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# Participant Handbook

**Sector**  
**Logistics**

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

**Occupation**  
**MHE Maintenance Technician**

**Reference ID: LSC/Q2315, Version 3.0**  
**NSQF Level 4**



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## Material Handling Equipment (MHE) Maintenance Technician





**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. ”



## Certificate

### CURRICULUM COMPLIANCE TO QUALIFICATION PACK - NATIONAL OCCUPATIONAL STANDARDS

is hereby issued by the

**LOGISTIC SECTOR SKILLS COUNCIL**

for the

### **SKILLING CONTENT: PARTICIPANT HANDBOOK**

Complying to National Occupational Standards of

Job Role/ Qualification Pack: **'Material Handling Equipment (MHE) Maintenance Technician'**

QP No. **'LSC/Q2315,V3.0 NSQF Level 4'**

Date of Issuance: January 27<sup>th</sup>, 2022  
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*\*Valid up to the next review date of the Qualification Pack  
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Authorized Signatory  
(Logistic Sector Skill Council of India)



## Acknowledgements

We thank the following organizations who have helped us in developing the content 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 Material Handling Equipment (MHE) Maintenance Technician Qualification Pack (QP). It provides the learners with the necessary knowledge of major Warehousing activities such as Introduction to MHE Maintenance Technician, Preparation for Maintenance, Maintenance Operations, Post Maintenance Activities, Compliance to Health, Safety and Security Measures. The decision-making orientation provides the learners with a real-world approach focusing on both large and small Warehousing industries.

The book elaborates how Individuals in these positions can manage general physical activities to prepare documentation of Warehousing processing which includes Introduction to MHE Maintenance Technician, Preparation for Maintenance, Maintenance Operations, Post Maintenance Activities, Compliance to Health, Safety and Security Measures. The handbook is divided into Five NOSs. NOSs are National Occupational Standards which have been endorsed and agreed to by the Leaders of Industry for various roles. The NOSs are created on the educational, training, and other criteria required to perform the job/role of an EXIM Executive.

Key Learning Objectives for the specific NOS mark the beginning of the Unit/s for that NOS. The symbols used in this book are described below.

## Symbols Used



Key Learning  
Outcomes



Summary



Unit  
Objectives



Tips



Notes



Exercise







# 1. Introduction to MHE Maintenance Technician

Unit 1.1 - Supply Chain and Logistics Management

Unit 1.2 - Sub-sectors of Logistics Industry

Unit 1.3 - About Warehousing Industry

Unit 1.4 - Roles of Material Handling Equipment (MHE)  
Maintenance Technician





## Key Learning Outcomes

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

1. Differentiate Supply Chain and Logistics Management.
2. Recognize the various sub-sectors and the opportunities in them.
3. Interpret warehousing industry and opportunities in it
4. Interpret your job role as MHE Maintenance Technician and its interface with other job roles
5. Analyze the employment opportunities in warehousing industry.

## Unit 1.1 - Supply Chain and Logistics Management

### Unit Objectives

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

1. Interpret Supply Chain and Logistics Management

### 1.1.1 What is Logistics?

In a broader sense, logistics refers to the procedure of allocating and moving resources, such as people, products, stocks, and equipment, from one location to the desired location.

Delivering equipment and supplies to field troops is what the term logistics originally meant in the military.

When you plan a military invasion, you are using logistics. the component of military operations that deals with the selection, allocation, upkeep, and replacement of equipment and personnel.



Fig. 1.1.1. Logistics

Scan the QR code to watch the related videos



[https://youtu.be/kT\\_toh5NbxE](https://youtu.be/kT_toh5NbxE)  
What is logistics?



Fig. 1.1.2. Logistics vs. Supply Chain

#### Logistics vs. Supply Chain Management

Although they sometimes refer to the same thing, supply chain management and logistics are two independent process factors.

The term "logistics" describes activities that take place within a company, such as the acquisition and distribution of raw materials, the packaging, shipment, and transportation of goods to distributors.

Even so, supply chain management refers to a larger network of external businesses—suppliers, logistics service providers, call centres, warehouse providers, and others—working together to transfer products to customers.

According to Phillip Kotler, market logistics comprise organising, carrying out, and managing the physical flow of raw materials and finished goods from the point of origin to the point of use in order to meet client needs and turn a profit.

Logistics management is essential to supply chain management planning since it affects a company's top and bottom line's productivity and efficiency.

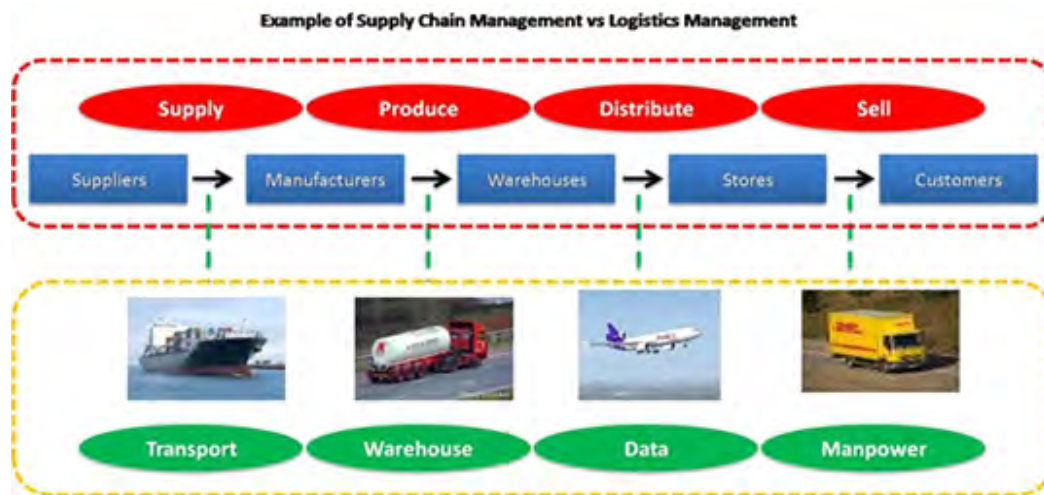


Fig. 1.1.3. Examples of Supply Chain Management

Three forms of flow exist in supply chain management:

- i. Material flow
- ii. Information/Data flow
- iii. Money flow

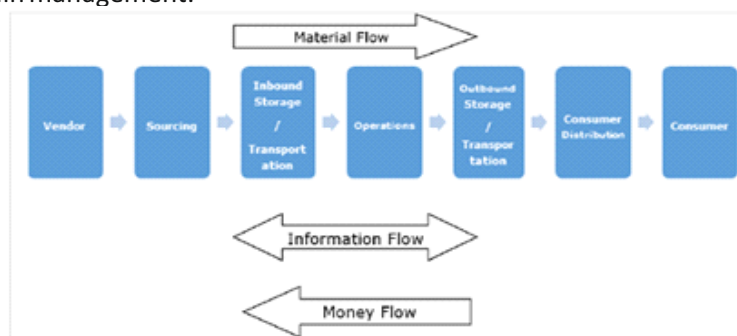


Fig. 1.1.4. Different Types of Flow in Supply Chain Management

Let's take a closer look at each of these flows and determine how well they work for Indian businesses.

1. **Material Flow:** Material flow is the orderly transfer of a product from the producer to the consumer. The many warehouses used by distributors, dealers, and retailers make this possible.

Our biggest obstacle is making sure that the merchandise moves promptly and uninterrupted through each link in the chain. The business will benefit more from it if it moves quickly because it will shorten the cash cycle.

The product may also move from the consumer to the manufacturer for any necessary repairs or to exchange for a defunct material. Finally, finished commodities are delivered from clients to their end users via various agencies. In this case, a procedure known as 3PL is in use. Additionally, there is internal flow within the client company.

**2. Information Flow:** The request for quotation, purchase order, monthly schedules, engineering change requests, quality complaints, and supplier performance reports are all examples of information/data flow from the customer side to the supplier.

The information flow from the producer to the consumer consists of the company presentation, the offer, the confirmation of the purchase order, the reports on the actions taken in response to deviations, the shipment information, the inventory report, the invoicing, etc.

The manufacturer and the consumer must communicate frequently for the supply chain to be successful. We frequently observe the participation of other parties in the information network, such as distributors, dealers, retailers, and logistic service providers.

The information loop also includes a number of departments on both the production and consumer sides. It is important to highlight that for internal manufacturing, there are differences in the internal information exchange with the client.

**3. Money Flow:** The clients check the order for accuracy based on the invoice presented by the producer. If the claims are true, clients pay the appropriate producer directly. Debit notes used to transfer money from the producing side to the customers are also visible.

In other words, managing all three flows effectively and efficiently is crucial for achieving an efficient and successful supply chain. A supply chain manager has a difficult time determining which data is essential for making decisions. As a result, he or she would desire to be able to view all flows with a single button click.

#### **Example: Amazon**

Amazon is a US-based cloud computing and electronic commerce firm. They are the biggest internet-based retailer in the US, with its headquarters in Seattle, Washington. One of the first businesses to begin selling books online was Amazon. They currently provide a wide variety of goods, including music, video games, shoes, apparel, luggage, and many other things. Amazon has just about anything you can imagine, and users love their wide selection of deals and goods, as well as their customer-driven shopping and recommendations. Since Amazon doesn't have physical stores, one of the reasons they can provide such a diverse range of goods is that they are not constrained by physical space. Their supply chain starts with the lowest levels of inventory and progresses through order-specific logistics all the way to an excellent international distribution network for their goods. At the moment, Amazon can send around 10 million distinct items. Due of its diversity, it has an advantage over rivals and serves as the ideal illustration of what effective supply chain management is capable of.



*Fig. 1.1.5. efficient supply chain management*

### 1.1.2 Importance of Logistics

While many small businesses focus on designing and producing their products to better fulfil consumer needs, the business will collapse if those products fall short of expectations. The main function of logistics is this.

However, other market variables are also impacted by logistics.

The firm can be more profitable the more effectively raw resources can be purchased, transported, and stored until they are required. The ability to coordinate resources to enable efficient material distribution and utilisation can make or ruin an enterprise.

Customer satisfaction can suffer if products are not created and delivered on time, which will have a detrimental effect on a company's profitability and long-term viability.



Fig. 1.1.6. efficient supply chain management

### Notes



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## Unit 1.2 - Sub-sectors of Logistics Industry

### Unit Objectives

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

1. Interpret above Sub-sectors of Logistics Industry
2. Identify various sub-sectors and the opportunities in them

### 1.2.1 Sub-Sectors of Logistics Industry

The deciding aspect has been in identifying the sub-sectors

- A. Subsector employment potential
- B. Validated skill gap in industry and
- C. Projected sub-sector growth

The global logistics sector covers all aspects of the supply chain, including order processing, customer service, inventory management, and transportation. Storage, material handling, purchasing, packing, information distribution, and maintenance are further supply chain tasks.

#### 1) WAREHOUSING – STORAGE AND PACKAGING

The handling of incoming materials, maintaining inventories, and distributing and dispatching outgoing materials are all covered by the warehousing subsector. The sub-sector includes secondary transport packaging as a significant component.

In India's top six cities—Ahmedabad, Kolkata, Bangalore, Chennai, Mumbai, and National Capital Region—there are over 60% of all modern warehouses (NCR). In eight key Indian cities, organised players' warehousing areas grew by 77% annually in 2017, reaching 46.2 million square feet in 2018.



Fig. 1.2.1. efficient supply chain management

Three-party logistics (3PL), e-commerce, fast-moving consumer durables (FMCD), fast-moving consumer goods (FMCG), manufacturing, and retail industries are the main users of organised warehousing facilities in the country. In 2018, the 3PL and e-Commerce firms among them continued to use structured warehouses the most.

Over the course of the next 4-5 years, it is anticipated that investments totaling close to INR 691 billion will be made in India's warehousing and logistics industry as a result of the implementation of the Goods & Services Act and the industry's attainment of infrastructure status. Developers and institutional investors have made significant investments in the country's storage market, totaling more than 470 billion rupees (INR) as of May 2019, on average 19 billion rupees each deal.

Scan the QR code to watch the related videos



<https://youtu.be/NuLzIZuQoLA>  
Sub-sector of Logistics

Several of the largest businesses operating in the Indian warehousing industry are Container Corporation of India Ltd., Gati Ltd., Mahindra Logistics Ltd., Transport Corporation of India Ltd., DHL Express (India) Pvt. Ltd., Spear Logistics Pvt. Ltd., and Jayem Warehousing Pvt. Ltd.

### 1) Warehouse Job Titles:

- Kitting Labelling
- Forklift Operator
- Warehouse Picker
- Warehouse Packer
- Warehouse - Kitting / Labeller
- Warehouse Binner
- Data Feeder – Warehouse
- Warehouse Associate
- Warehouse Supervisor
- Inventory Clerk
- Inventory & Materials Manager
- Warehouse Manager
- Reach Truck Operator
- Receiving Assistant
- Warehouse Quality Checker
- Loading Supervisor
- MHE Maintenance Technician
- Goods Packaging Machine Operator
- Warehouse Claims Coordinator
- Warehouse, Inventory and Transport Manager
- Material Handling Operator and Technician
- Warehouse Executive

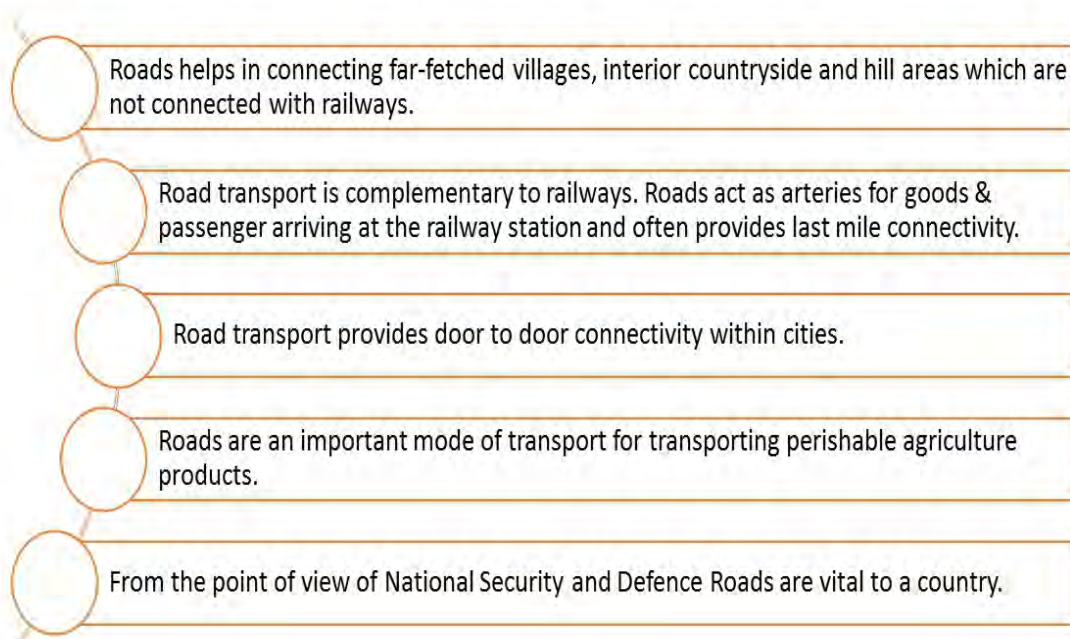
### 2) LAND TRANSPORTATION

In India, land transport carriage accounts for 60% of the modal mix compared to rail and water freight. The coordination of the freight, transportation, and transportation network is consolidated under the transport subsector. Due to the lack of commercial vehicle drivers, particularly in the heavy vehicle sector, this will be a focal area for LSC.



Fig. 1.2.2. Land Transport

The backbone of the economy is the transportation system. It promotes trade, commerce, and industry growth. Transportation eliminates the barrier of geography and makes it easier to convey goods from producers to consumers. Additionally, it aids in eliminating geographical disparities.



**Land Transportation related Job Titles:**

- Commercial Vehicle Driver
- Loader/Unloader
- Transport Coordinator
- Transport Manager
- Land Transportation Supervisor
- Land Transportation Executive
- Land Transportation Associate
- Consignment Booking Assistant
- Consignment Tracking Executive
- Documentation Assistant

**3) COURIER AND EXPRESS SERVICES**

Time-sensitive shipments, numerous high-value shipments, and a sizeable portion of the segment in India's papers are handled by the courier and express industry. Due to the fact that many companies still offer E Commerce services, it is a subsector with a high employment rate.



