mock Drills

## 5.2.2 Warehouse Safety Rules

On the job accident prevention is the responsibility of all the district's employees. It is the further responsibility of each employee to correct or report any unsafe condition or practice that he or she may observe.

Each supervisor is responsible for prevention of accidents to employees working under his/her supervision. It is the supervisor's responsibility to train these employees to enable them to work safely and efficiently

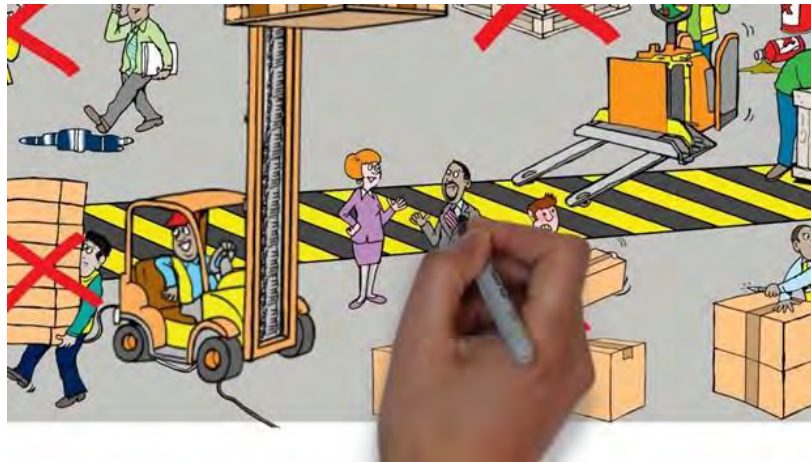


Fig 5.2.22: Warehouse Safety Rules

### 5.2.3 General Safety Rules

The following are some important general safety rules that each employee is required to follow, regardless of work assignments.

1. Lifting improperly is a major factor of the tremendous number of claims for back injuries. The following procedures should be followed:



Fig 5.2.23: General Safety



Fig 5.2.24: Plan the Job

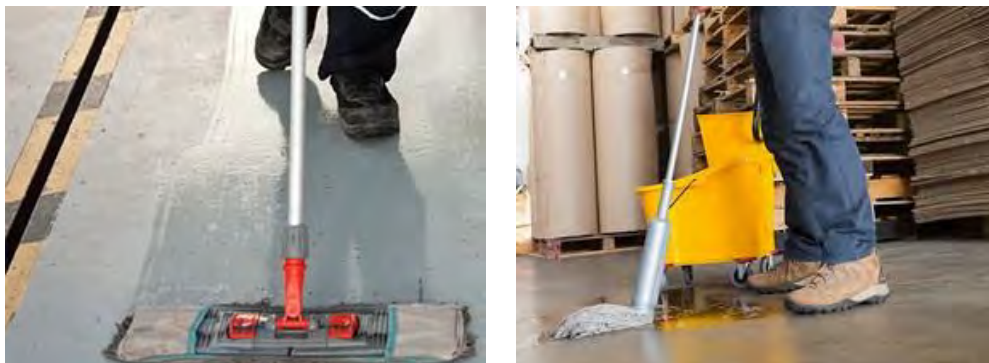
- a) Size up the load; make sure it is stable and balanced. Test the weight to ensure you can lift it yourself.
- b) Plan the job. Ensure that your path of travel is clear and that you have identified the location where you will place the load.
- c) Establish a good base of support. Use a wide balanced stance with one foot ahead of the other.
- d) Bend your knees and get as close to the object as possible. Lift with your legs and not your back.
- e) Get a good grip on the object to be lifted. Make sure you can maintain your hold throughout the lift and won't have to adjust your hands later.
- f) Lift gradually, don't jerk, but use a slow steady movement.
- g) Keep the load close while carrying; this prevents you from arching your back and adding additional stress to your back.
- h) Pivot; don't twist when you need to change directions. Move your feet in the direction of the lift. Twisting is especially harmful for your back.
- i) If the load is too heavy either enlist another helper or use a mechanical device.

2. Good housekeeping is an aid to safety. All employees shall keep tools, equipment, and work areas clean and orderly.



*Fig 5.2.25: Good Housekeeping*

3. Keep aisles stairways and exits clear of boxes and other tripping hazards. Do not obstruct exits.
4. Clean spills immediately. Mark the spill if you must leave to retrieve assistance or additional supplies.



*Fig 5.2.26: Clean Spills*

5. Each employee should know the location of fire extinguishers in their work area. The area in front of a fire extinguisher should be kept clear for ready access. Employees should not fight fires that are beyond their fire training and limitations of the available fire fighting equipment. When in doubt, call professional help and evacuate to a safe area.



Fig 5.2.27: Fire Extinguisher

6. Gasoline will not be used as a washing or cleaning fluid. When cleaning solvent is required, use an approved cleaning solvent.
7. Material will be stored in a safe and orderly fashion. Flammable liquids should be stored in an approved Flammable Storage Cabinet.
8. Any employee, while on duty or on district property, who possesses, sells, or receives any illegal drug or who is under the influence of drugs or alcohol, will be discharged and, in appropriate situations, referred to law enforcement authorities.



**No alcohol or  
other  
intoxicants are  
permitted  
on this site**

Fig 5.2.28: Alcohol is Prohibited

9. Smoking will not be allowed at any facility.



Fig 5.2.29: Smoking is Prohibited

10. Use caution when opening doors which serve two-way pedestrian traffic.
11. Use a stepladder or a step stool for reaching above shoulder height. Never stand on the cap of a ladder.
12. While in a district vehicle, seat belts are required to be worn at all times. Do not disable airbags unless you have written permission from your Supervisor.



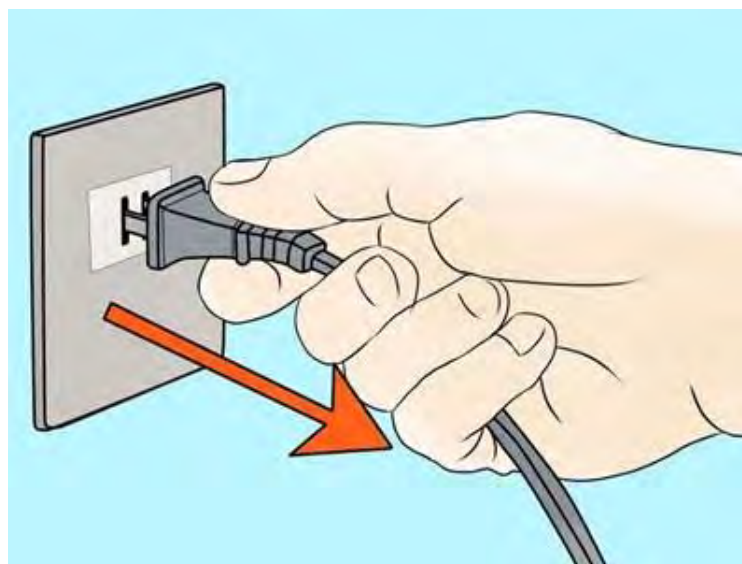
Fig 5.2.30: Safety





*Fig 5.2.31: Seat Belt*

13. Do not operate machinery that you are not familiar with and have not been trained to use.
14. Inspect all tools and equipment prior to use to ensure they are in working order and do not present a hazard.
15. After use put all tools/or equipment back in their proper place.
16. Disconnect all electrical cords by grasping the plug and carefully disengaging; never yank by the cord. If an electrical cord is frayed or wires are exposed remove it from service.