Fig. 1.2.3. Courier & Express Services

**Courier & Mail Services related Job Titles:**

- Courier Delivery Executive
- Courier Pick-up Executive
- Mail Handler
- Courier Sorter
- Shipment Bagging Agent
- Lead Courier
- Shipment Classification Agent
- Clearance Support Agent
- Shipment Query Handler
- Delivery Management Cell Agent
- Courier Branch Sales Executive
- Courier Institutional Sales Executive
- Key Consignor Executive
- Courier Claims Processor
- Courier Associate
- Courier Executive
- Courier Supervisor
- Courier Manager

**4) PORT TERMINALS, ICDs' AND CFS OPERATIONS**

The Sagarmala project's emphasis on port facilities will considerably increase both the speed and volume of cargo movement. The Port user group will inevitably undergo more restructuring, and as the new projects are started, multi-skilled certified individuals will be required.

**Port terminals, ICDs' and CFS operations related Job Titles:**

- Cargo Surveyor
- Grab Ship Unloader Crane Operator
- Rail Mounted Quay Crane operator
- Signalman
- Stevedoring Labour
- Ship and yard planning supervisor
- CFS and ICD supervisor
- Cargo handler- manual
- Cargo equipment handler
- Cargo Surveyor



Fig. 1.2.4. Port Terminals, ICDs' and CFS operations

**5) EXIM LOGISTICS - FREIGHT FORWARDING & CUSTOMS CLEARANCE**

Logistics experts will need to be well-versed in the regulations of the export country since they will be in line with domestic rules and regulations. The application of trade agreements and customs laws would be strictly complied with in a protectionist environment. Freight forwarders must know carriage rules, foreign trade documents, etc., and apply their industry expertise to arrange cost-effective freight in a highly competitive

climate affected by currency changes worldwide. To make sure that applicants are capable of handling this complex work, broad-based vocational training would be required in addition to technical skill training.



Fig. 1.2.5. EXIM Logistics - Freight Forwarding & Customs Clearance

#### **EXIM logistics - freight forwarding & customs clearance related Job Titles:**

- Customs Clearance - Documentation Executive – Export
- Customs Clearance - Documentation Executive – Import
- Customs Clearance – Field Operation Executive – Export
- Customs Clearance – Field Operation Executive – Import
- Freight Forwarding - Documentation Executive – Export
- Freight Forwarding - Documentation Executive – Import
- EXIM – Executive
- EXIM – Manager
- EXIM – Supervisor

#### **6) AIR CARGO OPERATIONS**

With more regional connection, the flow of time-sensitive and valuable commodities will rise. The majority of Courier and Express organisations would make use of this regional connectivity to guarantee quicker and more dependable delivery schedules. More scattered workplaces will be required as a result, which will increase the demand for qualified local individuals to fill open positions.



Fig. 1.2.6. Air Cargo Operations

#### **Air Cargo related Job Titles:**

- Ground Operations Associate
- Pallet Maker
- Ramp Operation Associate

#### **7) COLD CHAIN LOGISTICS SOLUTIONS**

To prevent deterioration, agricultural products including post-harvest fruit must be stored in a controlled environment. Similar to how meat and fish must be properly prepared and transported in a refrigerator, humidity control is crucial. Many plants need to be updated, and personnel must receive training in both the technical aspects of the plant and its upkeep as well as the product.



**Cold Chain Solutions related Job Titles:**

- Cold Chain Manager
- Cold Chain Engineering Specialist
- Perishable Product Handling Specialist
- Cold Chain Process Management Specialist
- Refrigeration Equipment Maintenance Specialist
- Reefer Vehicle Operator
- Cold Chain Lead



Fig. 1.2.6. Cold Chain Solutions

**8) E-COMMERCE**

Ecommerce logistics refers to the operations involved in choosing, packing, and delivering orders placed online as well as managing inventory for an online store or marketplace. Ecommerce logistics begins with the movement of merchandise from the manufacturer and continues until it arrives at the final destination of the end customer. Fulfillment, which includes order fulfilment, inventory management, warehousing and storage, as well as order picking, packaging, and shipping, is one of the most crucial components of e-commerce logistics.

**E-Commerce related Job Titles:**

- E-commerce Team Lead
- E-commerce Manager

**9) INLAND WATERWAYS AND MARINE SERVICES**

Inland waterways include rivers, canals, lakes, and backwaters, whereas sea routes include seas and oceans. While goods are typically moved via sea routes from one land mass to another, inland waterways are used to move cargo from one location inside a land mass to another.

**• Inland water ways**

- It exists in the form of river, canals, back waters and lakes
- Within a body of land, it is mostly utilised to move products from "one place to another."
- "Generation" of "hydroelectric power" and navigation is possible in these waterway areas.
- Internal trade throughout the nation primarily uses inland rivers.



Fig. 1.2.7. Inland Waterways &amp; Marine Services

**• Sea routes**

- It exists in the form of sea, oceans.
- Here, the goods are transported from "one land mass to another" through oceans and sea.
- Readymade carriage ways for ships
- Sea routes are widely used all over the world for international import and export and it is one of the important way of transport compared to air route.



Fig. 1.2.8. Sea routes

**Inland Waterways and Marine Services related Job Titles:**

- Vessel Operator Grade 1/2/3



## 10) SUPPLY CHAIN

A supply chain is a system of businesses, individuals, tasks, data, and resources used to provide a good or service to a customer. A supply chain is a collection of actions used to deliver a good or service to the consumer. The procedures entail transferring and converting raw resources into finished goods, transporting those goods, and giving them to the final consumer.



Fig. 1.2.7. Cold Chain Solutions

### Supply Chain related Job Titles:

- Dispatcher
- Distribution Manager
- Distribution Supervisor

## 11) LIQUID LOGISTICS

The field of "supply chain for liquids" makes heavy use of liquid logistics, a specific subset of logistics that deals with liquid products. For discrete or unit products, standard logistics approaches are typically applied. Products that are liquids differ from discrete products in terms of logistics. Liquid product features that have an impact on logistics handling include:



Fig. 1.2.8. Liquid Logistics

- Liquids can be moved by flowing from a higher level to a lower level without the use of mechanical propulsion or manual labour.
- The flexibility in the design of storage systems and the use of "dead" space for storage is greatly increased by liquids' ability to conform to the shape of the container they are in.
- The amount of liquid in a tank can be automatically and continually remembered using the level at which the liquid has settled in the tank.
- Changes in a liquid's properties can be sensed and converted into measurements of the liquid's quality to provide indications.
- Liquid logistics systems drastically decrease or eliminate many security and safety hazards. By providing direct, nearly real-time, and accurate measurements of the movement and balance of products along the supply-chain flow, tools like liquid level sensors and flow metres can be helpful in lowering security risk. As products move independently and under control through the supply stream, the safety risk is decreasing.
- Liquids may, in some circumstances, be "processed" far from the initial production plant, providing the prospect for increased supply-stream efficiencies and greater product flexibility at the point of final use.

These factors set liquid logistics apart from discrete item logistics techniques. For businesses that create, process, move, or use liquid products, these sources of uniqueness could result in competitive advantages if properly planned for and managed.

### Liquid Logistics related Job Titles:

- Tank Farm Associate
- Tank Farm Supervisor
- Tank Farm Manager
- Liquid Transport Operator



## Unit 1.3 - About Warehousing Industry

### Unit Objectives

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

1. Memorize about importance of Warehouse and recognize its Types
2. Identify various activities in warehousing industry
3. Identify the employment opportunities in warehousing

### 1.3.1 Understanding Warehousing Industry

A simple definition of a warehouse is:

**'A warehouse is a designated area used for the handling and storage of materials and goods.'**

A warehouse is a type of storage building designed to preserve the produce's quality and quantity. The lag between product manufacturing and consumption creates the necessity for a warehouse. The holding and preservation of commodities before they are delivered to customers is referred to as warehousing or storage. Time utility is produced by storage by bridging this gap. The products must be stored in order to be accessible to buyers as and when needed. Storage permits a business to continue producing in anticipation of future demand.



Fig. 1.3.1. Understanding Warehousing Industry

Businesses may continue manufacturing all year long and sell their goods whenever there is a sufficient market for them thanks to warehouses. The need for warehouses is also caused by the fact that some products are only produced during a specific season but are in high demand all year long. Similar to this, some goods are produced all year long but are only in demand during a specific season.

A logistics management system, which is an element of supply chain management, includes warehouse management and warehousing. Although inbound services that prepare things for storage and outgoing functions that combine, pack, and ship orders offer significant economic and service benefits to both the firm and its consumers, they are sometimes considered as little more than a place to store finished goods.



Fig. 1.3.2. Warehouse Management

Scan the QR code to watch the related videos



Types of warehouses

An organisational structure outlines how tasks are assigned, coordinated, and overseen in order to achieve organisational objectives. It can also be thought of as the lens or viewpoint through which people observe their company and its surroundings.

### An example of Organization Structure of a “Logistic Company”:

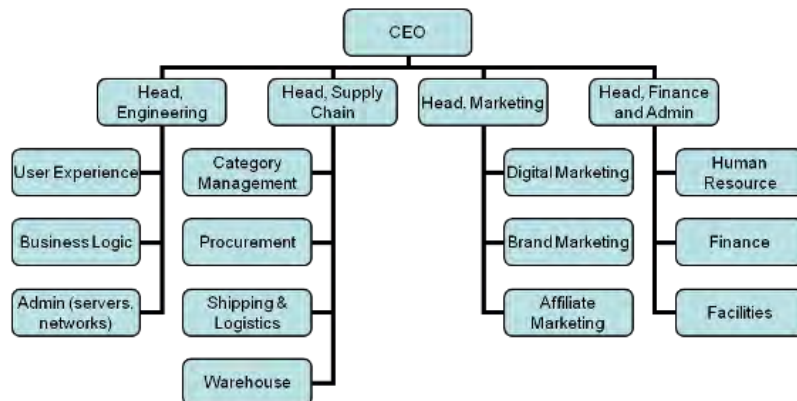


Fig. 1.3.3. Organization Structure

### An example of Organization Structure of a “Warehouse”:

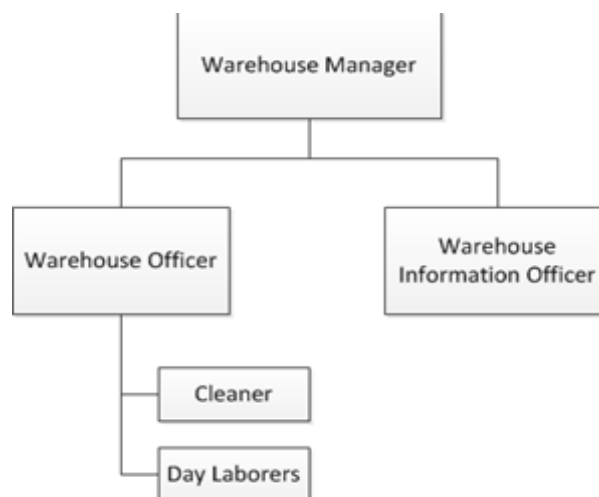


Fig. 1.3.4. Organization Structure - Warehouse

A warehouse is a sizable structure used for storing goods, supplies, or other commodities.

#### Importance of Warehouses:

- Protection of goods against climatic conditions
- Protection from theft
- Producers can store raw material for future production
- Surplus created can be stored before being finally sold
- Shortages in the market can be avoided
- Price fluctuations can be minimized
- International trade is not possible without warehousing.
- Traders can keep their cargo in bonded warehouses, before they pay the duty.
- Plays important role when demand for products or the time of production is seasonal.
- Provides place for display of goods.

#### Types of Warehouses:

Four groups can be used to categorise warehouses:

- Private warehouses
- Public warehouses
- Bonded warehouses
- other type of warehouses

**(a) Private Warehouses:**

For the purpose of storing their own products, commercial enterprises build and own private warehouses. They are not intended for use by other manufacturing or commercial units and are only owned and used by the producers themselves.

Due to the high cost of building and maintaining these warehouses, there aren't many of them. Such warehouses are only affordable for large corporations.



*Fig. 1.3.5. Organization Structure*

**(b) Public Warehouses:**

Also known as duty-paid warehouses, these facilities. A warehouse that is open to the general public is known as a public warehouse or duty-free warehouse. Due to the significant financial outlay required for their construction and upkeep, the majority of corporate organisations, particularly those of a small and medium size, cannot afford to operate their own warehouses.

They use these kinds of warehouses, which may belong to an individual or an organisation whose main goal is to offer storage facilities to customers in exchange for a fee or other payment. The government-created laws and regulations are followed by these warehouses.

For businesspeople, public warehouses are quite helpful. In order to offer speedy transportation services, these warehouses are typically located close to railroad tracks or major thoroughfares. For lending and financial aid, goods in the warehouse might be hypothecated to banks and other financial institutions.

Due to the most up-to-date mechanical equipment utilised in handling and maintaining the items, public warehouses guarantee improved security and handling of the commodities. In the warehouses, products can be labelled, graded, and packed in the desired sizes.

**(C) Bonded Warehouses:**

For imported goods that can't be cleared because their importer didn't pay the necessary customs duty, bonded warehouses are employed. These warehouses are located close to ports. Before the customs duties are paid, goods cannot be taken out of these warehouses.

Government or commercial organisations may be in charge of running bonded warehouses (when granted licences to operate such warehouses). The operation and functioning of both are subject to stringent regulation and supervision by customs authorities.



*Fig. 1.3.6. Bonded Warehouses*

The importer of the items has some control over them and is free to inspect and examine them whenever he pleases. Goods can be taken proportionately out of these warehouses after paying a fraction of the custom charge.



These warehouses allow for in-house branding, packing, grading, labelling, and canning of the goods maintained there. By using the receipt provided by these warehouses as collateral security, bank loans can be obtained.

The likelihood of items being subject to any risk of theft, damage, or deterioration is extremely low. The ability of the importer to receive the products without having to pay any customs duties considerably facilitates entrepot trade, or the re-export of imported goods.

#### **Other type of Warehouses:**

These include:

- Special Commodity Warehouses.
- Cold Storages or Refrigerated Warehouses.
- Institutional Warehouses.

#### **(A) Special Commodity Warehouses:**

These warehouses are designed to store a certain kind of item, such as tobacco, cotton, wheat, etc. The maturity of the product is crucial when choosing the type of warehouse. Storage tanks are required for the storage of gasoline, and godowns are required for the storage of agricultural products.

#### **(B) Cold Storage or Refrigerated Warehouses:**

These are the warehouses that are used to store perishable goods including fresh meat, eggs, butter, fruits, and vegetables. Cold storage facilities allow for the longer storage of goods. In fact, cold storage facilities have made it possible to consistently offer some goods all year long.

For instance, people can have access to various kinds of fruits and vegetables throughout the year. The modern way of life has been significantly enhanced by refrigerated warehouses.

#### **(C) Institutional Warehouses:**

Due to the nature of their operations, several institutions and entities each have their own warehouse. For instance, the Food Corporation of India, the Banks, and the Railways all have their own warehouses where they carry out their business. The stock of the parties is kept by the banks in these warehouses as collateral for the loans that have been given.

Railways keep warehouses for storing a lot of cargo. Before being shipped, goods that need to be delivered to various locations around the nation are maintained in warehouses. Similar to this, delivery-related products are held until they are paid out to the claimant.

In addition to maintaining warehouses, several transportation companies also store the items that need to be delivered and received. The Food Corporation of India has constructed a large number of warehouses all around the nation to house agricultural products.

#### **Warehouse Basic Operations:**

The business plan of a company includes warehouse operations in their entirety.

A business can ship and receive essential stock in time for replenishment on store shelves or in industrial facilities by running efficient warehouse operations.



*Fig. 1.3.7. Warehouse Operations*

The six fundamental warehouse operations include receiving, putting away items, storing items, picking, packaging, and shipping. By optimising these six procedures, you may streamline your warehouse operation, reduce expenses and errors, and raise the proportion of excellent orders.

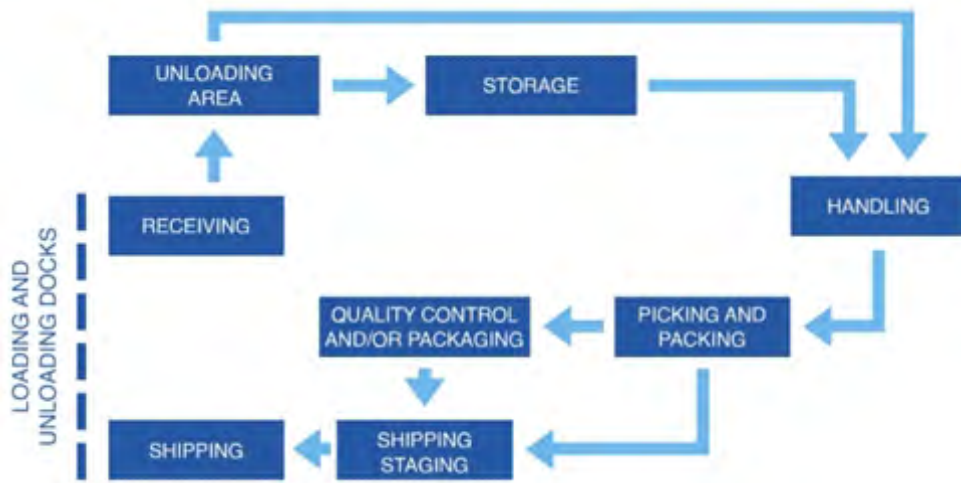


Fig. 1.3.8. Loading and Unloading Docks

**Warehouse Activities:**

- Receive goods
- Identify the goods
- Dispatch goods to storage
- Hold goods
- Pick goods
- Marshal shipment
- Dispatch shipment
- Operate an information system



Fig. 1.3.9. Warehouse Activities

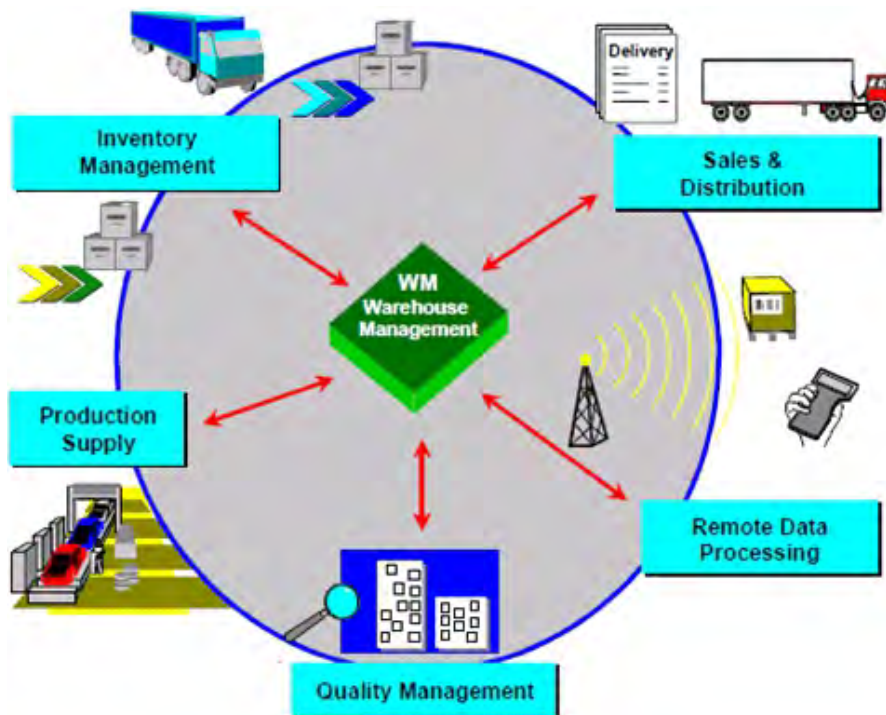


Fig. 1.3.10. Warehouse Management

**Receive goods:**

- Accepts goods from
  - Takes responsibility for outside transportation or an affiliated factory;
  - Verifies that the items match the order and the bill of loading;
  - Verifies the amounts;
  - Verifies for damage; and
  - Fills Out Damage Reports As Necessary

**Identify the goods:**

- Items are labelled with the proper stock-keeping unit (SKU) number (part number), and the quantity received is noted.

**Dispatch goods to storage:**

- goods are sorted & put away

**Hold goods:**

- till needed, commodities are stored and well protected.

**Pick goods:**

- To obtain products from stock, choose them from storage and bring them to a marshalling location.

**Marshal shipment:**

- The items that make up an order are collected and reviewed for errors or omissions; order records are updated.

**Dispatch shipment**

- orders are packaged, shipping documents are prepared, & goods loaded on the vehicle

**Operate an information system**

- A record indicating the quantity in stock, quantity received, quantity issued, and location in the warehouse must be kept for each item in stock.

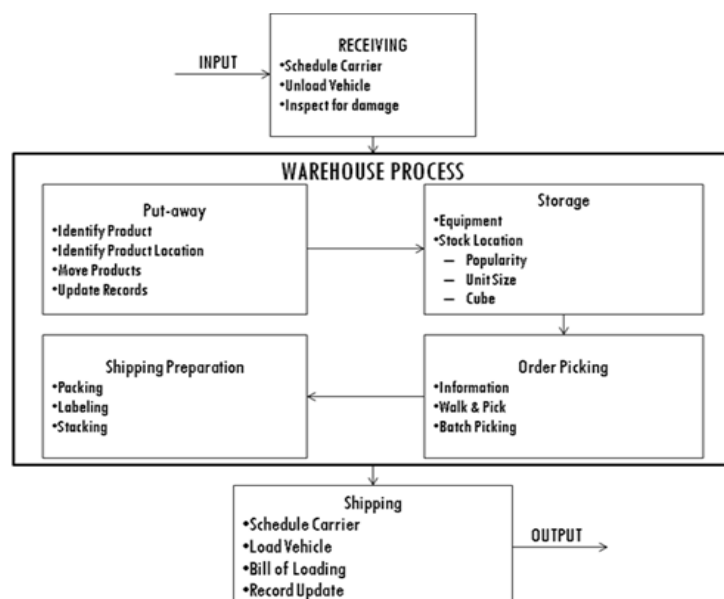


Fig. 1.3.11. Warehouse Process

### Employment Opportunities in Warehousing Industry

Within a warehouse operation, a variety of positions, from managerial positions to regular labourer employment, may be available. The level of responsibility that each function has varies, which may have an impact on their pay scale. 12 positions in a warehouse are listed below.

- 1. Forklift driver:** Forklift drivers handle cargo that needs to be loaded, unloaded, and transported. A forklift is a compact car with steel tines that is frequently used to move large objects. In order to stack tall shelves in a warehouse, forklift operators are required. Typically, forklift operators can find employment in most companies that have a warehouse area.
- 2. Warehouse employee:** Warehouse employees frequently do a number of tasks, such as transporting items, driving forklifts, processing orders, packaging pallets, and storing goods. The general operations of a warehouse depend on warehouse personnel. For the most part, companies with warehouses will hire warehouse personnel.
- 3. Warehouse worker:** Warehouse workers are usually in charge of loading, unloading, and delivering products to customers. Most warehouses and businesses that deal with deliveries use warehouse drivers. They may operate anything from light trucks to road trains. Typically, warehouse drivers are required to have a licence for each type of vehicle they operate.
- 4. Material handler:** Processing and recording delivered and received products is a common focus for material handlers. They collaborate with inventory managers to identify missing goods and make sure delivery and purchase orders are in line. Warehouses and facilities for import and export are common places for material handlers to find employment.
- 5. Warehouse picker:** After a delivery, warehouse pickers make sure they obtained the right goods. They physically locate the commodities inside the warehouse and manage ticket orders from other warehouse employees. They gather and arrange the products according to their weight, size, number, and quality. Warehouses and other businesses that export and import products frequently have openings for warehouse pickers.
- 6. Shipping and receiving clerks** are in charge of managing inventories and maintaining records of the products that are being carried or stored. They may be in charge of weighing parcels, wrapping goods, and printing labels in addition to monitoring an inventory. Work for shipping and receiving clerks is typically available in warehouses that handle the storage and transportation of commodities.
- 7. Laborer:** Laborers typically assist with physical work and perform other general activities at a warehouse. A warehouse worker's common duties include unloading pallets of containers, packing items, loading trucks, and rearranging inventory. In most industries that require general physical labour, like construction, landscaping, and warehouse work, labourers can find employment.
- 8. Warehouse manager:** A warehouse manager often is in charge of managing everything from finances to product delivery. Warehouse managers put into practise management techniques that can improve workplace productivity and give workers a well-organized work schedule. Most warehouse managers have transferable abilities that may enable them to operate in a variety of management-related sectors.

**9. Logistics manager:** Logistics managers assist with the coordination, supervision, and planning of many business-related activities. An experienced logistics manager typically works with supply chains, transportation, imports, and exports. A logistics manager is typically employed by businesses that move and store significant amounts of inventory to ensure efficient warehouse operations.

**10. Inventory manager:** Inventory managers organise and enhance inventory records. Managing a warehouse workforce, putting in place inventory control measures, and enhancing workplace effectiveness are often part of their duties. In addition to working in warehouses, inventory managers may be able to apply their expertise to managerial positions in other sectors of the economy.

**11. Warehouse supervisor:** Warehouse managers typically rely on warehouse supervisors to organise the warehouse's systems and oversee personnel. A warehouse supervisor's typical responsibilities include supervising the workforce and keeping an eye on deliveries. Most warehouses employ them, and they might also be able to find executive positions in other fields.

**12. Warehouse lead:** The warehouse lead is usually in charge of managing staff, keeping an eye on performance, and implementing safety measures. To comply with laws governing workplace safety within a warehouse operation, warehouse leads frequently design safety practises. Large distribution centres and supply chain organisations are likely to hire warehouse leads.

There are numerous warehouse jobs with various tasks and obligations. The majority of warehouse operations involve both the storage and delivery of items. Typical duties for an entry-level warehouse role include loading trucks, packing goods, keeping track of stock levels, and delivering packages. For warehouses to maintain a well-organized inventory, effective management solutions are needed. By managing staff, keeping an eye on deliveries, and putting workplace safety regulations into practise, warehouse leads contribute to increased efficiency in warehouse operations.



*Fig. 1.3.12. Warehouse Positions*

The typical duties of a warehouse employee may include:

- packing goods
- transporting goods
- recording inventory
- operating forklift and lift systems
- processing shipments
- ordering goods
- unloading and loading trucks
- preparing goods for transport
- supervising warehouse employees
- verifying shipping documents
- organizing purchase orders and receipts
- overseeing warehouse operations





## Unit 1.4 - Roles of Material Handling Equipment (MHE) Maintenance Technician

### Unit Objectives

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

1. Interpret MHE Maintenance
2. Memorize about your job role as MHE Maintenance Technician
3. Interpret its interface with other job roles

### 1.4.1 Roles of Material Handling Equipment (MHE) Maintenance Technician

To make sure MHE is in working order, maintenance is a process that involves inspection and repairs.

#### Job Description in brief

Maintenance of Material Handling Equipment (MHE) In the logistics sector, a technician is often referred to as an MHE Maintenance Associate. The efficient operation of MHE is the responsibility of those in this position. Picking things from an inventory list is the responsibility of individuals. To guarantee that the MHE are always available, they must do both preventative and breakdown maintenance. Maintaining records of the maintenance tasks completed and creating thorough reports are additional duties.



Fig. 1.4.1. MHE Technician

#### Personal Attributes

The individual must be able to work well both independently and collaboratively with others in order to succeed in this position. The person must be able to prioritize tasks and complete them in the allotted time. The employee must be able to focus intensely for the duration of the shift.

#### Roles & Responsibilities

##### • Obtain information and checklists

- Request the supervisor's daily maintenance checklist
- Obtain the specific maintenance checklist and inquire with the supervisor about any breakdowns or issues with any of the Material Handling Equipment (MHE)
- in case of special maintenance, Interpret which particular machine(s) are to be checked and where they are located
- Interpret which is the critical MHE and attend to it first so as to minimize losses to the company
- Research the maintenance history of the particular equipment from earlier reports, if necessary.
- schedule the maintenance tasks in a way that will save time and reduce trip distance.

##### • Collect necessary tools and supplies

- amass and don all required personal protective gear (PPE)
- determine the amount of tools needed and procure them from the tool crib or storage racks.
- to gather any needed grease, lubricants, fluids, or replacement parts from the store area.
- immediately after obtaining the supplies, complete any paperwork that the shop requires.





Fig. 1.4.2. MHE Tools & Supplies

- **Carry out preventive maintenance**

- to evaluate how the MHE is operating generally to spot any issues.
- If necessary, make any tiniest settings or parameter modifications to ensure proper operation.
- If a machine has to be overhauled, schedule it well in advance and during off-peak times.
- Inspect the tyres, parking brake, main horn, reverse horn, caution lamp, etc. for damage.
- Inspect the levels of the fluids in the engine, transmission, differential, hydraulic, radiator coolant, and brake oil, and top off any that are low.
- use lubricants and grease when necessary.
- Replace any worn-out components when the manufacturer specifies.



Fig. 1.4.3. MHE Tools & Supplies

- finish and mark off each item on the maintenance schedule checklist.
- perform tests on the MHE to make sure it is reliable and secure before use.
- evaluate the MHE and notify the supervisor if replacement is necessary if there is a possibility of future issues.
- educate all operators on a regular basis about battery charging and safety procedures.
- maintain backup batteries routinely and make sure they're fully charged.
- to get a health card ready for each MHE

- **Carry out breakdown maintenance**

- study the MHE to identify the issue's origin
- to assess whether the issue can be fixed with current knowledge or if a specialised technician from the producing firm is needed.
- Determine whether the part could be repaired or if replacement is required if the issue could be fixed.



Fig. 1.4.4. Breakdown Maintenance

- if the part could be repaired, carry out repairs using available machine shop equipment
- if part cannot be repaired or if replacement is required, obtain the required parts from the store (if available) or inform inventory clerk to place orders
- Get the necessary parts and replace them in accordance with the manufacturer's instructions.
- Inspect the levels of the fluids in the engine, transmission, differential, hydraulic, radiator coolant, and brake oil, and top off any that are low.
- Apply lubricants and grease as needed.
- finish and mark off each item on the breakdown maintenance checklist.
- do a test on the MHE to make sure it is reliable and secure before use.
- If there are delays or a specialised technician from the manufacturing firm is needed to resolve the issue, escalate to the supervisor.

- **Carry out housekeeping**

- Dispose of any worn-out or damaged parts and used-up fluids in accordance with business policy.
- provide any extra fluids or parts back to the supplier.
- Conduct a fundamental visual safety examination of the workspace where maintenance work was done.
- clear the work area of any spillage and remove any sharp objects.
- return any used tools to the storage racks or tool crib.
- place any PPE that was utilised back in its proper storage rack.



Fig. 1.4.5. Carry out housekeeping

- **Reporting and documentation**

- escalate the situation to a supervisor in case parts are delayed or there are any other factors that will lengthen the outage.
- alert the supervisor to any problems encountered during the day.
- Give a daily report to the manager detailing the equipment's condition, any damage, etc.
- complete any forms that the store or management may require.
- Record any maintenance work that is done.
- Update the MHE condition in the relevant health card and the dates for the upcoming reviews in the maintenance schedules.
- Write out a thorough report outlining the issue's cause, its resolution, its anticipated lifespan, and the recommended replacement times.



Fig. 1.4.6. Reporting and Documentation

- **Maintain health, safety and security measures during all activities**

- Follow safety guidelines and procedures in the event of biohazards, fire dangers, etc.
- Put on all necessary safety gear, including as helmets and protective clothing, when inspecting incoming and outgoing shipments.
- follow organization procedures with respect to documentation
- recognize and report unsafe conditions and practices
- Follow organisational protocol right once to take action if there are any indications of an emergency scenario, an accident, or a safety breach.



Fig. 1.4.7. Workplace Safety

- to determine the causes of the tragedy.
- Include the causes, the response, and the action in the incident report or manager's note.
- report any variations from the norm, along with any justifications (if any).
- Visually check the equipment and activity environment for appropriateness and safety.
- guarantee that all pertinent staff adheres to the proper protocol in the event of any occurrence.



Fig. 1.4.8. Workplace Safety Equipment

## Tips



- 3 principle of material handling
  - Standardization Principle: It encourages standardization of handling methods and equipment.
  - Ergonomic Principle: It recognizes human capabilities and limitation by design effective handling equipment.
  - Energy Principle: It considers consumption of energy during material handling.
- The 5 P's or 5 Manual Handling Principles to avoid injury that we refer to are summarised as follows;
  - Plan – plan your lift adequately.
  - Position – centre the body & feet correctly.
  - Pick – lift item using good posture.
  - Proceed – move toward desired location.
  - Place – set object down safely.
- Keep forklifts clean to make it simpler to spot worn or broken parts. Use water to clean instead of combustible liquids. Forklift maintenance, inspection, and repair should only be performed by trained professionals. In order to repair or replace parts on LPG forklifts, only licenced gas fitters should be used.

## Summary

In a normal "hard and tangible commodities" organisation, logistics is typically viewed as a differentiator that enables either a lower cost or a better value.

The conventional focus of logistics has been on reducing costs, which are primarily one-time feel-good factors. High value, on the other hand, enters the picture much later and can be either tangible or intangible in the early stages of a good.

The main distinction is that supply chain management adopts an integrated and contextual approach, whereas logistics is primarily concerned with supply chain operations in isolation.

One of the most effective ways for businesses that produce goods and/or services to maximise their budget is through supply chain management (SCM). Logistics, which manages physical, informational, and human flows to optimise them and prevent needless resource waste, also plays a significant part in supply chains.