*Fig 5.2.32: Safety*

17. Use handrails when using the stairways. Never take more than one stair at a time.



*Fig 5.2.33: Use Handrails*

18. Only qualified, designated employees should work on electrical wiring and equipment.

19. Horseplay or practical jokes will not be tolerated.

20. Material Safety Data Sheets must be available, at the point of use, to any person who requests this information



Fig 5.2.34: Notice

21. Report all accidents to your supervisor.
22. Report all unsafe or broken tools and equipment to your supervisor. Mark the tool or equipment so that no one else will use.
23. Observe all warning signs, safety bulletins and posters



Fig 5.2.35: Notice

24. Do not do any job that appears unsafe; ask your supervisor for guidance.

## 5.2.4 Warehouse Safety Rules

The following are some important general warehouse personnel safety rules that each employee is required to follow:



Fig 5.2.36: Safety Rules

- Before loading and unloading a truck, set the brakes.
- Do not move a truck before all persons are properly seated or protected from the hazards of a shifting load.
- Do not misuse forklifts or pallet jacks.
- High lift rider trucks must be provided with an overhead guard.
- Know the location of eye wash stations when handling batteries to be charged.
- NO SMOKING signs should be posted.
- Lower forks to the ground when the truck is not in use or the operator is more than twenty five feet away.
- Always travel with the load lowered.
- Check the trucks daily or after each shift.
- Travel backwards if the view to the front is obstructed by the load.
- Do not overload lifts or hoists.
- Do not allow anyone to stand or walk under a load.
- Do not jump off docks, pickup trucks, or other elevated surfaces.
- Keep aisles unobstructed.
- Stow pallets flat.

- Do not store highly combustible chemicals in a warehouse. These should be kept in a separate storage area.
- Avoid stacking materials on the floor. Use shelves or pallets
- Forklift operators should be properly trained and qualified before using the vehicle.
- Each forklift should have a horn and backup warning noise. The horn should be used at every intersection.
- A seatbelt should be worn while operating a forklift.
- When moving a load do not stop quickly; make turns slowly.
- Never carry allow others to ride on any part of a forklift. Forklifts were made for one person.
- Never run over objects lying in the floor and try to avoid chuck holes. These hazards could easily topple the load.

### 5.2.5 General Health, Safety and Welfare

Warehousing and storage cover a wide range of activities that can result in various hazards and risks. Effective health and safety management involves you, the employer, looking at the risks that arise in the workplace and then putting sensible health and safety measures in place to control them. By doing this you can protect your most valuable asset, your employees, as well as members of the public from harm. You will also help protect your premises, goods, equipment and reputation.



Fig 5.2.37: General Health, Safety and Welfare

Steps to successful health and safety management include:

- Identifying the key health and safety priorities within a business;
- Concentrating efforts on these priorities;
- Assessing the risks to employees and others;
- Eliminating risks where possible. Where risks can't be eliminated, they should be reduced to an acceptable level;
- Using safe systems of work;
- Providing the workforce with adequate information and training;
- Involving the workforce and health and safety representatives in decision making on health and safety issues; and
- Regularly reviewing performance.

## 5.2.6 Risk Assessment

The first step in managing health and safety is to identify the priorities - i.e. to carry out a risk assessment. This book will help as it covers the recognized main hazards in warehouses. It is also important to consider additional hazards specific to a site that may also need attention.



Fig 5.2.38: Risk Assessment

Risk assessment can be broken down into five steps;

- Step 1 identify the hazards;
- Step 2 decide who might be harmed and how;
- Step 3 evaluate the risks and decide on precautions;
- Step 4 record your findings and implement them; and
- Step 5 review your risk assessment and update if necessary.

## 5.2.7 Warehouse Safety Checklist

### Warehouse Ergonomics

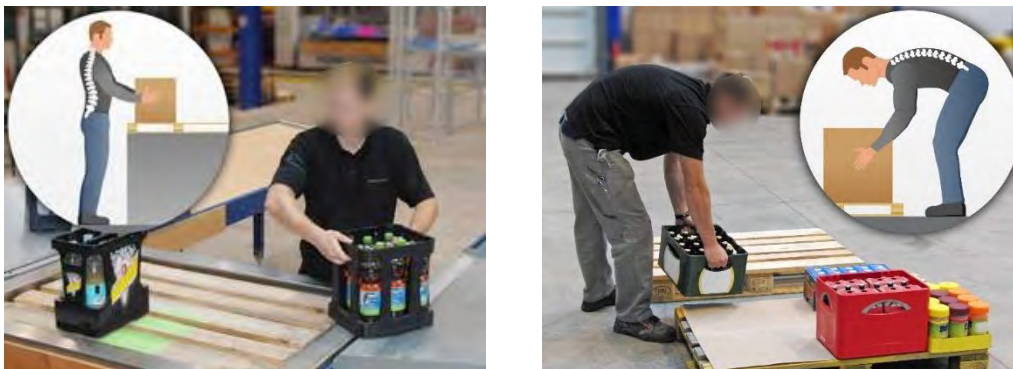


Fig 5.2.39: Warehouse Ergonomics

- Equip packing stations with impact absorbing, anti-slip industrial floor mats to relieve the stress placed on employees' knees, shins, and ankles when they work entire shifts standing in one place
- Prevent musculoskeletal disorders by opting to move heavy loads with mechanical equipment, instead of manually lifting them.
- Make sure that floors are kept free of spills and tripping hazards.
- Prevent eyestrain and errors by providing workers with overhead lighting that is adequate for all operations. Customize different areas of the facility with task lighting as needed.
- Never twist your body while carrying a load - turning your torso in a situation like this can lead to back injuries. If you need to change direction, turn yourself by shifting your feet in small steps.
- If a load pushes the size or weight limit of what you can comfortably lift, don't risk hurting your- self - get help and team-lift the materials instead.
- When lifting, keep your back in a natural position, and rely on your legs to do the actual lifting.
- Lifting from floor or shoulder level is a common cause of injury; prevent employee from injury- ing themselves by arranging storage in such a way that these types of lifting tasks are reduced or eliminated.

### Safely Storing Materials

- Make sure that stacked loads are straight and even, to prevent them from toppling over.
- Heavier loads should be stored on lower or middle shelves, so that they create a center of gravity for your shelving units, as opposed to leaving them top-heavy.
- When removing objects from shelves, only do so one item at a time.
- Keep the aisles and areas surrounding your shelf systems free from obstruction

### Forklift Safety

- Never allow anyone who is under the age of 18 and/or not specifically trained in forklift operation to operate a forklift.



Fig 5.2.40: Forklift Safety



- When driving a forklift, never exceed 5mph, and always slow down in areas that have slippery floors or are likely to be congested with people, materials, or other transport vehicles.
- Properly maintain forklifts, and always remember to do a walk-around check for hazardous conditions before you operate one.
- Never operate a damaged or defective forklift until it has been adequately repaired and proven safe for use.
- Make sure that aisles and loading docks that are traversed by forklifts are kept clear, allowing plenty of space for a forklift to safely maneuver through.
- Personal Protection Equipment for Arc Flash and Electrical Hazards Require all forklift operators to utilize the manufacturer-installed seatbelts.
- Keep your warehouse well ventilated to allow the dissipation of forklift fumes and carbon monoxide, and ensure that employees are fully trained on the dangers of inhaling excessive amounts of forklift exhaust.
- Never attempt to lift, stack, or transport loads that exceed the forklift's weight capacity.
- Maintain a zero-tolerance policy for "stunt driving," racing, and any other forklift-related horseplay.
- Provide proper PPE (like rubber gloves and safety glasses) at forklift battery charging stations, to protect workers in the event that they are exposed to battery acid or other chemicals.

### Loading Dock Safety

- Tapes and Adhesives Place visual warnings like signs and strips of brightly colored tape along dock edges to prevent employees from accidentally walking off.
- Never allow forklifts to back up all the way to a loading dock's edge.
- Ensure that dock stairs and ladders are equipped with handrails and otherwise meet OSHA requirements.
- Whenever a dock plate is used, make sure that it's well secured, and verify that its weight capacity can safely accommodate the load you intend to move over it.