These strategic elements are commonly referred to as the 7 R's in the world of logistical management, ultimately ensuring that the right product is in the right quantity and right condition, and is in the right place, at the right time, to the right customer at the right price.

Four major Material Handling factors which are to be considered- motion, time, quantity and space.

## Notes

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## Exercise

- 1) Is Logistics the Same as Supply Chain Management?
- 2) What is the future of warehousing?
- 3) What does MHE stand for in a warehouse?
- 4) What are the 7 R's of logistics?

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[https://youtu.be/kT\\_toh5NbxE](https://youtu.be/kT_toh5NbxE)  
What is Logistics?



<https://youtu.be/NuLzlZuQoLA>  
Sub sectors of Logistics



<https://youtu.be/tp4TQOBsNqk>  
Types of warehouses





## 2.Preparation for Maintenance

Unit 2.1 - Material Handling Equipment (MHE)

Unit 2.2 - Documentation & Information collected for Maintenance

Unit 2.3 - Preparation for Maintenance

Unit 2.4 - Process of Planning the Sequence for Maintenance



## Key Learning Outcomes

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

1. Categorize the various tasks to be performed while preparing for maintenance
2. Recognize the various documents and information to be collected from supervisor for maintenance
3. Develop the process of prioritizing the machines or equipments to be checked first
4. Use the process of planning the sequence for maintenance



## Unit 2.1 - Material Handling Equipment (MHE)

### Unit Objectives

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

1. Identify the different types of goods and their classification
2. Interpret the various tasks to be performed while preparing for maintenance

### 2.1.1 Goods and its Classification

**In economics**, goods are those that fulfil human needs and offer usefulness, such as to a customer buying a pleasant product. It is usual practise to distinguish between transferable products and non-transferable services.

The term "commercial goods" refers to tangible commodities that are produced and then made accessible for supply to be used in a commercial industry. Tractors, trucks, mobile homes, planes, and even roofing supplies are examples of commercial items. Commercial and personal commodities are fairly broad categories that include practically everything a person encounters from the moment they wake up at home, during their drive to work, and once they arrive at their place of employment.

Although the term "commodities" can also apply to marketable raw materials and basic goods, it is most frequently used to describe economic items.

Any raw materials, packing supplies, spare parts, pieces, or finished products connected to manufacturing, agriculture, or production might be classified as stored goods.

**By cargo characteristics, warehouses can be:**

- 1) **Raw material warehouse:** The raw material warehouse is used to store the raw materials used in production. Such warehouses are generally large.
- 2) **Product warehouse:** The function of the product warehouse is to store the finished products, but these products have not yet entered the circulation area. Such warehouses are generally attached to the production plants.
- 3) **Refrigerated warehouse:** It is used to store goods that need to be refrigerated and stored, usually for agricultural and sideline products, medicines, etc., which have requirements for storage temperature.
- 4) **Constant temperature warehouse:** The constant temperature warehouse is the same as the refrigerated warehouse for storing products that require storage temperature.
- 5) **Dangerous goods warehouse:** The dangerous goods warehouse is literally easier to understand. It is used to store dangerous goods. Because dangerous goods may cause danger to the human body and the environment, there are generally specific storage conditions for such items. Requirements, for example, many chemical products are dangerous goods, and their storage has special regulations.
- 6) **Water surface warehouse:** For items such as logs and bamboo rafts that can float on the water, they can be stored on the water surface.

**Warehousing is necessary because of the following reasons:**

- (i) **Seasonal Production-** You are aware that although agricultural products are harvested during specific seasons, they are consumed or used all year round. As a result, these commodities need to be properly stored or warehoused, where they can be delivered as and when needed.
- (ii) **Seasonal Demand-** There are some products that have a seasonal demand, such as woollen clothing in the winter or umbrellas in the rainy season. To accommodate the seasonal demand, many commodities are

nevertheless produced all year long. Therefore, it is necessary to store these items in a warehouse so that they can be made available as needed.

- (iii) **Large-scale Production** - In the case of manufactured goods, production now occurs to satisfy both current and future product demand. To take advantage of the advantages of large-scale production, which is more cost-effective, manufacturers also make things in enormous quantities. Therefore, until they are cleared by sales, the final goods, which are manufactured in vast quantities, need to be carefully stored.
- (iv) **Quick Supply** - Despite being produced in a few distinct locations, industrial and agricultural products are eaten all across the nation. Therefore, it is crucial to keep these items on hand close to where they will be consumed so that consumers will have immediate access to them when they need them.
- (v) **Continuous Production**- In order for manufacturers to continuously produce items, there must be a sufficient supply of raw materials. Therefore, it is necessary to maintain a sufficient amount of raw material stock in the warehouses to assure ongoing manufacturing.
- (vi) **Price Stabilization**- In order for manufacturers to continuously produce items, there must be a sufficient supply of raw materials. Therefore, it is necessary to maintain a sufficient amount of raw material stock in the warehouses to assure ongoing manufacturing.

#### Elements of Warehousing In India:

Whether a warehouse aims at storing products or storing and order fulfillment, it tends to use particular elements that assist the manufacturer, distributors, and retailers keep a track of their inventory and store it safely. These primitive elements consist of:

- Making use of a shelving and rack system to get the most storage space and the easiest access to its products.
- Using climate control systems is crucial for the top 10 logistics companies in India, especially for frozen goods or those that require freezers.
- Having access to shipping providers for the completion of orders.
- Strong security to safeguard the product from unforeseen circumstances.
- Having an Inventory Control System that offers information about the products to their owner.
- Equipment to transfer the product from one spot to another.
- Those in charge of running distribution centres' operations.
- Availability of affordable transport services in India to carry the goods into the warehouse and remove them in accordance with the order.

#### Types of dangerous goods

Currently, 12,000 different chemicals, gases, solids, and liquids are classified as dangerous commodities. In order to make it easier to classify them, they are split up into 9 groups according to the following key feature:



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<https://youtu.be/7zFSs4QGNE>  
Classification of Goods

Fig. 2.1.1. Types of Dangerous Goods

- **Class 1 – Explosives**

These substances can produce a huge explosion because they have the capacity to change the state of their molecules quickly from one state to another, typically from solid to gas.

The further division of group 1 is as follows:

- Risk of mass explosions.
- Projection risk absent a massive explosion.
- Fire risk associated with blast wave or projectile risk.
- Minimal threat of explosion.
- Explosion risk is quite low.
- Exceptionally offensive articles.

- **Class 2 – Gases**

Because these gases must be carried in a container under high pressure in order to minimise their volume, this type of cargo is now regarded as high risk.

In the event that the products are discharged or explode, this pressure has the potential to do significant harm.

We can further divide gases into three subgroups within this group:

- Flammable gases.
- Gases that are not harmful or combustible.
- Dangerous gases

- **Class 3 – Flammable liquids**

This group mostly consists of substances with a high burning potential, such gasoline or kerosene.

These liquids are divided into subgroups in the same way as the previous two classes.

- Flammable liquids that pose no additional risks.
- Flammable corrosive liquids and toxic flammable liquids o Pesticides
- Corrosive, poisonous, and flammable liquids
- Flammable, desensitised explosive liquids

- **Class 4 – Flammable solids**

These solid materials produce combustible gases when they come into contact with water. Additionally, we come across explosive and self-reacting items.

Based on this, we divide them into three subclasses:

- explosive compounds that are desensitised, self-reactive, and flammable.
- Combustible substances that can ignite on their own.
- Solids that release combustible gases when they come into touch with water.

- **Class 5 – Oxidizing agents and organic peroxides**

Materials in Class 5 have a high oxygen concentration and can mix with other risky items, including flammable or combustible liquids, to create a difficult-to-put-out conflagration.

It's crucial to remember that this kind of merchandise shouldn't be moved or kept with other explosive or flammable materials.

Class 5 is divided into two groups:

- Oxidizing substances
- Organic peroxides

- **Class 6 – Toxic and infectious substances**

In this example, Class 6 refers to chemicals and hazardous substances that pose a substantial risk to human health and the environment.

The products from scientific investigations that contain harmful agents, viruses that cause diseases, and infections are also included in this class.

The following divisions make up Class 6:

- Poisons made of chemicals and other toxic substances.
- Substances that are harmful because they contain pathogens.

- **Class 7 – Radioactive**

These compounds fall within this category because they have unstable atoms and fluctuating molecular structures. Products like enriched Uranium, Plutonium, or Thorium fall under this category.

- **Class 8 – Corrosives**

All chemical products with a high amount of alkaline or acid components belong to this group. They are compounds that can harm people right away when they come into contact with other things or the skin.

- **Class 9 – Miscellaneous dangerous goods**

The dangerous items that pose a risk during storage and transportation but weren't categorised in any of the preceding classes are included in this final class.

### Special storage needs

In terms of the kind and security of the storage area, some relief supplies necessitate special consideration. For example:

- Shipments of medical supplies and medications may include a variety of small, valuable, and frequently restricted products, many of which have a short shelf life. Therefore, a secure environment is needed, along with careful attention to expiration dates.
- Hazardous products including fuels, compressed gases, pesticides, alcohol, ether, and other combustible, poisonous, or corrosive materials must be stored separately, preferably in a cool, secure shed outside the main warehouse but still inside the compound.
- Antibiotics and vaccines may need to be stored in cold storage facilities that are temperature-controlled, have adequate capacity, and have a stable power source as well as a backup.
- When handling and storing combustible substances like alcohol and ether, extra care must be used. To prevent needless surpluses and maintain proper stock rotation to prevent expensive losses due to expired items, inventory management procedures must be put into place. In cooperation with the medical professionals, protocols for regulating, storing, and dispensing medical supplies and medications should be devised.



Fig. 2.1.2. Types of Dangerous Goods

**The different types of warehouses include:**

- **Heated and unheated general warehouses**—provide space for bulk, rack, and bin storage, aisle space, receiving and shipping space, packing and crating space, and office and toilet space;
- **Refrigerated warehouses** maintain the quality of perishable commodities and other materials that call for refrigeration in general supplies. includes mechanical areas, processing facilities, and freeze and chill space; and
- **Controlled humidity (CH) warehouses**— comparable to regular warehouses, with the exception that vapour barriers are used in their construction, and humidity control technology is included to keep the humidity at specified levels.



Fig. 2.1.3. Different Types of Warehouses



**Notes**




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## Unit 2.2 - Documentation & Information collected for Maintenance

### Unit Objectives

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

1. Interpret Principles of Material Handling
2. Recognize the various documents and information to be collected from supervisor for maintenance

### 2.2.1 Principles of Material Handling

A broad notion in supply chain management is **material handling**. It's a fundamental procedure that uses a variety of tools and actions that can be either manual, semi-automated, or automatic.

There are numerous moving pieces in a warehouse. This is the literal reason why improper material handling has far-reaching effects. It affects staff safety, morale, and the flow of production, for better or worse. Nevertheless, understanding material handling systems and putting best practises into practise greatly enhance the efficiency of your warehouse.



Fig. 2.2.1. Principles of Material Handling

**Material handling principles are as follows:**

- **Orientation Principle:** The orientation principle promotes studying every system relationship that is accessible before beginning any preparatory planning. The study involves an examination of current approaches, issues, etc.
- **Planning Principle:** It creates a plan that encompasses fundamental requirements, preferable alternatives, and contingency planning.
- **Systems Principle:** The integrated system design incorporates handling and storage tasks in a cost-effective manner.
- **Unit Load Principle:** Handle product in a unit load as big as you can, according to the unit load principle.
- **Space Utilization Principle:** Promote efficient use of all available space.
- **Standardization Principle:** It promotes uniformity in handling techniques and tools.
- **Ergonomic Principle:** The ergonomic principle takes into account human capabilities and limitations while designing ergonomic handling tools.
- **Energy Principle:** It considers consumption of energy during material handling.
- **Ecology Principle:** The ecology principle promotes processing materials with the least amount of environmental damage possible.
- **Mechanization Principle:** To promote efficiency, it advocates mechanization of handling processes whenever this is practicable.
- **Flexibility Principle:** Supports techniques and tools that can be used in a variety of settings.
- **Simplification Principle:** Promote technique and process simplification by eliminating extra steps.
- **Gravity Principle:** Promotes the application of gravity in the transportation of products.
- **Safety Principle:** Supports the provision of safe handling tools in accordance with safety laws and guidelines.



- **Computerization Principle:** The computerization of material handling and storage systems is encouraged by the computerization principle.
- **System Flow Principle:** The System Flow Principle promotes the integration of physical material flow and data flow.
- **Layout Principle:** Promotes planning the operational sequence for all available systems.
- **Cost Principle:** The cost principle promotes a cost-benefit review of all potential options.
- **Maintenance Principle:** Promotes the creation of a strategy for scheduled maintenance and preventative maintenance.
- **Obsolescence Principle:** Promote the creation of equipment policies so that you can benefit from the right economic advantages.

The principles mentioned above are used to design material handling operations. Cranes, conveyors, and industrial trucks make up the material handling equipment.

### Equipment/Machineries used in Warehouse

In manufacturing, warehousing, distribution, consumption, and disposal, material handling refers to the movement, protection, storage, and control of materials and goods.



Fig. 2.2.2. Equipments / Machineries - Warehouse

The following five broad categories can be used to categorise MHE: Transporting Devices. Equipment for transporting materials between locations (e.g., between workplaces, between a loading dock and a storage area, etc.). Conveyors, cranes, and industrial trucks are the three main subcategories of transport equipment.

**Forklifts** are motorised industrial trucks designed to lift and transport objects over short distances. They are sometimes referred to as lift trucks, fork trucks, or forklift trucks.



Fig. 2.2.3. Forklift

**Conveyor Belt:** A conveyor belt serves as the system's carrying medium (often shortened to belt conveyor). One of the various varieties of conveyor systems is the belt conveyor system. An unending loop of carrying medium—the conveyor belt—rotates around one or more pulleys, which are also known as drums, in a belt conveyor system. The belt and the material on it are moved forward by one or both of the pulleys being powered. The drive pulley is the powered pulley, and the idler pulley is the unpowered pulley. Belt conveyors can be divided into two primary industrial categories: general material handling, which includes moving boxes around a facility, and bulk material handling, which includes transferring heavy loads of resources and agricultural products including grain, salt, coal, ore, sand, and overburden.



Fig. 2.2.4. Conveyor Belt

**Pallet:** A pallet is a flat transport framework that supports products in a secure manner while being hoisted by a forklift, pallet jack, front loader, work saver, or other jacking equipment, or a crane. A pallet is occasionally incorrectly referred to be a skid (a skid has no bottom deck boards). A pallet serves as the unit load's structural base, allowing for efficient handling and storage. A pallet is frequently used to carry goods or shipping containers after they have been loaded and secured with strapping, stretch wrap, or shrink wrap. Because it works well with contemporary packing like cardboard boxes and Intermodal containers, which are frequently used for bulk shipment, its use has significantly replaced previous kinds of crating like the hardwood box and the wooden barrel since its introduction in the 20th century. Pallets can be composed of plastic, metal, paper, and recycled materials, though most are made of wood. Each material has advantages and disadvantages relative to the others.



Fig. 2.2.4. Pallet

**Pallet Jack :** A pallet jack, also known as a pallet truck, pallet pump, pump truck, dog, or jigger, is a device used to lift and move pallets. To move large or light pallets inside a warehouse, the most basic forklift is known as a "pallet jack."



Fig. 2.2.5. Pallet Jack

Scan the QR code to watch the related videos



<https://youtu.be/bq9mgk5zLPE>  
Principles of Material Handling



**Mezzanine:** A mezzanine is an intermediary floor, comparable to a balcony, in a structure with a centre that is open to the floor below with a double-height ceiling. Mezzanines can perform a wide range of tasks. Industrial mezzanines are ad hoc or sporadic constructions, such as those seen in warehouses.



Fig. 2.2.6. Mezzanine

#### **Benefits of Effective Equipment Maintenance:**

- Maximized asset performance and minimized equipment downtime
- Increased wrench time for maintenance technicians by reducing travel time
- Reduced cost and overtime
- Parts reserved for work orders assures the right parts at the right time
- Automatic work scheduling when parts become available saves time

#### **Documents and Information for MHE Maintenance**

One type of informative work aid that compensates for potential memory and focus lapses is the checklist. It aids in ensuring accuracy and thoroughness when performing a task. A simple illustration is a "to do list." A timetable, which lists things to be completed according to the time of day or other considerations, would be a more sophisticated checklist. Documenting the work and doing an audit based on the documentation are two of the main tasks on the checklist.



Fig. 2.2.7. MHE Maintenance

<b>Materials Handling and Storage</b>			
<b>Parameters</b>	<b>Good</b>	<b>Average</b>	<b>Poor</b>
Is there safe clearance for all equipment through aisles and gates?			
Is stored material stable and safe?			
Are storing areas free from tipping hazards?			
Are only trained operators permitted to operate forklifts?			
Is charging of electric batteries accomplished only in designated areas?			
When loading or unloading from a dock to a truck or dock to a rail car, are			
Are essential warning devices and signs in use for railway sidings?			
Are provisions posted for maximum loads which are approved for shelving, floors and roofs?			
Are racks and platforms loaded only within the parameters of their capacity?			
Are chain hoists, ropes and slings suitable for the loads and marked accordingly?			
Are slings checked daily before use?			
Are all new, repaired, or reconditioned alloy steel chain slings proof-tested before usage?			
Are pallets and skids the correct type and checked?			
Do personnel use proper lifting methods?			
Is the size and condition of containers hazardous to workforces ?			
Are elevators, hoists, conveyors, balers, etc., correctly used with appropriate signals and directional warning signs?			

Forklift Inspection Checklist: Sample 1

## Forklift Inspection Checklist

Forklift Model: \_\_\_\_\_

Vehicle No.: \_\_\_\_\_

Inspector Signature: \_\_\_\_\_

Date: \_\_\_\_\_

Inspect each part below. Put check marks next to all unsafe parts. Explain the safety hazards and the necessary corrective actions at the bottom of this form. **Do not operate a forklift that has any unsafe parts.**

- |  |   |
|--|---|
| <input type="checkbox"/> 1. Forks                    | <input type="checkbox"/> 12. Emergency Brake            |
| <input type="checkbox"/> 2. Mast & Mast-guard.       | <input type="checkbox"/> 13. Handholds/Footholds        |
| <input type="checkbox"/> 3. Hydraulic Cylinders      | <input type="checkbox"/> 14. Signs/Labels/Markings      |
| <input type="checkbox"/> 4. Roll Cage                | <input type="checkbox"/> 15. Load Chart                 |
| <input type="checkbox"/> 5. Lights                   | <input type="checkbox"/> 16. Seat/Seat-belt             |
| <input type="checkbox"/> 6. Steering/Steering Wheel  | <input type="checkbox"/> 17. Engine Cover Latches       |
| <input type="checkbox"/> 7. Control Levers and Knobs | <input type="checkbox"/> 18. Tires/Wheels               |
| <input type="checkbox"/> 8. Gauges/Indicators        | <input type="checkbox"/> 20. Fuel Tank/Mounting Bracket |
| <input type="checkbox"/> 9. Backup Alarm             | <input type="checkbox"/> 21. Fuel Hoses and Connections |
| <input type="checkbox"/> 10. Pedals                  | <input type="checkbox"/> 22. Other: _____               |
| <input type="checkbox"/> 11. Brakes                  |   |

### Engine Inspection

Inspect engine while it is shut off. Be careful of hot areas!

- |   |  |
|---|--|
| <input type="checkbox"/> 23. Radiator       | <input type="checkbox"/> 29. Automatic Shut Off    |
| <input type="checkbox"/> 24. Fan Belts      | <input type="checkbox"/> 30. Electrical Wiring     |
| <input type="checkbox"/> 25. Exhaust System | <input type="checkbox"/> 31. Hydraulic Fluid Level |
| <input type="checkbox"/> 26. Leaks          | <input type="checkbox"/> 32. Fuel Level            |
| <input type="checkbox"/> 27. Air Filter     | <input type="checkbox"/> 33. General Condition     |
| <input type="checkbox"/> 28. Battery        | <input type="checkbox"/> 34. Other: _____          |

**Describe safety hazards:**

**Corrective Action Required:**

I, the undersigned, do hereby certify that to the best of my knowledge this forklift is in safe operating condition.

Inspector Signature: \_\_\_\_\_

Date: \_\_\_\_\_



Forklift Inspection Checklist: Sample 2

## FORKLIFT OPERATOR'S DAILY CHECKLIST

(Complete Before The Start of Each Shift)

DATE	TRUCK NO.	BUILDING NO.	SHIFT
<input type="checkbox"/> INTERNAL COMBUSTION	<input type="checkbox"/> ELECTRIC	HOUR METER START                      END                      TOTAL HRS.	
OPERATOR'S SIGNATURE		SUPERVISOR'S SIGNATURE	

CHECK ANY DEFECTIVE ITEM WITH AN X AND GIVE DETAILS BELOW.

ACCELERATOR	HOUR METER
ALARMS	HYDRAULIC CONTROLS
BATTERY CONNECTOR	LIGHTS - HEAD AND TAIL
BATTERY - DISCHARGE INDICATOR	LIGHTS - WARNING
BELTS	MAST
BRAKES - PARKING	OIL LEAKS
BRAKES - SERVICE	OIL PRESSURE
CABLES	OVERHEAD GUARD
ENGINE OIL LEVEL	RADIATOR LEVEL
FORKS	SAFETY EQUIPMENT
FUEL LEVEL	STEERING
GAUGES	TIRES
HORN	UNUSUAL NOISES
HOSES	OTHER _____

**DETAILS:** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**MAINTENANCE COPY**



*Fig. 2.2.7. Forklift Maintenance Activity*



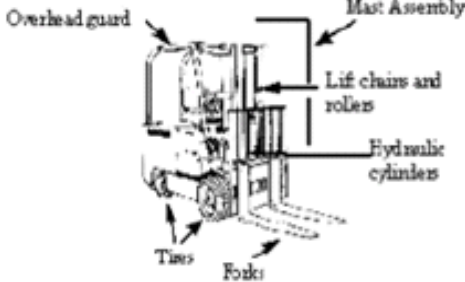
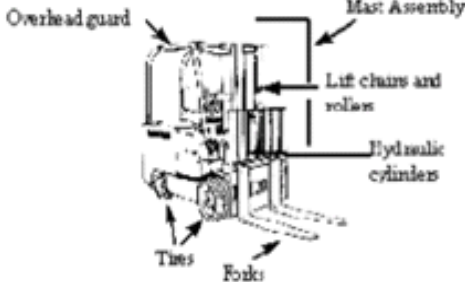
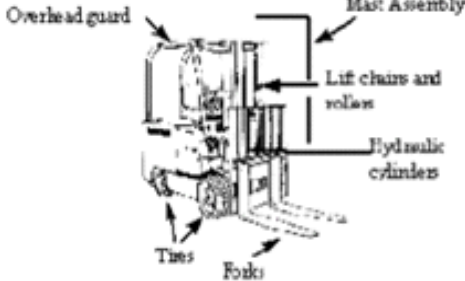
*Fig. 2.2.8. Forklift Maintenance Checklist*

Electric Lift Truck Safety Daily Inspection Checklist: Sample 3

**DAILY LIFT TRUCK SAFETY INSPECTION CHECKLIST  
ELECTRIC LIFT TRUCK**

Week of: \_\_\_\_\_ to \_\_\_\_\_ Department: \_\_\_\_\_

Location: \_\_\_\_\_ Area Supervisor: \_\_\_\_\_

<b>Date:</b> _____ <b>Inspector:</b> _____		
<b>KEY OFF Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Overhead guard</li> <li><input type="checkbox"/> Hydraulic cylinders</li> <li><input type="checkbox"/> Mast assembly</li> <li><input type="checkbox"/> Lift chains and rollers</li> <li><input type="checkbox"/> Forks</li> <li><input type="checkbox"/> Tires</li> </ul> </li> <li>○ Examine the battery*</li> <li>○ Check the hydraulic fluid level*</li> </ul> <p>* Can be done once every 10 uses or monthly, as needed.</p>	<b>KEY ON Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of gauges                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Hour meter</li> <li><input type="checkbox"/> Battery discharge indicator</li> </ul> </li> <li>○ Test standard equipment                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Steering</li> <li><input type="checkbox"/> Brakes</li> <li><input type="checkbox"/> Front/tail/brake lights</li> <li><input type="checkbox"/> Horn</li> <li><input type="checkbox"/> Safety seat (if applic.)</li> </ul> </li> <li>○ Check the operation of load-handling attachments</li> </ul>	<p style="text-align: center;"><b>Electric Forklift Truck</b></p> 
<b>Date:</b> _____ <b>Inspector:</b> _____		
<b>KEY OFF Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Overhead guard</li> <li><input type="checkbox"/> Hydraulic cylinders</li> <li><input type="checkbox"/> Mast assembly</li> <li><input type="checkbox"/> Lift chains and rollers</li> <li><input type="checkbox"/> Forks</li> <li><input type="checkbox"/> Tires</li> </ul> </li> <li>○ Examine the battery*</li> <li>○ Check the hydraulic fluid level*</li> </ul> <p>* Can be done once every 10 uses or monthly, as needed.</p>	<b>KEY ON Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of gauges                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Hour meter</li> <li><input type="checkbox"/> Battery discharge indicator</li> </ul> </li> <li>○ Test standard equipment                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Steering</li> <li><input type="checkbox"/> Brakes</li> <li><input type="checkbox"/> Front/tail/brake lights</li> <li><input type="checkbox"/> Horn</li> <li><input type="checkbox"/> Safety seat (if applic.)</li> </ul> </li> <li>○ Check the operation of load-handling attachments</li> </ul>	<p style="text-align: center;"><b>Electric Forklift Truck</b></p> 
<b>Date:</b> _____ <b>Inspector:</b> _____		
<b>KEY OFF Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Overhead guard</li> <li><input type="checkbox"/> Hydraulic cylinders</li> <li><input type="checkbox"/> Mast assembly</li> <li><input type="checkbox"/> Lift chains and rollers</li> <li><input type="checkbox"/> Forks</li> <li><input type="checkbox"/> Tires</li> </ul> </li> <li>○ Examine the battery*</li> <li>○ Check the hydraulic fluid level*</li> </ul> <p>* Can be done once every 10 uses or monthly, as needed.</p>	<b>KEY ON Procedures:</b> <ul style="list-style-type: none"> <li>○ Visual inspection of gauges                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Hour meter</li> <li><input type="checkbox"/> Battery discharge indicator</li> </ul> </li> <li>○ Test standard equipment                             <ul style="list-style-type: none"> <li><input type="checkbox"/> Steering</li> <li><input type="checkbox"/> Brakes</li> <li><input type="checkbox"/> Front/tail/brake lights</li> <li><input type="checkbox"/> Horn</li> <li><input type="checkbox"/> Safety seat (if applic.)</li> </ul> </li> <li>○ Check the operation of load-handling attachments</li> </ul>	<p style="text-align: center;"><b>Electric Forklift Truck</b></p> 




Hand Pallet Truck Inspection Checklist: Sample 4

**Hand Pallet Truck – Inspection Checklist** Week Starting: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

Company/Site: \_\_\_\_\_ Machine No: \_\_\_\_\_

CHECK DAILY BEFORE EACH SHIFT: ✓ = OK    ✗ = Action Needed	Mon	Tue	Wed	Thu	Fri	Sat	Sun
	Shift	Shift	Shift	Shift	Shift	Shift	Shift
	D A N	D A N	D A N	D A N	D A N	D A N	D A N
Check load-capacity plate is fitted, legible and correct.							
Inspect forks for damage.							
Check wheels.							
Check hydraulic jack cylinder for any leaks.							
Check jack lifts all the way up.							
Check lowering handle.							
Check handle is secure.							
Check operation - lift, hold and lowering.							
Check all bolts and fasteners.							
Check blade rollers.							
Any other visible damage or defects (write details below).							
Operator doing check to initial at the bottom of each column.							

FAULT REPORTED BY: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
 FAULT REPORTED TO: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
 Description of fault: \_\_\_\_\_  
  
 NOTE: Operator to TAG OUT machine if needed.

ACTION TAKEN TO RETURN TO SERVICE: \_\_\_\_\_  
 \_\_\_\_\_  
 REPAIRED BY: \_\_\_\_\_  
 Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_ Signature: \_\_\_\_\_



Fig. 2.2.9. Hand Pallet Trolley

Electric Pallet Truck Daily Checklist: Sample 5

## Electric Pallet Truck Daily Check List

Date:    /    /    Truck #: \_\_\_\_\_ Operator: \_\_\_\_\_

Hour Meter: \_\_\_\_\_ Dept.: \_\_\_\_\_ Charged: \_\_\_\_\_

✓ = No problem visible

X = Problem is detected

	Visual Inspection	✓	X
1	Battery - Water Level		
	Vent Caps		
	Cables		
2	Battery Connector		
3	Key Switch		
4	Capacity Data Plate		
5	Control Handle		
6	Safety Reversing Switch		
7	Power Head		
8	Drive Wheel		
9	Stabilizers		
10	Fork (Right)		
11	Load Wheels (Right)		
12	Load Wheels (Left)		
13	Fork (Left)		

	Operational Inspection	✓	X
A	Horn		
B	Gauges		
C	Lights		
D	Lift/Lowering Control		
E	Forward Drive and Braking		
F	Reverse Drive and Braking		
G	Safety Reversing Switch		
H	Oil Spots on Floor		
I	Listen for Unusual Noise		
J	Scale Tested (if applicable)		
K	Other		

# Sample

Comments: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

**Caution:** This is not a complete list of all items which may require attention. Operators are responsible for ensuring that the lift truck is in proper working condition in accordance with the manufacturer's specifications.  
**DO NOT** operate the lift truck if a problem is detected. Report any problems to the supervisor immediately.

Signed: \_\_\_\_\_  
 White - Supervisor    Yellow - remains in book

**To be completed by designated operator and forwarded to the supervisor prior to the shift.**



Fig. 2.2.10. Battery Operated Pallet Trolley



Fig. 2.2.11. Manual Pallet Trolley





## Unit 2.3 - Preparation for Maintenance

### Unit Objectives

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

1. Demonstrate the usage of various PPEs
2. Explain the process of prioritizing the machines or equipment to be checked first

### 2.3.1 PPEs Role in Warehouse

**PPE, or personal protective equipment**, is clothing used to reduce exposure to hazardous workplace illnesses and injuries. Contact with chemical, radioactive, physical, electrical, mechanical, or other job hazards may cause these wounds and illnesses. Personal protective equipment includes things like gloves, safety goggles, shoes, earplugs or muffs, hard helmets, respirators, or coveralls, vests, and complete body suits.

Personal protective equipment safeguards employees and aids in the prevention of illnesses and injuries.

Always hold a meeting with your subordinates at the end of the day to go over the work that has to get done the following day. He needs to check every area of the warehouse to provide a secure working environment. It's crucial to regularly check your PPE and equipment.



*Fig. 2.3.1. Safety Kit*

The primary daily task is to make sure that the warehouse is clean in every corner and that all of the equipment is in good operating condition.

**Worker responsibilities include:**

- **Use of proper PPE:**
  - Ensure that you are wearing the appropriate PPE for the task. If you're unsure, ask your safety representative.
- **Maintenance and inspection**
  - Examine PPE both before and after usage.
  - Always take care of PPE.
  - After usage, clean all PPE.
  - Repair or replace PPE that is harmed or broken.
  - Store PPE away from sunlight and other contaminants in a clean, dry environment.
- **Training**
  - Ensure you have been trained in how to fit, wear, and maintain PPE.
  - Ensure training program includes information that explains when and what PPE should be worn, and why it should be worn.

Equipment in warehouses needs to be maintained properly for both productivity and safety reasons. Lift trucks, conveyor systems, automated material handling equipment, dock equipment, stretch wrapping machines, palletizers, bailers, and compactors should all have preventative maintenance programmes in place. Employees should be instructed and urged to report equipment issues right away. All important pieces of equipment should have predetermined contingency plans so that you are ready to use them if they break down.

Pallet racking maintenance is frequently disregarded. There will be some level of racking damage in any warehouse with racking. Damaged racking needs to be replaced or repaired as soon as feasible, both for safety reasons and as a sign of character.

Racking damage likely to get worse if damaged pieces are left in place. Where there is a greater chance of damage, rack guards and barricades might be placed.

Putting on multiple layers of protection at once, such as hard helmets, ear muffs, and goggles, must not make the situation more dangerous or impair the worker's ability to do the task at hand. Wearing PPE shouldn't increase risk on its own. Gloves can pose an entanglement hazard when used with a drill press or metal lathe, but they protect the skin when handling moving machinery.



Fig. 2.3.2. Safety Instruction Label



Fig. 2.3.3. Handling Cargo in Operation Area



Fig. 2.3.3. Identification of Safety Gears

### Prioritizing checking of Machines or Equipment

**Regular maintenance** is intended to keep tools, machines, and structures running at their best. When lubrication is required for a specific piece of equipment, the efficiency of the entire line may suffer.

#### The Four Levels of Maintenance Tasks Priorities

- Emergency jobs are critical issues with operational safety or health. Examples include losing access to power or water, HVAC problems, fires, natural disasters, the collapse of crucial assets, and serious security issues. Obviously, no matter how big the list is, those are placed at the top.