### Conveyor Safety



Fig 5.2.41: Conveyor Safety



Fig 5.2.42: Conveyor Safety

- Regularly inspect conveyors to ensure that they're undamaged and in safe condition.
- Make sure that all pinch points are well guarded.
- Ensure that there is proper lighting and sufficient workspace in the vicinity of the conveyor.
- Tailor a lockout plan for your conveyor system, so it can remain safely shut down in the event of a malfunction or repair. Train employees in the procedure.

#### General Warehouse Safety Tips

- Floors must be kept clear of spilled liquids and clutter that could cause employees to slip or trip.
- If power cords or hoses must be run across walkways or open areas, cover them heavy-duty cord covers to prevent tripping hazards, as well as to protect the cables from run-over damage.
- Set reasonable time requirements for task completion – rushing can lead to accidents and injury- ries.
- Prevent worker fatigue by ensuring that employees doing physical work receive an adequate number of rest breaks throughout their shifts.
- Have set lockout/tag out procedures in place to prevent employees from being injured during the repair of damaged machinery and electrical panels.
- Keep the warehouse well ventilated at all times.
- Depending upon the average temperature of your facility, train employees on proper hydration, appropriate clothing, and other best practices for working in hot or cold environments.

## 5.2.8 Warehouse - Safety Guide

It is always risky to attempt an in-depth discussion of such a wide-ranging issue as warehouse safety management. This is particularly true when, as is the case with safety, the aim is to provide a comprehensive study of the general problems found at these facilities.

Among all the risks to which a warehouse is; exposed, fire is the one which normally has the gravest consequences, although it is by no means the only one that must be taken into account. It is also important to consider a number of other risks, including merchandise theft, illegal entry with criminal intent, environmental risk caused by poor warehouse management and even damage caused by the forces of nature.



Fig 5.2.43: Warehouse Fire Risks



*Fig 5.2.44: Destruction of goods and Warehouse facilities*

The objective of the safety is to provide assistance to the reader in identifying the general risks faced by all parties involved in complete warehouse safety management. As a result, the safety practices facilitates decision-making aimed at mitigating or anticipating potential losses by eliminating or controlling risks and by implementing preventative and corrective measures. In short, the safety will provide an effective tool for warehouse risk management.

## 5.2.9 Warehouse Design

Whenever one intends to start up or expand an industrial or business activity, it is necessary to gather as much information as possible. Buildings, plant, equipment and warehousing facilities will all be required in order to develop the activity.

The ideal company situation would involve being able to produce and distribute goods continuously, thereby eliminating the need for a warehouse altogether and removing the requirement of having goods in storage, where they are effectively “frozen” assets. However, the elimination of warehouses is only feasible in specific types of manufacturing, involving made-to-order or just-in-time production.

Large amounts of raw materials, semi-finished products, auxiliary material, packaging and finished products must be made available to the various users, whether intermediate or final, internal or external. Consequently, the creation of storage areas is necessary in order to enable distribution upon demand at a later date.

Warehouses must be designed and built according to a previous analysis of the movement and relationship between materials and products anticipated in the production process.



*Fig 5.2.45: Storage in Aisles and Transit Areas*

Appropriate warehouse design can prevent many future problems and, therefore, the initial design stage should involve consideration of a number of factors, such as:

- The shape and size of the storage areas in relation to the characteristics of the items to be stored.
- The loading and handling methods and the transit areas.
- National, regional and local regulations concerning stored goods, such as those applicable to chemical goods storage.
- The warehouse location in relation to the production areas and transportation facilities.
- Accessibility, visibility and easy identification of the Goods.
- Admissible loads on floors and storage structures.
- Free space between the stored goods and the ceiling.

Although it is tempting to classify warehouses, this is a complex task that is beyond the scope of this Warehouse Safety. If necessary, warehouses can be classified according to the type of goods stored and such a method would involve classification as follows: dry, refrigerated or frozen foods; clothes and textiles in general; construction equipment and materials; machinery and spares; and so on. Classification can also be made according to the end customer involved, for example, external or internal customers; retailers or wholesalers; and so on. Finally, classification can even be based on the mechanical loading methods employed, for example, forklifts trucks; trans-pallets; automated storage and transportation systems; and so on.

## 5.2.10 Warehouse Risks and Preventive Measures

In general, the risks to which warehouses are exposed relate to a number of factors. Past experience and statistics concerning warehouse loss events both demonstrate that they form a significant part of the total losses in industrial environments as a whole.



Fig 5.2.46: Warehouse Safety

Adequate business risk management practice requires an initial identification of the hazards to which the company is exposed, followed by appropriate risk assessment, and subsequent implementation of plans for risk prevention and control. The risks concerned do not only include the most typical ones such as fire, but also explosions, illegal entry into the workplace involving the possibility of theft or vandalism, environmental damage which may occur due to accidental spillage of toxic products, falling shelves, knocks and damage to shelf and rack structures or merchandise, and even risks generally classified as natural catastrophes, such as floods or storms.

All measures implemented to minimize these risks must be closely interrelated and must be carried out in addition to suitable warehouse maintenance and frequent safety condition checks. Only then will the effectiveness of the safety system chosen by the company be ensured.

### Fire risk

In general, storage of goods does not entail a high likelihood of fire unless the materials themselves represent a special risk, as would be the case when storing explosives, fuels, solvents, and so on.



Fig 5.2.47: Fire Extinguishing Work at a Warehouse



*Fig 5.2.48: Fire Extinguishing Work at a Warehouse*

However, when fires in warehouses do occur, they almost always have devastating consequences. This is because difficulties often arise when trying to control and extinguish fires at the initial stage, even when automatic fire-extinguishing systems are installed throughout the warehouse.



*Fig 5.2.49: Results of a Fire in a Perfume Warehouse*

The variables that have a significant effect in causing a fire and resulting in spreading it are numerous and can be interrelated. As a consequence, it is often difficult to establish the exact origin of fires and to reduce their occurrence in warehouses by acting on only one of these factors. Experience of warehouse fires shows that extensive damage occurs as a result of factors such as the following:

- Late discovery of the fire.
- Rapid fire spread.
- Inadequacies in storage space layout and design.
- Lack of compartmentalization.
- Bad housekeeping.
- A disproportionate amount of stored goods.
- Generation of a high level of toxic fumes and gases.
- Absence of automatic sprinklers.
- Absence of a damage reduction and action plan in the event of emergency.

The main factors or circumstances that influence the increasing incidence of warehouse fires are discussed below;

Ignition sources: Fire occurs due to the rapid and continuous combustion of a material. This requires three basic elements:

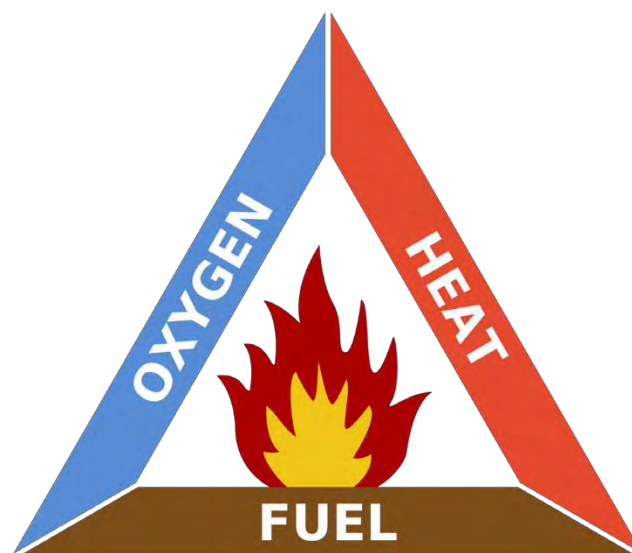


Fig 5.2.50: Ignition Sources of Fire



1. Fuel, which is the element that burns. Examples include paper, cardboard or petrol.
2. Oxygen, found in the air and present when certain substances decompose.
3. Energy, to raise the temperature of the fuel to its ignition point, for example, a flame, sparks or lightning.