Fig. 2.3.4. Maintenance Engineer on Job



- Following that, you have urgent responsibilities that will immediately impact operations. These can include safety checks, maintenance to important assets, leaky roofs, poorly performing high-use equipment, and high-use equipment.
- Then there are chores of a medium importance, such as schedules for preventative maintenance. In order to sustain optimal production, these chores must be completed because they will eventually affect operations. Examples include changing the oil, checking the belts, arranging vendor servicing, and replacing filters.
- Last but not least, maintenance teams are constantly faced with low priority requests or tasks that must be completed as cover for work that is not essential to ongoing operations. Non-essential repairs, the installation or replacement of furniture, cosmetic painting, etc., could all fall under this category.

### (1) Prioritizing the equipment

Each plant should prioritise its own machinery according to how it will affect the factory's overall production (volume and quality), taking into account factors like how much damage the equipment would endure if it broke down.

In general, the following six criteria are used to evaluate machines. Each of these criteria is given a score, and the equipment's overall score determines whether it is classified AA, A, B, or C. This priority ranking is then used to choose the proper maintenance system.

Aspect	Key points
P (production)	Machines with no standby Machines that fail frequently Machines whose failure leads to drastic cuts in production Machines that are less productive than those of competitors Machines whose output fluctuates widely
Q (quality)	Machines that greatly affect quality Machines whose output quality fluctuates widely Machines whose failure leads to changes in quality
C (cost)	Machines fed with expensive raw materials Machines that require a lot of manual input Machines that consume large amounts of heat, power, etc. Machines whose failure would lead to large consumption and yield losses
D (delivery)	Machines that many other machines depend on Machines near the end of the production line Machines critical to production timing Machines whose failure would slow down the factory's entire production
S (safety, environment) M (morale)	Safety equipment Air conditioning equipment Pollution control equipment Other equipment whose failure would adversely affect the environment
P: production volume (loading status, availability of alternative equipment) Q: effect on quality C: effect on cost D: effect on delivery lead times and equipment damage S: safety M: morale	

Although the table demonstrates that there are numerous useful methods for evaluating equipment, the final choice ultimately rests with the company's business judgment, so it serves little purpose to pedantically insist on a ranking system that relies only on scoring. As a general rule, the equipment percentage for each rank should be in the range of 5-7% for AA, 25% for A, 60% for B, and the remaining C.

Item Evaluated	Description	Score
Effect on production	If this machines stops, the whole plant stops	5
	If this machines stops, the whole plant slows down	3
	A failure of this machine has no effect on production	0
Effect on quality	A problem with this machine greatly affects quality	5
	A problem with this machine affects quality	3
	A problem with this machine does not affect quality	0
Effect on maintenance	A sudden breakdown incurs high repair costs	5
	Repair costs are moderate	3
	Repair costs are insignificant	0
Effect on safety	This machine incorporates risk factors such as combustibility or toxicity	5
	If this machine breaks down, there is a risk of injury to personnel	3
	There are no hazards associated with this machine, and no conceivable collateral damage could occur	0
Years of service	20 or more	5
	between 10 and 20	3
	10 or under	0

#### Example of equipment ranking

Ranking	Critical AA Rank	Important A Rank	PM B Rank	BM C Rank
Total score	pts	pts	pts	pts

Next, the proper maintenance scheme should be chosen for each tier, as shown below:

- AA: Systematized top-level CBM (monitoring equipment permanently installed).
- A system of intermediate CBM (periodic simple and precision diagnosis).
- System for time-based preventative maintenance (TBM).
- C: System for breakdown maintenance (BM).

When choosing their maintenance systems, most businesses generally adhere to the aforementioned process.



Aspect	No.	Item evaluated	Score			Scoring guideline
P	1	Average utilisation	4	2	1	≥ 80%: 4 ≤ 60%: 1
	2	Existence of standby or alternative machine, and ease of switchover	4	2	1	Not available, or takes a long time to switch over: 4 Available and can be switched over easily: 1
	3	Effects of failure on other equipment	4	2	1	Affects large numbers of other machines in the factory: 4 Has hardly any effect on other machines: 1
	4	Failure frequency	4	2	1	≥ 4/month: 4 ≥ 1/month: 1
	5	Time shut down for repair	4	2	1	1 day per occasion, on average: 4 2 h per occasion, on average: 1
Q	6	Effect on quality assurance of product	4	2	1	Serious effect: 4 Hardly any effect: 1
	7	Average value of quality loss per failure	4	2	1	≥ \$1,000: 4 ≤ \$100: 1
C	8	Average value of losses such as energy consumption and labour per failure	4	2	1	≥ \$1,000: 4 ≤ \$100: 1
	9	Total labour costs for repair	4	2	1	Average ≥ \$4,000/month: 4 Average ≤ \$1,000/month: 1
S	10	Risk to personnel	4	2	1	Considerable: 4 Zero: 1
	11	Risk of environmental damage	4	2	1	Considerable: 4 Zero: 1

## Notes:

- Consult the instructions before scoring each item.
- Only use the results that are listed in the scoring columns.
- The ranking is based on the overall score (A, B, or C).
- In the end, high-priority equipment is denoted by the letters A, medium-priority equipment by the letters B, and low-priority equipment by the letters C.

**(2) Selecting the maintenance system**

The maintenance system to be used on the equipment within each rank must be chosen after the equipment and the pieces that need to be maintained have been prioritised. Ideally, procedures like FMEA and FTA should be used to identify the sections that need to be maintained during the design and fabrication phases. However, in actual use, they are typically discovered through the knowledge gained through fixing numerous malfunctions that occur while the equipment is in use.

The following two key considerations must be made when choosing which maintenance system to use:

- The importance of the equipment.
- The reasons why the equipment is degrading.



### Prioritizing Equipment and Selecting Maintenance System:

Ranking	Importance	Maintenance rank	Maintenance regime		
			TBM	CBM	BM
AA	The most important equipment from the viewpoint of achieving the production goals (the most important 3%-5% of the A-ranked equipment)	PM, special class	○	◎	
A	Important equipment from the viewpoint of achieving the production goals	PM, 1 <sup>st</sup> class	◎	○	
B	Next in priority to A	PM, 2 <sup>nd</sup> class	○		○
C	Low-priority equipment	BM			○

### Notes




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## Unit 2.4 - Process of Planning the Sequence for Maintenance

### Unit Objectives

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

1. Demonstrate the Routine Maintenance Workflow
2. Explain the process of Daily, Monthly and Annual Maintenance Checks

### 2.4.1 Routine Maintenance Workflow

**Regular inspections** and machine servicing are examples of routine maintenance. Regular upkeep is carried out, whether it be daily, weekly, monthly, or yearly. System upkeep and functionality depend heavily on routine maintenance.

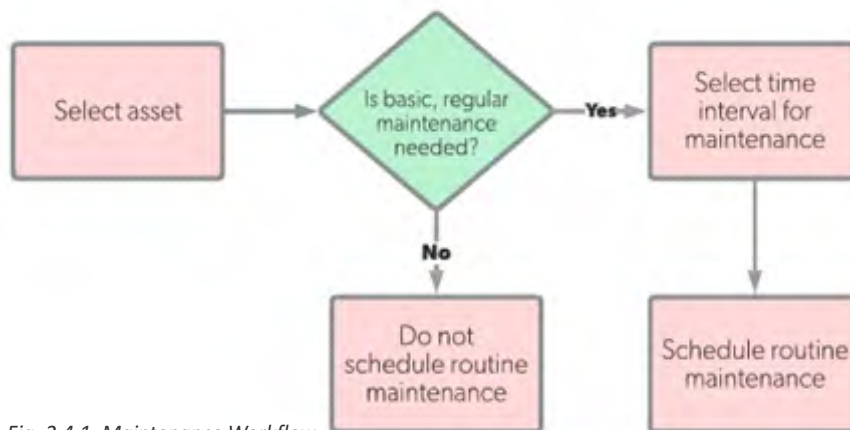


Fig. 2.4.1. Maintenance Workflow

Small and straightforward routine maintenance activities can be completed successfully with only the most fundamental maintenance knowledge. They can be finished every day, every week, every month, every quarter, or every year. Companies that invest in routine maintenance can increase the lifespan of their assets, minimise the need for emergency maintenance, and maintain the reliability of their production lines or facilities.

In order to rise the reliability of the machines they use on a daily basis, machine operators perform routine maintenance, which is a type of preventive maintenance and a crucial component of total productive maintenance.

#### How routine maintenance decreases downtime

Regular maintenance is intended to keep tools, machines, and structures running at their best. When lubrication is required for a specific piece of equipment, the efficiency of the entire line may suffer. An entire production line can be stopped if dirt causes a particular component to malfunction, at least until the issue is resolved. Regular lubrication and cleaning of the equipment helps to avoid these issues.

Additionally, regular scheduling of routine maintenance enables a business to make the best use of its maintenance resources. If maintenance workers move from one emergency work order to another, they might need to travel to different places, gather new tools and equipment, or simply change their attention from one problem to another. A maintenance professional performing regular maintenance can clean, examine, and modify numerous components on a single piece of equipment considerably more quickly.

**Examples of routine maintenance**

Cleaning communal areas, checking and cleaning apartments as occupants move in or out, or changing filters or other HVAC system components are all responsibilities of workers who undertake normal maintenance for an apartment complex or other residential property.

In a manufacturing environment, routine maintenance entails executing conditioned monitoring exercises, examining specific components, lubricating, cleaning, and adjusting machinery.

Municipality employees who serve as maintenance technicians carry out routine maintenance all across a city. This covers gardening, garbage collection, and building inspections to look for burned-out bulbs and faulty ballasts.

**Benefits of routine maintenance**

Regular maintenance keeps bigger issues from developing. Equipment, machinery, and facilities have a longer lifespan and continue to operate at their peak efficiency when they are well-maintained. Regular maintenance allows experts the chance to "lay their eyes on" crucial parts of a production line or particular system on a regular basis and gives them a chance to spot any other potential issues that might be hiding.

Additionally, the majority of maintenance specialists hired to carry out standard inspections, cleaning, or modifications are in their first or second year with a particular maintenance department. Regular maintenance is often easy and uncomplicated and serves as a great introduction to a facility, company, or complex for a new specialist.

**How to maximize routine maintenance**

When you take into account the decrease in emergency work orders, greater equipment efficiency, and decreased need for equipment replacement, routine maintenance offers excellent return on investment.

Provide instruction and training to maintenance technicians on how to clean, inspect, lubricate, service, and tune equipment, components, or systems in order to maximise the advantages of routine maintenance. For any piece of machinery or equipment that needs routine maintenance, make a thorough maintenance checklist, and look up the industry norms for lubricating, replacing, or cleaning to make sure the maintenance is suitable.

**What should an operator inspect during the visual pre-use check?**

- General condition and cleanliness.
- Floor – clear of objects that could cause an incident.
- Overhead – no obstructions.
- Nearby objects to avoid as you drive away.
- Fire extinguisher – present and charged.
- Engine oil level, fuel level, radiator fluid level (liquefied petroleum gas (LPG), gas, and diesel forklifts).
- Propane equipment – fuel tank mounting system, fuel tank position pin, propane relief valves and hose condition.
- Battery – fully charged; no exposed wires; plug connections not loose, worn or dirty; vent caps not clogged; electrolyte levels in cells is adequate; secured in place by holddowns or brackets.
- No broken, missing, or loosened bolts, nuts, guards, chains, or hydraulic hose reels.
- Wheels and tires – check for wear, damage, and air pressure, if pneumatic tires.
- Forks: carriage teeth should not be broken, chipped, or worn; forks should not be bent or at different heights; there should be no cracks; positioning latches should also be in good working order.



- Chain anchor pins – not worn, loose or bent.
- Fluid leaks – no damp spots or drips.
- Hoses – held securely; not loose, crimped, worn or rubbing.
- Grease or debris in the operator compartment.
- Seatbelt and/or operator restraint device (if equipped) – belts and restraints work properly; no visible wear or damage; anchors, buckles, etc. function properly.
- Seat locks – in position
- Overhead guard, or roll over protection structure (ROPS) if present – secure with no damaged areas.
- Other guards – all guards in place and in good condition.

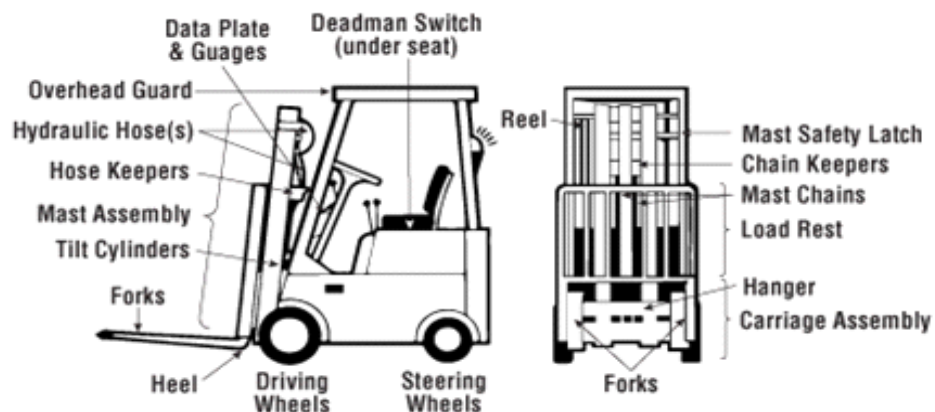


Fig. 2.4.2. Operational Pre-use Check

- **What should an operator inspect during the operational pre-use check?**
- Foot brake – pedal holds, unit stops smoothly.
- Parking brake – holds against slight acceleration.
- Deadman seat brake – holds when operator rises from seat.
- Clutch and gearshift – shifts smoothly with no jumping or jerking.
- Dash control panel – all lights and gauges are operational. Other guards – all guards in place and in good condition.
- Horn – working and loud enough to be heard in working environment;
- Back-up (reverse) alarm and other warning devices are operational.
- Lights – headlights and warning lights are operational.
- Steering – moves smoothly.
- Lift mechanism – operates smoothly (check by raising forks to maximum height then lowering forks completely).
- Tilt mechanism – moves smoothly, holds the load (check by tilting mast all the way forward and backward).
- Cylinders and hoses – not leaking after above checks.
- Listen for any unusual sounds or noises.

Any issues found during the daily check should be reported right away to the supervisor.

**Maintaining your forklift is essential to the safe running of your machinery. One of the greatest methods to prolong the life of your fleet, increase uptime, and guarantee the safety of your crew is to follow a regular forklift maintenance programme.**

To make sure your lift trucks are working at their best, use this checklist for forklift maintenance.

Follow this forklift maintenance checklist to ensure your lift trucks are operating at peak efficiency.

- **Perform a Visual Check of the Forklift Exterior**

A visual inspection of the forklift should be part of your daily maintenance routine.

- Check the oil, fuel and radiator fluid levels



- Check the battery plug to make sure it fits correctly
- Check the front and rear tires for pressure, cuts, chunks or shreds
- Check bolts, nuts and screws to see if any are loose or broken
- Check the carriage teeth of the forklift to ensure they are not broken or chipped
- Check the headlights and warning lights

- **Perform a Visual Check of the Forklift Interior**

After the visual inspection, look inside the forklift for operation-related maintenance needs.

- Check the foot brake, hand brake, parking brake, clutch and gear shift
- Check any lights missed from the first visual check
- Check steering mechanisms, lifting mechanisms, tilting options and forklift cylinders
- Check any obscure or unusual noises when the forklift is on

- **Perform a Check of the Forklift Engine**

After completing your visual checks, it's time to test the engine and prepare the forklift for operation.

- Run the engine to see if there are any coolant or fuel leaks
- Audit all belts under the forklift to see if they are worn or weak
- Adjust the mirror, horns, controls and safety devices as you sit in the forklift
- Change seat settings so you can comfortably reach pedals & steering mechanisms

These cover the basic checks you should perform before each shift.

Additionally, it's critical to remember when a device is dangerous or not functioning properly. There are a number of circumstances under which a forklift must be taken out of service, according to the OSHA Powered Industrial Truck Standard. If something were to happen while driving, you would stop, park the car, and call for help.

- **Watch out for Potential Hazards**

If your forklift needs maintenance, report repair problems to your supervisor and follow your company's procedures. This helps prevent possible hazards, such as:

- Forklift sliding or skidding as a result of spills, leaks, and grease.
- Mechanical failure brought on by subpar maintenance.
- Mishaps and injuries brought on by defective machinery.

Regular forklift inspection should be part of your fleet maintenance process. This ensures greater productivity and decreased costs over time.

### **Forklift Maintenance - Plan, Checklist and Schedule**

A daily forklift checklist will help the operator become accustomed to the safety inspections.