The energy needed to start the combustion is one of the elements which must be present in order for a fire to start. This energy comes from an ignition source, which is defined as something with sufficient energy to raise the temperature of the stored goods and produce a fire.

Common ignition sources in warehouses include:

- Power installations, such as electricity, gas or heating installations. The risk is greater when these are poorly maintained or located near the stored goods.
- Electrical installations are the origin of many fires and there are several factors which can increase this risk. These include:
  - Damaged or poorly insulated electrical wires, leaving conductors exposed, and so on.
  - Failure to use the correct size of electrical conductor protection, leading to overheating.
  - Multiple use of the same electrical socket, causing overloading at a particular point in the electrical network.

A suitable way to prevent fires due to the existence of electrical installations in poor condition is to introduce predictive maintenance. This includes carrying out thermal imaging (thermography) at least once a year.

Thermal imaging is a technique which uses an infrared camera to measure the surface temperature of different components. In most cases, electrical faults are preceded by increased temperatures at the weakest point of the installation. This technique is extremely useful since it facilitates detection up to months in advance of defects which could cause a breakdown leading to process stoppage or, in the worst case scenario, a fire.



Fig 5.2.51: Thermal Imaging Analysis of a Main Switchboard. Real image on the left, thermal image on the right.

- In addition, goods can become hot and catch fire if they are stored near energy sources such as heaters or lighting which is heat-producing.
- Goods must be stored at least 1 meter from any lighting or heat-producing source (an air heater, a ventilation fan, a blow torch etc.) which could cause a fire.
- Lightning should also be protected against possible impact from goods so that their breakage and the resulting hazardous situations are prevented.

Ignition sources characteristic of the manufacturing process: These can be found in storage areas inside industrial processes which use heat or open flames, such as industrial furnaces.

Ignition sources associated with storage processes: Warehouses often use machinery to handle goods. This machinery may be electrical or powered by thermal engines using diesel oil, petrol or gas. Machinery can include forklift trucks, pallet trucks or lifting equipment. In general, indoor warehousing uses electrical equipment requiring a battery power supply which must be recharged periodically using battery chargers



Fig 5.2.52: Forklift battery charging

Battery chargers present a particular risk because during the recharging process, they release hydrogen gas. This is explosive even though it may only be present in the air in very low concentrations and, as a consequence, the presence of combustible or flammable material around the battery-charging area increases the fire and explosion risk in the warehouse.



Fig 5.2.53: Forklift in direct contact while charging battery

The following recommendations should be followed in relation to battery-charging areas:

- Anti-explosion trucks must be used in areas where there may be explosive or flammable gases, vapors or dust, in accordance with the current regulations.
- The battery-charging area must be free of ignition sources and well ventilated.
- Electrical installations must comply with the provisions of the Electrical/Technical Regulations
- Necklaces, bracelets, watches or any other metallic objects which could lead to short-circuits or sparks must not be worn during battery handling and charging operations.
- Lighters or live flames must not be used to check charging levels.
- In automatic battery-charging operations, only the number of batteries specified by the equipment manufacturer must be recharged simultaneously.



Fig 5.2.54: Material stored next to a battery charger



Fig 5.2.55: obstacle-free battery - charging area

- Daily and period checks of circuits, tanks, couplings and battery elements and circuits.
- Daily and periodic checks of combustion systems and/or electric batteries.

In the case of equipment powered by thermal engines, sparks can occur in the exhaust pipe, potentially leading to a warehouse fire. This is particularly true if there are explosive atmospheres involving explosive or flammable gases, vapors or dust. In such cases, it is advisable to provide flame-extinguishing or spark containment devices around the exhaust pipe outlet.

Other possible ignition sources, albeit not common in warehouses, are those related to hot work. This type of work includes all operations which generate heat, sparks, flames or high temperatures and which, in the presence of flammable or combustible materials can cause a fire. This is the case with certain tasks performed in general warehouse maintenance, such as soldering, circular sawing, drilling, and so on.

Execution of these tasks in a safe manner requires certain basic safety measures to be followed.

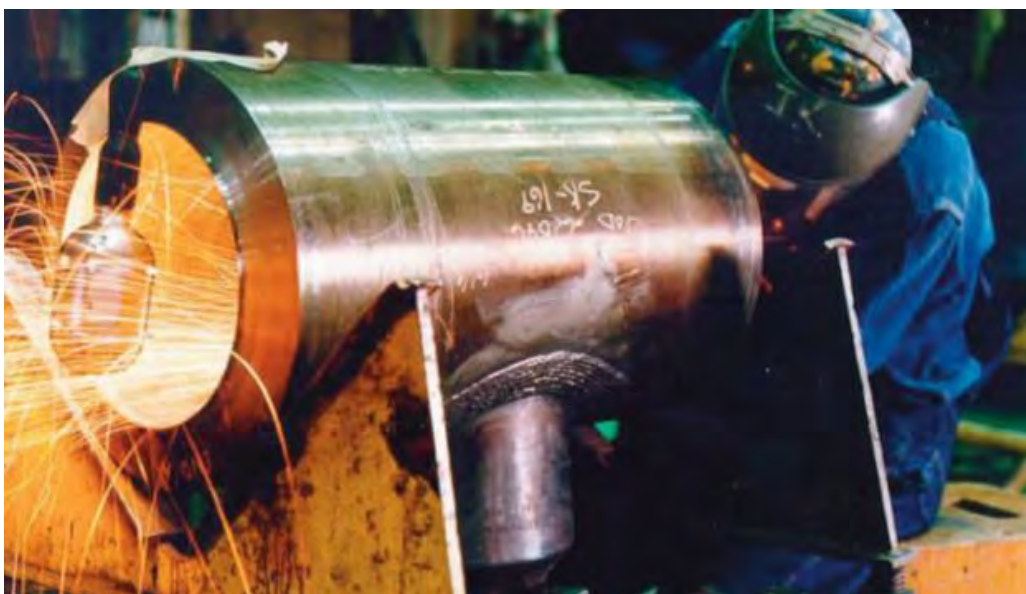


Fig 5.2.56: Sparks from filing processes can be propelled a considerable distance

Another potential ignition source of no less importance is that related to poor practices by smokers. Controlling this risk involves creating specific smoking areas and forbidding smoking elsewhere. No-smoking signs must be displayed and staff must be appropriately informed of their obligations. These prohibitions must be strictly observed and periodic checks should take place at least once a month.



Fig 5.2.57: No smoking signs

Ignition sources associated with the process of using heat to shrink wrap products, which involves wrapping the goods in a thin plastic film. Some warehouses use this technique to protect the goods against breakage or becoming worn in appearance. Shrinking-wrapping processes may require the use of heat to seal the plastic film. The heat is generally supplied by a soldering electrode or electrical resistor incorporated in the shrink wrapping device. The plastic material used is often highly combustible (for example, polypropylene or polyethylene.) and therefore the risk of fire is considerably increased.

### Fire load

Fuel is the second factor involved in the origin of a fire and to understand its role, it is necessary to discuss what is known as the fire load. In general, the fire load of a warehouse is calculated by considering, among other factors, the quantity and the heating value of each combustible material present, including construction materials.