- Check the tires to make sure they are inflated and unharmed or worn out excessively.
- Check to see if there is enough fuel.
- Check the machine's horn, lights, street, and other safety features.
- Ensure that the engine oil is at the proper level to maximise fuel efficiency and to prevent engine blockage.
- Inspect all of the vehicle's safety features, such as the brakes, lights, and alarms; doing so can help you prevent any crashes or accidents.

**Monthly forklift maintenance inspections** are often a little more thorough. It's crucial to adhere to certain industry standards as well as manufacturer suggestions.

- Oil change.
- Air filter maintenance.
- Examine any cracks that you notice.
- Checking the batteries in electric forklifts.
- Lubricate the mass components and the chassis.

Here are a few of the services on a full annual forklift maintenance checklist:

Standby of:

- Brake fluid
- Engine coolant
- Fuel filter
- Lube in drive hubs
- Fuel strainer element
- Water separator
- Check reverse light operation
- Check brake pedal switch operation
- Check direction switch operation

Make sure that all the forklift parts are ready to operate smoothly. Lubricate the chains, the brakes, the hinges, the attachments, and the acceleration and clutch pedals as needed.

**The following tasks should be given priority and be included on the warehouse maintenance checklist, according to a good warehouse preventative maintenance plan:**

- Complete and intact safety equipment.
- Goods that are securely stacked on pallets or neatly boxed up.
- Proper risk mitigation measures.
- Clearly labelled danger zones, poisonous regions, and fire exits, among other things.
- Visible labelling on the products designating fragile items, etc.
- Running fire and safety exercises.
- Routinely updated machine operational authorizations and protocols.
- A frequently updated warehouse management system.
- Fully functional machinery and equipment.
- Clear and unobstructed aisles, stairways, and ramps for loading and unloading.
- Facilities that are usable by employees.
- Safe and functional electrical wiring and lighting.
- Pest control in the storage facility.
- An effective ventilation system.
- An up-to-date floor plan.
- A monthly assessment of the warehouse and the effectiveness of the preventative maintenance programme.

**Adopting best practises would also be part of good warehouse upkeep:**

- Plan procedures for picking up products to maximize efficiency
- Minimize touch points
- Zero reliance on manual input
- Products required more often placed accordingly
- Keep evaluating your strategy
- One SKU for each item
- Prioritize safety of the warehouse

- Vendor operations to be standardized
- Contingency Planning/ Reactive maintenance plan
- Information sharing/ Transparency
- Track KPIs
- Practice 360-degree feedback



Fig. 2.4.3. Maintenance Workflow Planning

## Tips



- Maintain proper posture by not stooping and keeping lifts near to the body. Lift slowly and deliberately, avoiding any unexpected movements. Never twist to pick up a big object or lift things when sitting down.
- Check the oil level in your pallet jack at least once every six months, and replace it ideally once a year. (Note: The oil should have the proper viscosity, ideally not more than 30cSt at room temperature, to make it easier to pump the conveying tool.)
- It's important to inspect pallet jacks before using them. Look for cracks and other signs of defects or possible damage. Over time, the solid rubber wheels of pallet jacks may also develop wear, resulting in unstable loads and poor handling.
- Must be done everyday before using a forklift: Check fluid levels (oil, water, and hydraulic fluid, for example) Check for leaks, cracks and visible defects everywhere on the forklift. Check mast chains visually; avoid the use of hands.
- In general, electric forklifts should undergo an inspection and service every 500 hours. Drive motor/hydraulic running hours are used to calculate "hours" on an electric lift truck.

## Summary



Equipment used to move, store, control, and protect materials, goods, and products during the production, distribution, consumption, and disposal processes is known as material handling equipment (MHE).

The day-to-day running of any warehouse relies heavily on the ability to manoeuvre product around the space safely— lifting pallets into place and removing pallets from racking as efficiently as possible. Because of this, Material Handling Equipment (MHE) is a vital aspect of warehouse life.

In Forklift, some components to check include:

- The brake system
- The cooling system
- The electrical system
- Engine Frame and chassis
- Fuel Hydraulics
- Front end Steer and Axle
- Transmission and drive
- Wheel And other general checks.

## Notes




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## 3. Maintenance Operations

Unit 3.1 - Maintenance Operations

Unit 3.2 - Preventive and Breakdown Maintenance

Unit 3.3 - Testing process of MHE as per SOP





## Key Learning Outcomes

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

1. Apply the various maintenance operations
2. Interpret the steps involved in preventive maintenance
3. Recognize the steps to be followed during breakdown maintenance
4. Memorize the testing process of MHE as per SOP

## Unit 3.1 - Process of Planning the Sequence for Maintenance

### Unit Objectives

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

1. Perform various maintenance operations as per SOP

### 3.1.1 Material Handling Equipments

**Every industry depends on material handling in one way or another.** It is a crucial element of every productive warehouse. By making products simple to locate, move, and ship, material handling may enhance customer service, minimise costs by shortening the time it takes to move products, and prevent product damage by shipping your goods safely. Additionally, it guarantees enhanced safety from both long-term and short-term disabilities.

**Importance of Material handling equipment:** The most important thing when selecting material handling equipment is to make sure that it is safe and capable of meeting your needs. In addition to this, it ought to be affordable.



Fig. 3.1.1. Material Handling

Scan the QR code to watch the related videos



<https://youtu.be/BBWPIByOefI>  
Material handling equipment in warehouse

In general, good material handling equipment should be able to:

- Use the principles of containerization, unit load, or cartelization to move the most components possible in a single unit.
- Using mechanical aids in place of manual work to speed up the movement of the material
- Reducing the amount of mobility an industrial process requires.
- Whenever possible, using gravity to help move items.
- To reduce handling costs and transit-related material damage.

**Within the warehouse, forklifts have a variety of uses.** They hoist pallets of items onto shelves and move big, heavy objects from one place to another. They are simple to operate and to drive, so personnel may learn how to utilise them quickly. Small spaces can be used to store forklifts, giving the warehouse additional room for supplies and other equipment. They are among the most adaptable instruments available, and they will stay in use for a long time.

**Forklift Maintenance Checklist:** Forklifts must be properly maintained in order to continue performing their duties. It's exactly like an automobile. Maintaining a machine properly increases its lifespan and lowers safety risks. Because forklift maintenance is significantly less expensive than forklift replacement, these measures can assist warehouse operators in lowering overhead.

Here's a quick checklist of forklift maintenance requirements:



Fig. 3.1.2. Forklift Maintenance

- 1) **Forklift oil should be changed.** Like the oil in a car, the oil in a forklift needs to be replaced periodically. By doing this, combustion issues will be avoided, and the forklift's performance will be enhanced. Additionally, new oil improves the forklift's fuel efficiency, which ultimately results in cost savings.
- 2) **Verify the fluid levels.** To carry big objects, the majority of forklifts employ hydraulics. Hydraulics depends on fluid. Similar to petrol, the hydraulic fluid may eventually need to be topped off. Antifreeze is also used by forklifts to keep them from overheating. As necessary, top it off or replace it.
- 3) **Check for leaks if one of the fluid levels drops unexpectedly.** If there are any fluids laying around, look in the reservoir and under the forklift. If so, locate the leak's source and make the necessary repairs.
- 4) **Oil moving components.** A component may require fresh grease or oil if the forklift has started to grind or squeak. Using some simple lubrication will resolve those problems.
- 5) **Regularly check the tyre pressure.** Forklifts operate all around a warehouse, therefore their tyres sustain significant wear. The floor debris such as plastic fragments, nails, screws, and other objects can puncture and harm the tyres. Of course, the floors should be cleaned regularly to prevent this issue, but some issues cannot be avoided. At least once per week, check the tyre pressure. Damaged tyres should be repaired or replaced.



Fig. 3.1.3. Forklift Equipments

Warehouse staff can perform the majority of forklift maintenance, but a forklift technician should be on hand for more serious concerns. Each department can operate efficiently throughout the day in the warehouse if the forklifts are in good condition.

The most creative and adaptable workhorses for any warehouse, manufacturing facility, or material handling operations are pallet trucks, or "Jacks," as they are more often known. They are available in a range of variations based on individual requirements and capacities. The Manual Pallet trucks, which operate similarly to a handcart but with features such as a hydraulic driven lever to lift, lower, and steer the jack, allowing easy manoeuvrability, are the most frequently seen for low-duty hauling. Additionally, it has sturdy wheels to withstand the uneven surfaces and rocky terrain on which they are typically rolled. The most common pallet trucks for low to medium duty warehouse applications are unquestionably electric trucks. These trucks, which also go by the names battery-operated pallet trucks, pallet jacks, power jacks, or plain walkies, have power drives and power lifts, which improve overall control and lessen the effort an operator must exert while carrying. Electric pallet trucks might come with compartments or even a platform to stand on.

Electric pallets have contemporary features like power steering and automatic brakes that increase safety while streamlining and optimising your regular warehouse tasks.

**1) Pedestrian:** It is a very helpful pallet truck with a load-bearing capability of about 1500kg that is also referred to as a "walkie." It's the perfect answer for light-duty situations. When compared to a hand pallet, it greatly reduces physical effort and increases productivity, which helps you work more efficiently and cut costs. With its traction and lift motor, consumers experience less strain and physical effort. Additionally, it has a joystick that controls the traction and lifts with automatic braking when the traction is released or the direction is reversed



Fig. 3.1.4. Pedestrian

**2) Platform:** It is recommended to think about a stand-on powered pallet jack where the operator can really board the truck and ride along the pallet for longer lengths than 30 metres in a single trip. These units are suited for heavy duty long distance commodities handling because they often have bigger capacities than the pedestrian variant. To increase usage across more applications, these use a variety of different safety capabilities than traditional pedestrian pallets.



Fig. 3.1.5. Platform

### Maintenance Policy and Repair

Plants and machinery always function to their maximum potential in the beginning, but as time passes and normal wear and tear sets in, this becomes more and more challenging. Production capacity can be kept at a more-or-less constant level by performing proper and routine maintenance. Determining what to replace also requires maintenance. A replacement is the replacement of an old fixed asset with a new asset that may have improved features and can fulfil the same purpose. A replacement may be required due to regular use, obsolescence, early service failure, destruction, etc.



Fig. 3.1.6. Maintenance Work

**Maintenance:** Maintenance is referred to as a process in which the optimal working condition of equipment is maintained to ensure maximum output. Repair, partial replacement, and complete replacement are all forms of maintenance. The importance of the maintenance policy is explained below:

- Equipment is constantly available and reliable thanks to the maintenance policy. This guarantees that the business can adapt to any unexpected shift in demand.
- Equipment calibration is always maintained as part of the maintenance policy to deliver high-quality output and a competitive edge. This prevents unexpected and frequent breakdowns and lowers the creation of defective goods.
- Maintenance procedures guarantee that there are no significant failures. This makes guarantee that businesses using the JIT mindset don't lose inventory or market share.
- Costs are consistently kept under control because to the maintenance policy.
- In industries that require a lot of capital, maintenance policy is crucial.

The following outcomes may occur if businesses are unable to adopt an appropriate maintenance policy:

- The use of all available capacity might not be reached.
- An increase in production costs due to the inability to minimize fixed labour costs.
- Rising maintenance costs as more replacement components become necessary.
- Decreasing product quality and rising waste.
- Worker and operator safety is in danger.

**Maintenance Management:** Maintenance is referred to as a procedure in which the optimal operational condition of equipment is maintained to ensure maximum production. Repair, partial replacement, and complete replacement are all forms of maintenance. The importance of the maintenance policy is explained below:



The following are the key goals of maintenance management:

- The least amount of output loss and the least amount of breakdowns.
- Minimum quantity of waste.
- The best possible use of staff and equipment for maintenance.
- The product's quality has increased.

### Planning and Scheduling

The maintenance department is in charge of organising and arranging maintenance in accordance with the requirements and goals of the business. Planning and scheduling are necessary to prevent disruptions of business as normal.

The following are crucial components of maintenance planning:

- Identify the necessary maintenance tools and procedures.
- Divide maintenance into routine, urgent, and emergency categories.
- Plan maintenance taking into account cost, time, space, etc.
- Planning for materials needed for maintenance requirements.
- Plan your time and financial needs.



Fig. 3.1.6. Planning and Scheduling

The following is the best way to explain the requirement to schedule maintenance:

- To maximise the use of equipment, tools, and labour;
- To maximise the use of personnel in maintenance; and
- To assure efficient production.

From the foregoing, it can be fairly inferred that a company's maintenance and repair policy must be comprehensive and efficient.

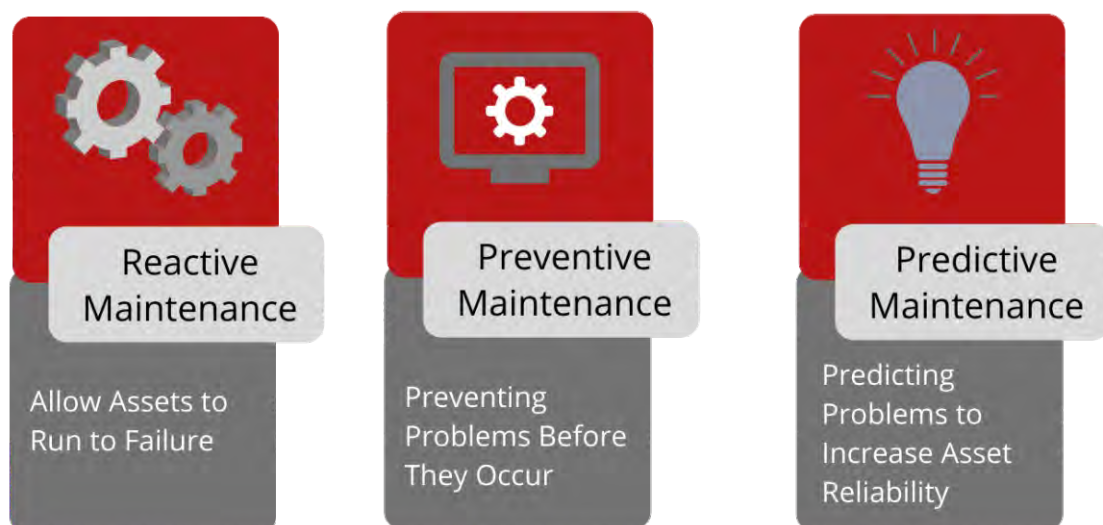


Fig. 3.1.7. Planning and Scheduling Process





## Unit 3.2 - Preventive and Breakdown Maintenance

### Unit Objectives

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

1. Memorize the steps involved in preventive maintenance
2. Interpret the steps to be followed during breakdown maintenance

### 3.2.1 Preventive versus Breakdown Maintenance

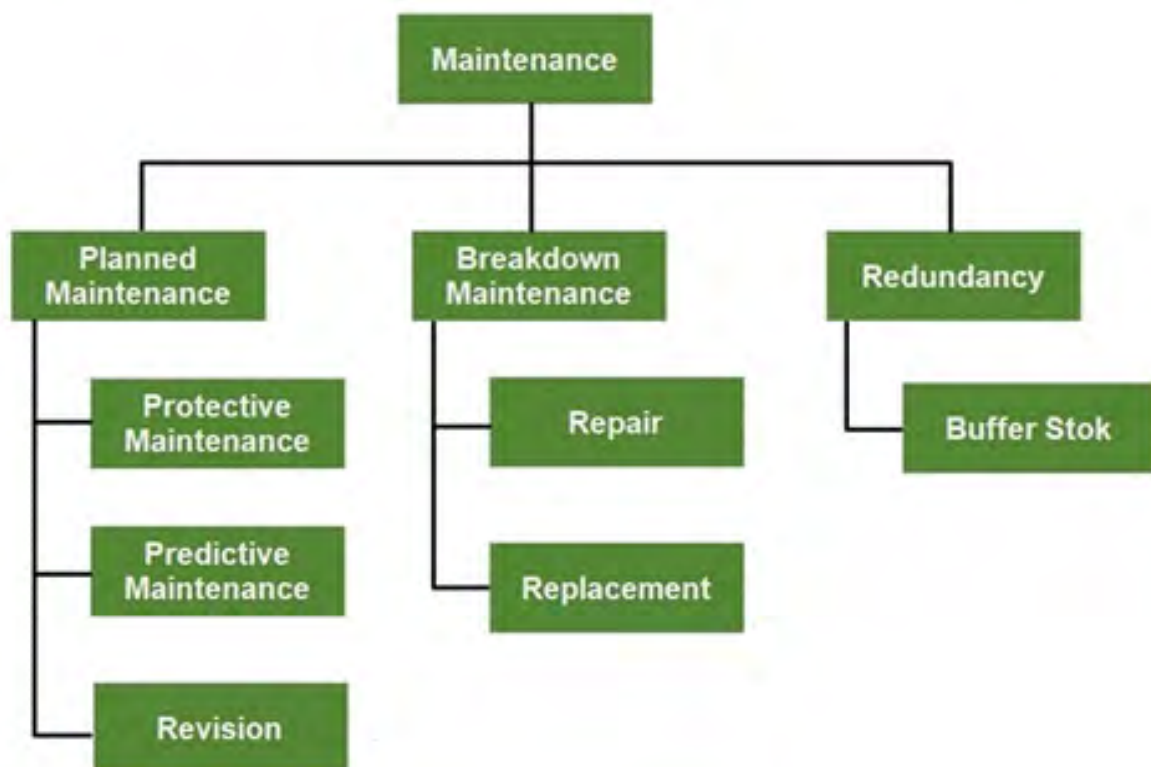


Fig. 3.2.1. Maintenance Chart

**While both preventive maintenance and breakdown maintenance aim to maintain and repair equipment, they do this in quite different ways.**

Through regularly scheduled maintenance, preventive maintenance finds any flaws before equipment breakdown or downtime. Running equipment until it malfunctions, at which point repairs and maintenance are carried out, is how breakdown maintenance works.