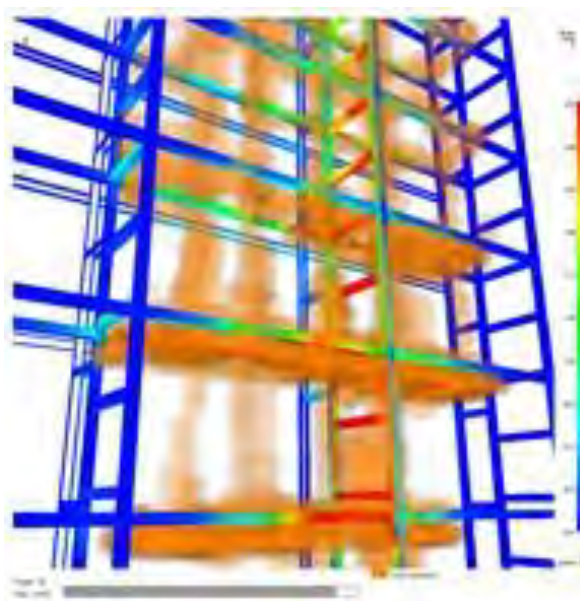


Fig 5.2.58: Fire load testing

What is of most importance here is the nature of the materials or goods stored. Depending on their characteristics, the rate of fire spread will be higher or lower. The severity of a fire will obviously depend on the combustibility of the material. On the whole, plastic and synthetic materials tend to burn faster than ordinary or natural materials such as cardboard. In this respect, we need to differentiate between:

Stored goods, including their packaging (paper, plastic, etc.). Consideration needs to be given to whether the warehouse is located in high-risk premises, as would be the case where activities such as painting and varnishing take place. This represents a considerably higher risk of fire and/or explosion. If the warehouse contains a high-risk product (for example, paint, oils or aerosols) in a small quantity in relation to the overall products stored, it is recommended that this product is isolated and given specific protection. External storage or confinement by the use of segregation devices or partitions providing at least one hour's resistance to fire is advisable.



Fig 5.2.59 Storage risks

Construction materials, including those used to build the warehouse structure, (concrete, wood, metallic structures, and so on), those used to cover the structure, (fiber cement, sheet metal, fiberglass, and so on) and those used to insulate or finish off the roof and walls (plaster, polyurethane, and so on). The use of insulation materials such as polyurethane or polystyrene increases the fire load due to their high degree of combustibility. To prevent fires related to the fire load occurring, we recommend the following measures, many of which are related to good housekeeping and practices at the warehousing facilities:

- a) Products that represent risks which may cause exceptional damage (such as dense smoke) or corrosive atmospheres should be stored separately from products which are especially vulnerable to such risk.
- b) The aisles and corridors separating goods can provide considerable advantages when faced with a fire fighting and rescue operation. The most appropriate aisle width depends on the foreseeable seriousness of possible fires, but in general terms, aisles of 2.4 meters will suffice. If possible, aisles should lead to the doors or windows in order to facilitate access.
- c) A separation distance of at least 60 cm should exist between the stored goods and the walls of the building. This is particularly important if the product expands when wet.

- d) Goods should not be stored so that they are higher than the lower part of roof beams or too close to roof trusses. If there are automatic sprinklers, it is advisable to ensure that a 1 meter separation distance exists between the highest storage point and the sprinkler heads. The minimum separation distance required is 60 cm. In the case of fire detectors, the recommended distance from stored goods is also at least 1 meter.



*Fig 5.2.60 Storage reaching the ceiling*

- e) Empty pallets must be stored outside production and warehouse buildings and be placed so that an adequate distance separates them from external walls of the building.
- f) The correct location of highly hazardous products, such as toxic, corrosive or flammable materials, is also important to reducing fire load. Such products must always be placed in specifically designated areas and sectioned off from other areas.
- g) In external storage areas, it is necessary to ensure that no additional risk arises due to the proximity of the stored goods to external equipment (transformers, refrigeration towers, fuel tanks, etc.), buildings or power lines.

## Oxygen

The most influential factors which can cause a fire to start and then spread are:

- a) Type of storage. Generally, indoor warehouses are designed with a specific storage capacity. However, financial reasons mean that the storage space is used to a maximum, leading to high stacks with minimum separation distances between them and, sometimes, the accumulation of large quantities of material in one area.

In the case of “block stack” storage, the more free space there is inside the stacks, the more serious the fire becomes because the air can circulate more freely, favoring combustion. Conversely, the denser the stacks are packed, the less serious the fire. Fire intensity will also increase in line with the height and the stability of the stacks. Stable stacks are unlikely to collapse and therefore present fixed surface areas, which favor fire spread. On the contrary, stacks which fall or collapse will generally help to control the fire.



*Fig 5.2.61: Paper rolls stacked vertically*

Waste must be classified and deposited in suitable containers. If possible, these should be located outside the production and warehouse buildings and separated from the external walls of the building. In all cases, waste must be appropriately dealt with or removed periodically.



Concentration of combustible materials must be avoided in areas used for packing, unpacking, classification, and so on.

The seriousness of a fire is also affected by the amount of free space, such as that found between the different layers of storage on pallets. Such spaces allow the fire to spread, but unfortunately are not normally reached by the water used in fire fighting.



*Fig 5.2.62: Stacks stored on pallets*

Both shelf and rack storage is common in warehouses. An explanation of both types is provided below:

Shelving, in which the stored loads are generally packaged goods placed on solid metal shelves or boards.



*Fig 5.2.63: Shelving*

Pallet racking, in which the palletized loads are placed on supporting beams using mechanical lifting equipment (such as forklifts) or hand operated equipment (such as pallet trucks)



*Fig 5.2.64: Pallet racking*

### Risk vulnerability

In addition to the factors outlined above, other factors which lead to increased vulnerability to risk include the fragile nature of certain valuable merchandise and the severity of the damage that may be caused to the warehouse or merchandise by certain building materials. The following are included among these factors:

- a) The existence of electronic or precision equipment of great importance to the company.
- b) The existence of documents or files of high strategic value to the company.
- c) Products liable to suffer damage due to combustion gases or as a result of environmental conditions producing rust.
- d) Luxury or valuable goods.
- e) Food products, such as fruit, vegetables and meat which can suffer irreparable damage due to combustion fumes. Further complications exist with these products due to the use of refrigerated chambers to store such goods prior to shipment to the final user. The sandwich panels used to construct these chambers present an added risk factor.



*Fig 5.2.65: Warehouse risk vulnerability*

Highly-combustible organic material, such as polyurethane or polystyrene, is normally found inside the panels and if a fire starts in their interior, it generally spreads quickly. In addition, a large amount of toxic fumes is also produced. Controlling and extinguishing this type of fire is a complex matter because the organic material is confined between sheet metal. Even if water is constantly sprayed on the panels, the cooling effect is not sufficient to put the fire out and it continues to burn on inside.

There are other factors which can increase risk, such as those arising from the use of flammable and/or explosive refrigerating gases, such as ethane or propane. A leak in the refrigeration circuit can produce a flammable atmosphere which results in an explosion.

These types of refrigerants are not normally used in the food industry. Instead, refrigerants of high and medium safety are generally used. A typical example of this is ammonia. While its intrinsic risk of ignition is low, its toxicity is high. It has a suffocating effect and it is estimated that the maximum risk free exposure level for humans is 25 ppm. It represents an increased risk not only for people in the surroundings of the refrigerated chamber, but also for the stored goods, which can be contaminated.

In these cases, if staff members are constantly present, current regulations require either the installation of one or more ammonia detectors with a 2% detection sensibility, or the installation of emergency stop buttons, which should be located outside.

#### **Added risks due to external factors**

External factors are those that can increase risk levels due to situations which are foreign to the warehouse itself. They are usually found in the warehouse surroundings. Significant examples of these external factors are the following:

- a) **Adjacent buildings:** Sometimes, the origin of a fire is not in the warehouse itself but in an adjacent building.



*Fig 5.2.66: Adjacent buildings, which may or may not be communicating*



*Fig 5.2.67: A dividing wall separating two buildings*

- b) Roofs of different heights on adjacent buildings.
- c) The presence of trees or undergrowth around the warehouse can cause a fire to spread to the inside of the warehouse. Ideally, the warehouse surroundings should be kept free of undergrowth



*Fig 5.2.68: Undergrowth outside the warehouse increases risk of fire*

- d) Fires caused by third parties foreign to the warehouse, which is called arson. This may occur due to the burning of pallets placed outside the warehouse, crates, and so on in agricultural cooperatives.
- e) Outdoor storage in warehousing facilities: Generally, the use of such facilities is not advisable due to their exposure to a large number of possible ignition sources of external origin, such as direct impact by lightning, fires caused by persons foreign to the warehousing facilities, the presence of undergrowth which may cause a fire to spread, and so on. The installation of automatic protection measures is not feasible in such circumstances. Despite this, the use of exterior warehousing or storage facilities is justified in certain cases:

- Products with low fire-risk levels (such as empty metallic drums) which do not require fire protection, even when inside buildings.
- Products of low value that do not justify the use of indoor storage areas.
- Products of low value with high fire-risk levels (such as empty pallets).
- Bulky products stored in amounts that make covered storage impractical (such as paper, wood, etc.).

However, even in these cases of apparently little importance, it is necessary to evaluate and consider certain conditions to ensure proper protection. The first assessment necessary is to ensure that goods stored outdoors do not represent a hazard which could cause an interruption in normal business activity, production stoppage, or any damage to third parties such as adjacent companies.

### Fire protection measures

The fire protection measures installed at the premises influence the ability to control fires and to extinguish them with the minimum possible consequences. The first measure to consider in this respect concerns warehouse construction characteristics.

Given their high heat-resistance levels, the most advisable construction materials are concrete and steel coated with plaster or fibrous silicate panels, or even sprayed with a layer of perlite or vermiculite mortar.



*Fig 5.2.69: Fire safety measures*

When steel is protected with intumescent paint, firstly it is important to ensure that its application covers the entire structure. No less important is maintenance, particularly in areas which could be affected by knocks. In any event, such coatings for metallic structures are not effective against lasting or intense fire, as is foreseeable in the case of warehouse fires.

The next preferred choice in terms of construction materials involves the use of large, heavy wooden beams because of their slow combustion and structural stability compared to an uncoated metallic structure.

Metallic structures without additional protection against fire are not advisable. Steel begins to become unstable when subjected to temperatures above 538 °C, even if only for a few minutes. Heat deformation of the structure can lead, among other problems, to the roof collapsing or falling in and to the pipes of the fire protection installations breaking.

The resulting water loss will lead to the fire protection installations malfunctioning, leaving any fire completely beyond control. Constructions with combustible materials, including light wood, are not advisable in view of their rapid combustion.

Another important factor is warehouse ventilation. Under “normal conditions”, a fire spreads in two directions: horizontally (following the distribution of the combustible material) and vertically. As the fire advances, the heat rising vertically steadily increases and hot combustion gases accumulate under the ceiling. When the heat spreading from these gases to the roof and the structural elements of the building becomes intense enough, the building may collapse.

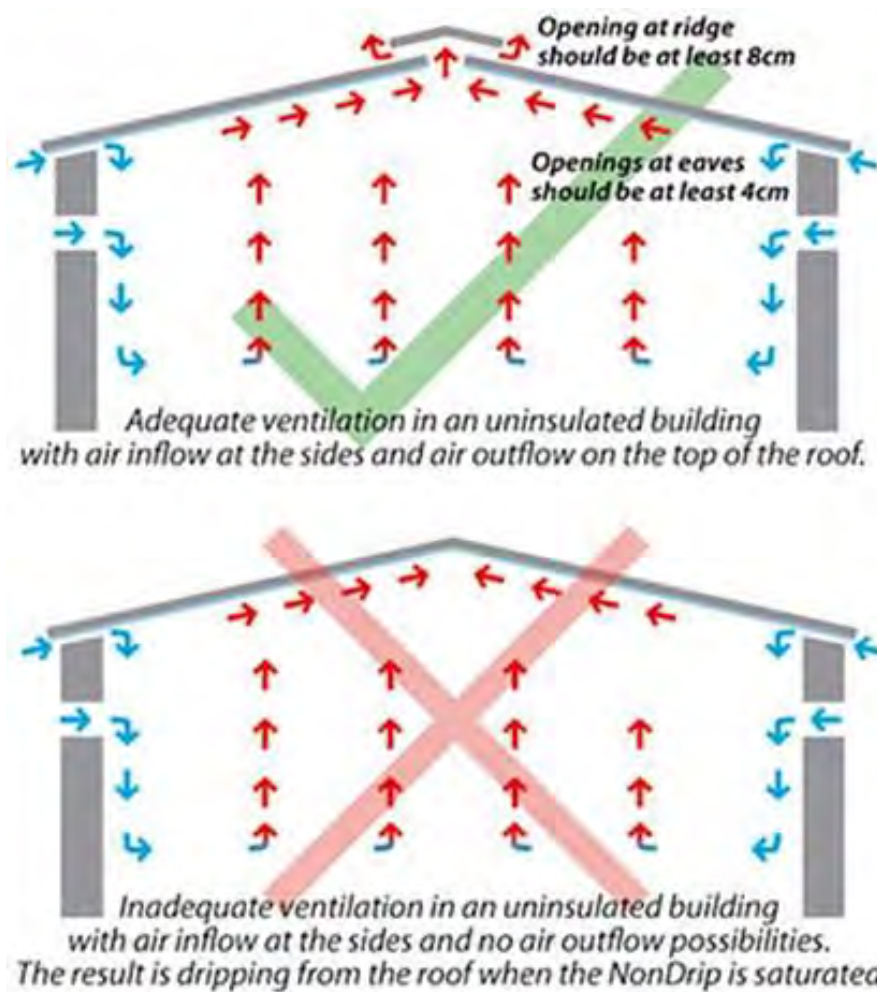


Fig 5.2.70: Warehouse Ventilation systems

In general, the ventilation provided by windows or openings located in the higher sections of the façade or roof is enough to dissipate hot gases generated by fire. Nevertheless, national, regional or local regulations may require the installation of smoke and heat vents. Lastly, another factor affecting the capacity to control and extinguish fires is the presence of active protection measures.

### Environmental risk

- a) For the most part, environmental risk associated with warehouses is limited to the presence of materials which are potentially toxic for the general environment or the workplace environment. In this respect, the following hazards can be identified:

Hazards related to the stored materials. If they consist of chemicals or toxic, corrosive or flammable materials, the main risk concerns emergency situations resulting from accidental spillage. In addition, there is increased environmental risk of toxic fume emissions being released into the atmosphere due to a fire in a warehouse containing such products. Some examples of the products involved include household cleaning products, home improvement products, cosmetics and personal hygiene products.



Fig 5.2.71: Hazardous substance stored in Warehouse

- b) Hazards related to equipment used for loading and transportation activities. The main environmental risks are those arising from the noise and exhaust fumes from lifting equipment or vehicles with diesel or petrol engines. The vehicles may be for indoor use, such as forklift trucks, or outdoor use, such as lorries in loading bays. One must also consider the possibility of accidental acid spillage from batteries during recharging operations.
- c) Basic environmental risk safety measures initially involve the suitable classification of the stored goods





Fig 5.2.72: Forklift equipment causing damage

- d) Potentially toxic chemical substances, such as petroleum products, solvents and dyes must be adequately labelled and safety data sheets must be provided for each product in order to enable their use in the event of an emergency. The provision of information and training for workers handling the products is an effective way to reduce risk. This is particularly true since in the event of spillage and subsequent cleaning, it is essential that staff are aware of the risks to which they are exposed and the possible consequences for their own health and the environment.