Preventive maintenance follows a schedule in which chores are finished at predetermined intervals before downtime occurrences. This is so that equipment's lifespan and operational duration be maximised through preventive maintenance.

Breakdown maintenance is more specialised than general maintenance since it is not applicable to many different types of equipment. For instance, it is not a good technique for maintaining crucial or important items of machinery or anything related to the safety and health of people.

However, it functions effectively with items that are intended to be utilised until they are no longer functional. This can include anything from household water heaters to light bulbs.

## Differences between preventive and breakdown maintenance

	Preventive maintenance	Breakdown maintenance
<b>Definition</b>	Preventive maintenance (PM) is work that is scheduled based on calendar time, asset runtime, or some other period of time.	Breakdown maintenance (BM) is work that is only performed when a piece of equipment breaks down or has a downtime event.
<b>Workflow</b>	<pre> graph TD     A[Preventive maintenance] --&gt; B[PM tasks: lubrication]     B --&gt; C[Equipment life extended]     C --&gt; D[Equipment failure]     D --&gt; E[Equipment failure]     E --&gt; A   </pre>	<pre> graph LR     A[Equipment failure] --&gt; B{Equipment failure?}     B -- Yes --&gt; C[Equipment failure: breakdown maintenance]     B -- No --&gt; D[Equipment failure: preventive maintenance]   </pre>
<b>Trigger</b>	Time	Downtime event
<b>Cost</b>	Low	Low
<b>Cost Savings</b>	12% to 18%	Dependent on equipment and breakdown maintenance plan
<b>Resources Needed</b>	<ul style="list-style-type: none"> <li>• Maintenance software for scheduling</li> <li>• Maintenance scheduler (for larger organizations)</li> <li>• Preventive maintenance checklists</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance software for downtime triggers</li> <li>• Necessary replacement equipment</li> </ul>
<b>Pros</b>	<ul style="list-style-type: none"> <li>• Extends the lifetime of assets</li> <li>• Optimizes planning of maintenance and resources</li> </ul>	<ul style="list-style-type: none"> <li>• Lowers overall costs of non-critical manufacturing equipment</li> <li>• Minimizes preventive maintenance costs on nonessential equipment</li> </ul>
<b>Cons</b>	<ul style="list-style-type: none"> <li>• Can be expensive to keep up over the long term</li> <li>• Labor intensive due to constant maintenance tasks</li> </ul>	<ul style="list-style-type: none"> <li>• Can't be used for many types of equipment, especially safety equipment</li> <li>• Requires careful planning and execution to work effectively</li> </ul>
<b>Use Case</b>	An organization wants to decrease unplanned downtime and emergency maintenance but does not have a large maintenance budget. As a solution, they implement a PM program for select assets. Work orders are scheduled for inspections, lubrication, filter replacements, and parts replacements based on recommendations from OEMs.	An organization wants to lower the cost of constantly replacing a variety of light bulbs in a facility. Instead of replacing them at designated intervals, the organization decides to adopt a breakdown maintenance plan, only replacing light bulbs when they are completely burned out. This saves time and reduces the overall cost of buying light bulbs as the necessary amount of spares is lower.

### Preventive MHE Maintenance Advantages

- Preparation-based approach
- Organized response to repair equipment
- Equipment and components are fully functional
- Longer equipment lifespan
- Workers and environment are safe
- Faster response from service support team
- Detailed reporting of equipment functionality

### Regular inspections of equipment

Before use, all equipment, such as a hand pallet truck, pallet stacker, scissor lifts, and more, should undergo routine inspections.

Additionally, it is wise to plan the inspections in advance to better prepare the staff members using the equipment and manage their time.

In general, taking this precaution helps the MHE work better while also averting potential accidents.

### Conduct regular housekeeping

Proper cleaning may be the least of the worker's concerns in such a busy atmosphere.

However, using MHE such forklifts, pallet jacks, and drum handling equipment will be safer if regular housekeeping is done.

In addition to keeping the floors clean, housekeeping may organise storage and inventory systems more effectively, which will enhance warehouse management.

### Lubricate moving parts of equipment

The majority of MHE in warehouses has moving parts that could become worn if proper care is not taken of them.

Therefore, lubricate all moving parts as directed by the MHE supplier.

The main goal of this is to guarantee that the machinery is always in working order without running the danger of serious breakdowns.

### Restore faulty equipment parts

Even the least used machinery might develop faulty components over time. Therefore, replace or repair damaged pieces before the entire MHE completely fails.

To prevent prolonged downtime, however, we advise that you already have spare components and a service crew on hand.

As opposed to broken MHE, which can significantly affect your production flow, this will save you time.



Fig. 3.2.1. Regular inspections of equipment



Fig. 3.2.2. Conduct Regular housekeeping



Fig. 3.2.3. Lubricating moving of Equipment



Fig. 3.2.4. Restore faulty equipment parts



### Make MHE Maintenance a Priority

MHE preventive maintenance will significantly enhance the performance of both workers and equipment.

Additionally, it's critical to remember that you will need MHE from a reputable MHE provider who can give you the greatest MHE and assistance.



Fig. 3.2.5. MHE Maintenance a Priority

### Maintenance System - Cranes, Hoists, and Conveyors

#### Hoists and Cranes:

- a) **Inspection:** All components, whether exposed or covered, are examined for damage. Wire ropes, wheels, bearings, nuts, and other worn-out or non-functioning parts are removed. Where necessary, lubrication is applied and the brakes are adjusted.
- b) **Repair:** Following an inspection, the system's repairable components are adjusted for minor fixes and flaws. It is possible to fix systems such couplings, riveted and bolted joints, trolleys, brakes, guards, etc.
- c) **Overhaul:** Rebuilding entails disassembling the entire mechanism and replacing all damaged parts. It is possible to change the crane's construction, buffers, rails, open gear transmission, pulley blocks, etc., as well as align and modify numerous sub-mechanisms.

#### Conveyors:

- a) **Inspection:** The tension and wear & tear of belts or rollers are checked. Safeguards are examined, fasteners are tightened, and the gear box is appropriately oiled.
- b) **Repairs:** Belts and rollers are inspected, corrected, and adjusted. According to their conditions, couplings, packings, safety guards, steel buildings, gear transmission, bearings, fastener joints, threaded components, etc. are adjusted or repaired.
- c) **Overhaul:** The conveyor system has been taken apart entirely. Belts, bearings, packings, oil seals, rollers, drums, fasteners, and couplings are just a few examples of the worn-out and irreparable parts that are changed. Depending on their state, structures, safety barriers, etc., may need to be repaired.

**Repair Cycle:** A typical repair cycle can look like this:

- |                  |                  |
|------------------|------------------|
| a) New Equipment | l) Inspection-9  |
| b) Inspection-1  | m) Repair-3      |
| c) Inspection-2  | n) Inspection-10 |
| d) Inspection-3  | o) Inspection-11 |
| e) Repair-1      | p) Inspection-12 |
| f) Inspection-4  | q) Repair-4      |
| g) Inspection-5  | r) Inspection-13 |
| h) Inspection-6  | s) Inspection-14 |
| i) Repair-2      | t) Inspection-15 |
| j) Inspection-7  | u) Overhaul-1    |
| k) Inspection-8  |                  |



Fig. 3.2.6. MHE Repair Cycle

15 inspections, 4 repairs, and 1 overhaul are part of this cycle. Depending on the type of material handling equipment used and the amount of time it has been in use, the period between two steps, such as (c) or (d) and (e), may be anywhere between 1 month and 6 months or even longer.





## Unit 3.3 - Testing process of MHE as per SOP

### Unit Objectives

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

1. Explain the testing process of MHE as per SOP
2. Interpret the Process of Report deviations as per escalation matrix

### 3.3.1 Testing Process of MHE as per SOP

A **Standard Operating Procedure** is a series of written guidelines that outlines the exact steps that must be done to carry out a regular task correctly. To ensure that the firm maintains consistency and complies with industry norms and business standards, SOPs should be adhered to exactly the same way each time.

The policies, methods, and standards provided by standard operating procedures are essential to the success of the business. They can help a company by decreasing errors, boosting productivity and profitability, fostering a safe workplace, and developing procedures for dealing with problems and overcoming barriers.

**SOP rules** may include the warehouse's opening and closing times, regular security checks, how items are moved to and from the warehouse, inventory control, how goods should be handled, how quickly shipments should be made, and staff hygiene procedures.



Fig. 3.3.1. SOP Specification

It can be helpful to make a list of everything that has to be accomplished over the course of a year and then classify the items by frequency. For example:

Monthly maintenance	Quarterly maintenance	Semi-annual maintenance
Oil change	Inspect pedal and hand brake	Replace brake fluid
Clean air filter	Clean radiator	Check engine bolts and manifold nuts
Lubricate chassis	Replace hydraulic filter	Inspect brake booster operation
Inspect drive belt tension	Inspect oil, fuel filter, PCV valve, and hose (engine -powered trucks)	Replace wheel bearing grease and engine coolant
Adjust idle speed and ignition time (engine trucks)	Drain water separator (diesel trucks)	Replace fuel filter
	Measure CO emissions	

Scan the QR code to watch the related videos



<https://youtu.be/2-hNYfX8rcU>  
Digital Multimeter Parts And Functions

Forklift maintenance is crucial to keeping your lift trucks in good working order and minimising downtime, but maintaining large machinery can be risky. The greatest approach to avoid serious injuries when it comes to maintenance worker safety is to adhere to industry best practices.

### Electric Pallet Truck Maintenance:

Maintaining an electric pallet truck's dependability is crucial because it is a crucial piece of machinery for any warehousing or logistics operation. Pallet trucks are a continuous investment that will provide you with a long and fruitful working life if you continue to give them the proper levels of care and maintenance.

Electric pallet trucks are by definition more straightforward, dependable, and simple to maintain than conventional manual pallet trucks. The main reason is that instead of relying on a potentially intricate hydraulic system, they employ electric motors to perform the hard lifting. Hydraulic manual pallet trucks frequently experience leaks, air bubbles throughout the system, and the necessity to monitor and top off the hydraulic fluid. You won't have to deal with these problems if you buy an electric pallet truck.



Fig. 3.3.2. SOP Electric Pallet Truck Maintenance

Detailed instructions for routine maintenance of electric pallet trucks:

#### Step 1. Proper operator training

Before you even think about the equipment itself, make sure your operators know how to utilise it effectively. What is the maintenance connection here? The majority of the time, user mistake rather than wear and tear or design defects may cause the issues you have with your electric pallet truck. As a result, the first stage in your maintenance programme for your electric pallet truck must be operator training.

The right steps to take are: Although electric pallet trucks are designed to be as user-friendly as possible, mistakes are nevertheless inevitable in a hectic warehouse and logistics setting. Spending a little time making sure all of your operators are learning how to use the equipment correctly by memory will end up saving you money.

Here's what you need to study:

- Walk-around check: Provide guidance on what operators should look for to make sure the pallet truck is ready to use before it is used at the start of the shift.
- Battery safety - demonstrate to operators how to monitor the battery's level of charge and how to swap out batteries as needed. At the conclusion of each shift, doing this automatically is an excellent practise.
- Electric pallet trucks have a pretty straightforward beginning method, but it's crucial that operators understand exactly what they need to perform.
- Speed control - Because an electric pallet truck's throttle may be unfamiliar to operators used to using manual pallet trucks, make sure they memorise safe ways to accelerate and decelerate.
- Maneuvering - An electric pallet truck has roughly the same proportions as a typical manual version. Make sure operators understand its measurements so they can determine the amount of space needed.
- Storage - promote an additional general inspection at the conclusion of the shift and remind users to take out and replace the battery for recharging.

The best preventative maintenance you can perform is to train operators on how to use the pallet truck properly. In the future, it will aid in preventing component wear, battery failure, and accident damage.

### Step 2. Interpreting batteries

In contrast to a forklift truck, the fundamental distinction between an electric and manual pallet truck is that the latter employs hydraulics while the former uses electric motors. The heavy-duty battery that will power the electric motors is In order to maintain the machine's dependability, understanding how to use and care for the battery will be crucial.

**Safe battery swapping:** Most electric pallet trucks enable you swap out the batteries on a regular basis. You can efficiently operate the pallet truck around-the-clock by having one battery charging while another is inside the pallet truck. The battery replacement procedure has been made as easy and straightforward as feasible.

However, it's crucial to ensure that employees take the battery out of the electric pallet truck carefully and properly before putting it in the dock for charging. Any damage has the potential to reduce the battery's effectiveness or render it completely inoperable. The batteries are made to withstand some impact, but continued damage will cause them to malfunction.

**Protection from the elements:** It's crucial to think about how this would effect the pallet truck if it will be utilised in a frequently chilly or damp location. It goes without saying that permitting any water into the electrics will result in an unstable machine at best as batteries are normally less effective in cold temperatures.

If you want to use your electric pallet truck outside or in a chilly facility, think about investing in optional additional weather protection sleeves. They merely fasten around the pallet truck's important components to guard against weather damage and maintain a more comfortable working environment.

### Step 3. Fork checks

Your electric pallet truck will utilise the forks frequently, which puts them at risk of sustaining damage. This could happen for a variety of causes, including normal wear and tear or operator error in general. However, it's crucial to keep a close eye on them because even little damage might have a detrimental effect on the effectiveness of the device.

Due to not being fully lowered before being put under the pallet, the prongs could be regularly chipped. The tips may bend as a result of this. Poor weight distribution interpretation may result in the forks buckling over time if large pallets are not fitted into place or the pallet truck is routinely overloaded. The forks' structural integrity could be endangered by any buckling.

**How you monitor fork wear:** The important thing is to incorporate this into daily machine checks. Explain what to look for and what to do if you discover it.

- Look for any locations where the paint has been consistently chipping; this will indicate where the forks are under the most strain.
- While squatting, check to see whether the fork's length is not bulging, bowing, or bending improperly to signify structural deterioration.
- Check the fork tips to make sure they haven't been bent inward or outward; these parts will absorb the brunt of any collisions or inappropriate loading.

Any damage must be noticed and reported right away if it is discovered. In a piece of equipment that is used frequently, paint chips are fairly inevitable, but you should have any structural damage repaired right away. Simply ignoring the issue will only make it worse over time, making repair costs and turnaround times increase as a result.

#### Step 4. General maintenance

There are a number of things you can do to keep your electric pallet truck in reliable working order as part of a general ongoing maintenance program. These are extremely quick and straightforward things to accomplish, but they can have a large impact because your electric pallet truck is a simple device with few moving parts.

- Regular lubrication is necessary to keep the pallet truck moving smoothly. It should be greased around its wheels and axles around once a month.
- Protect the wheels by using the truck only on flat, clear surfaces and keeping the path free of obstructions. As a result, the wheels won't chip or buckle.
- Appropriate storage - the pallet truck must be kept in a safe, secure area, out of the weather, when not in use.
- Regular cleaning - Dust, filth, and grime should be removed as frequently and thoroughly as possible to prevent damage to the truck.

#### Step 5. Daily checks

The thorough daily inspection is one of the greatest preventative maintenance techniques for any piece of working equipment, but especially an electric pallet truck. This needs to be done both before and after using the pallet truck at the beginning and end of the shift.

The daily inspection should include the following:

- A general visual inspection to check for damage to the forks, wheels, and control panels.
- An electrical inspection to make sure the pallet truck starts up and maintains a charge.
- Shifting the truck from side to side and back and forth to listen for any noises or faults.
- Check the battery's condition to make sure it is not damaged in any way before installing it.
- Verify that the battery that is leaving the truck and entering the dock for charging is the same.
- Make a full account of any damage discovered and notify right away, ideally with images.

This will assist identify any problems as they develop and should eventually become second nature.

### Maintenance as required

#### Cleaning the Forklift

Cleaning is dependent on the environment and type of use. If the