Fig 5.2.73: Material Safety Data Sheet

- e) In certain circumstances, it may be appropriate to install safety guards or rails on shelving and racking to protect them against being knocked or struck by forklift trucks.
- f) Adequate planning and maintenance of the areas where materials are stored is necessary to prevent their loss and/or accidents. The location of different chemical products must be shown on a warehouse map and a record of product entries and exits must be kept. Special attention should be given to the location of mutually incompatible substances which could provoke dangerous chemical reactions.
- g) In general, warehouses in this category must be compartmentalized or adequately sectioned off from other buildings occupied by persons, from other warehousing facilities, and from manufacturing areas. In addition, it is advisable to install collection systems and/or systems for limiting potential damage caused by accidental spillage. Basic examples include containment vats and floors which have been treated to improve resistance to products that may be spilled in the protected area in question.
- h) With respect to the battery-charging areas or premises found in many warehouses, the main environmental risks arise from acid splashes or spillage. These can be reduced by installing a waterproof, acid-resistant floor with a slope which allows easier removal of cleaning water and acid spills. Recommendable maintenance tasks include frequent cleaning of the premises and the use of suction to eliminate dust from battery chambers, while taking care not to suction the electrolyte.
- i) Environmental pollution must also be considered. Adequate safety conditions should be maintained with regard to noise and exhaust fumes produced by forklift trucks with diesel engines. Whenever possible, it is advisable to use electric forklift trucks for indoor warehousing activities, not only for the environmental advantages this offers but also because it reduces fire risk. Forklift trucks with thermal engines (whether diesel, petrol or liquefied gas) should only be used in outdoor, well-ventilated areas.

### **Natural risks**

Natural risks are those caused by natural forces. The magnitude of the losses caused by these forces depends on:

- The intensity of the natural phenomenon.
- Construction methods.
- Protection mechanisms against catastrophes of this type.

Although these type of loss events occur less frequently than fire, their damage potential is usually greater.

### **Wind**

Modern lightweight roofs can have entire roof panels torn off by wind. Walls and wall enclosures can also be affected, leading to the collapse of the building if these are designed only to enclose the structure without providing resistance to excess pressure or excess loads.

Design regulations exist to enable calculation of the wind loads exerted on a building and its roof. Factors influencing design choices include the wind regime and the topographical location of the building.



*Fig 5.2.74: Warehouse disaster due to wind*

To prevent wind suction from tearing the roof off, sufficient anchoring provision must be incorporated at the design stage. In addition, the building design must consider possible vibrations caused the dynamic forces produced by the effect of changes between wind pressure and wind suction on the roof.

As a general construction rule, it is advisable to employ systems which distribute wind loads down to the foundations. Such systems include, for example, the use of supporting or load-bearing walls. To obtain a stronger enclosing structure without introducing excessive weight, steel bar reinforcements can be used.

#### Flooding, rain, hail and snow

- Flooding can be caused by the following:
- As a direct result of water from excessive rainfall.
- Water from the melting of ice and snow.
- Water overflowing from lakes with natural outlets, rivers or estuaries, and other natural surface waterways.
- Water from rough seas along coastlines.
- Water from burst dams.



*Fig 5.2.75: Flood water surrounding a warehouse*

At times, the effects of such phenomena are worsened by the effect of human actions on our environment. These can include:

- The waterproofing effect of laying tarmac on large surface areas of land.
- Cutting down trees and crops, leaving the land bare and facilitating erosion.
- The practice of channeling water, which can worsen flooding by increasing the quantity of water which flows into rivers in short periods of time.
- The building of constructions in rivers or waterways.

Flooded land can lead to landslides and the collapse of buildings if their structures have not been efficiently designed to withstand land movements.

Other possible types of water damage to buildings are those resulting from rain, hail or snowfall on the roof. Damage caused by these phenomena includes leaks, burst water pipes or drains, collapsing roofs, smashed skylights and windows, and so on. Aside from building damage, there may also be damage to the stored goods, which could prove costlier than that to the building itself.

### **Lightning strikes**

Lightning produced in storms is directly or indirectly responsible for frequent harm to persons and damage to goods. Among the most common types of damage caused to warehouses are:

- Perforation of electrical installations.
- Fire and dangerous sparks.
- Damage to highly sensitive computer or electronic equipment.



*Fig 5.2.76: An electrical storm*

Although natural hazards are in general unpredictable, statistical data is available from lightning-strike records and it can be used to make risk estimates. It is possible to predict if a particular geographical area is at risk of suffering a lightning strike to a greater or lesser degree.

Lightning protection systems are based on a simple concept which involves intercepting the lightning before it strikes a specific object so that the current can enter or leave the ground without causing harm to people or damage to objects in its path. This is possible thanks to the use of pointed air terminals which allow the electrical current to travel easily along their length and to be discharged by this route.

Such systems must be installed in all buildings where toxic, radioactive, highly flammable or explosive substances are stored or handled, as well as in any buildings higher than 43m. In other cases, the need for a lightning protection system is evaluated by estimating the lightning-strike rate and comparing it to the risk level of the building requiring protection. Consideration must be given to the type of construction, its use, occupation rate and the activities performed in it. When the estimated strike rate is higher than the acceptable risk level, a lightning protection system must be installed.

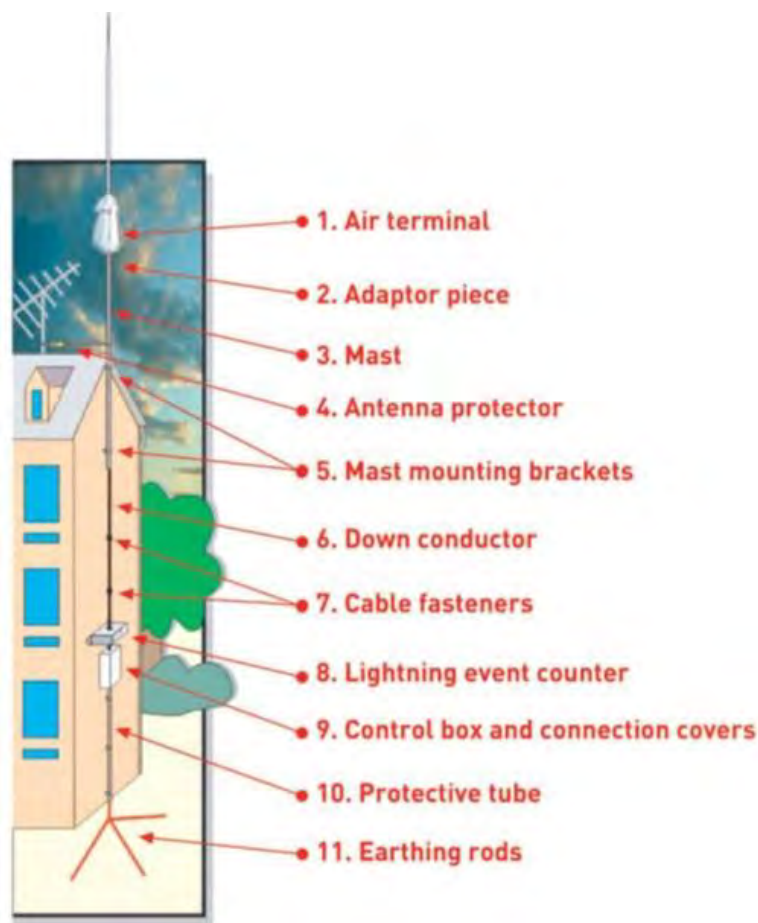


Fig 5.2.77: Lightning rod with feeder device

### Theft and intrusion risk

Theft and intrusion are other risks to which warehouses are exposed.

As regards the risk of intrusion, this can have highly damaging consequences for warehouses in the form of arson or intentionally setting fire to property. Warehouses have high combustible loads and are therefore prime targets for such crimes, particularly when there are no people in the building. The reasons are wide and varied and experience shows that personal grudges or revenge can play a part.

As for theft, although it exists as a risk factor in all warehouses, assessment of the degree of risk it varies from one warehouse to the next. In general, two key factors require consideration:

- To what degree are the products attractive to thieves?
- Theft vulnerability or the ease with which the goods can be stolen.

To estimate the first factor, it is necessary to know the value of the stored goods:

- What is their market value?
- Can they be sold or placed in the market easily?

As regards the vulnerability of the goods, one must first know who to protect the goods against:

- Someone external to the company?
- Company staff?
- Someone external with help from inside the company?

Next, an assessment must be made of the ease or difficulty involved in transporting the products. Valuable goods that are heavy or difficult to transport are not as attractive as those that are easily transported.

Finally, the warehouse surroundings require assessment. Location in an unpopulated area is quite different to location in an urban environment. The risk of suffering a theft which cannot be prevented is greater in the first case than in the second.

In short, product vulnerability to theft is evaluated according to the time factor, which refers to the time necessary to delay the intrusion or the reaction time after an alarm is set off.

The anti-intrusion and anti-theft measures employed in warehouses to reduce risk to acceptable levels can vary as widely as the products stored in them. For this reason, providing an exhaustive list of valid protection measures for all warehouses is not feasible here.

Protection systems need to be looked at on an individual basis, selecting the most suitable measures according to each risk and according to the minimum level of protection necessary. However, general recommendations can be divided into the following categories:

1. Passive protection measures intended to delay intrusion.



*Fig 5.2.78: Lockable metal shutter warehouse door*

2. Active protection measures intended to detect the intruder and raise the alarm in the event of intrusion.



*Fig 5.2.79: External emergency staircase & Peripheral fence with sliding gate*

3. Organizational measures, which include the relationships between the agents involved in intrusion protection.

Choice of the most appropriate anti-intrusion protection system requires careful balancing of the three types of measures outlined above.

### **Conclusion**

The volume of goods stored in warehouses means that the material losses suffered in the event of a fire can be considerable. In addition, damage to professional image may occur, which hinders recovery and the achievement of a return to normal business activity. As a consequence, the warehousing sector is highly sensitive to fire risk and adequate protection requires exceptional safety measures which may even surpass those required in law.

However, risks are not limited to those related to fire. It is also important to protect warehouses against theft, natural catastrophes and environmental damage that may be caused by stored goods.

Given the wide range of potential threats, warehouse safety management requires corporate managers to have a comprehensive vision of risk. In addition, the company must have a proper maintenance policy for its warehousing facilities and the best housekeeping and cleaning practices must be followed. The existence of a safety management policy alone will be of little use unless it is complemented by the involvement of all parties. Naturally, leadership is essential in order to achieve good results in this area. Managerial actions and decisions send clear messages to all levels of the organization regarding which actions are considered important and which are considered unacceptable.

The principal purpose of a well-designed and adequately maintained warehouse is to ensure that the receipt, protection and dispatch of goods are carried out as efficiently as possible. To achieve this goal, the important requirements do not only include factors such as location near the final customer, ease of transport, flexible storage spaces and proper sizing of the warehouse. It is also vital to guarantee the safety of the stored goods and in doing so, of the warehouse itself.

For this reason, warehouse safety represents an added value in the services offered to clients.





## Summary

The warehouse picker is an individual who is responsible for capturing any errors or discrepancies in product picking before it is sent to packing stage. The individual in this role is also responsible to identify any common workplace hazards and report to management for appropriate actions to be taken. Some of the common workplace hazards that once might encounter inside the warehouse has been discussed in this unit for better understanding. Important aspects of environmental health and safety is explained clearly with pictorial examples for better understanding.

## Exercise

1. What is the use of this signage



2. Say true or false

We can mix Bleach and Rubbing Alcohol: \_\_\_\_\_

We can mix Hydrogen peroxide and Vinegar: \_\_\_\_\_

We cannot mix one Drain cleaner with another Drain cleaner: \_\_\_\_\_

3. Say 'Yes' or 'No'

It is not required to used personal protective equipment while carrying housekeeping activities: \_\_\_\_\_

We can place the housekeeping equipment anywhere in the available empty space:

\_\_\_\_\_

Scan the QR code to watch the relatable video



To Carry Out Housekeeping  
<https://youtu.be/qPIRi-RWNIY>



Warehouse material handling  
<https://www.youtube.com/watchv=kcM9u4heDVk>



## Annexure – QR Codes

S.No	Chapter No.	Unit No.	Topic Name	URL	Page No.	QR code(s)
1	Chapter 1- Introduction to warehouse binner	Unite 1.1- Supply chain management	1.1.1 What is Supply Chain Management	<a href="https://www.youtube.com/watch?v=lZPO5RclZEo">https://www.youtube.com/watch?v=lZPO5RclZEo</a>	25	  Supply Chain Management
2	Chapter 1- Introduction to warehouse binner	Unite 1.1- Supply chain management	1.1.3 What is Logistics Management	<a href="https://www.youtube.com/watch?v=4QU7WiVxh8">https://www.youtube.com/watch?v=4QU7WiVxh8</a>	25	  Logistics management
3	Chapter -2 Preparation for Binning	UNIT 2.1 – Receiving Packages	UNIT 2.1.2 – Unloading	<a href="https://youtu.be/2NqAZ_aoSvg">https://youtu.be/2NqAZ_aoSvg</a>	30	  Warehouse unloading
4	Chapter -2 Preparation for Binning	Unit 2.4 - Safety, Security and Maintenance Aspects	Unit 2.4.2 - Types of personal protective equipment	<a href="https://youtu.be/_NyioZRt5wY">https://youtu.be/_NyioZRt5wY</a>	55	  Types of PPE
5	Chapter-3 Binning	Unit 3.1 – Storages and Equipment used	Unit 3.1.2 – Material Handling Equipment	<a href="https://youtu.be/BBWPIByOefl">https://youtu.be/BBWPIByOefl</a>	71	  Types of material handling

6	Chapter-3 Binning	Unit 3.2 - Understanding Labels, Technologies and Signages	Unit 3.2.7 - Types of warehouse labels	<a href="https://youtu.be/tYYYIfk kjVQ">https://youtu.be/tYYYIfk kjVQ</a>	77	  Warehouse labels and signs
7	Chapter - 4 Perform Post Picking Activities	Unit 4.1 - Perform post binning activities	Unit 4.1.1 - Perform Post Binning Activities	<a href="https://youtu.be/urjlro_4Ydo">https://youtu.be/urjlro_4Ydo</a>	92	  Layers and types of packaging
8	Chapter - 4 Perform Post Picking Activities	UNIT 4.3 - Exposure to Documents	Unit 4.3 .1- Exposure to Documents	<a href="https://youtu.be/9_JpN_ug5CQ">https://youtu.be/9_JpN_ug5CQ</a>	99	  Real time warehouse KPI dashboards
9	Chapter - 5 To Carry Out Housekeeping	Unit 5.1- To Carry Out Housekeeping	Unit 5.1.1- Housekeeping	<a href="https://youtu.be/qPIRi-RWNIY">https://youtu.be/qPIRi-RWNIY</a>	163	  Warehouse cleaning checklist for daily, weekly and monthly
10	Chapter - 5 To Carry Out Housekeeping	UNIT 5.2 - Occupational / Environmental Health and Safety	5.2.2 - Gendral safety rules	<a href="https://www.youtube.com/watch?v=kcm9u4heDvk">https://www.youtube.com/watch?v=kcm9u4heDvk</a>	163	  Warehouse material handling





**Skill India**  
कौशल भारत - कुशल भारत



Scan the QR code to access the ebook



Address: No. 480 A, 7th floor Khivraj Complex 2, Anna Salai,  
Nandanam, Chennai – 600 035

Email: [reena@lsc-india.com](mailto:reena@lsc-india.com)

Web: [www.lsc-india.com](http://www.lsc-india.com)

Phone: 044 4851 4605

Price:

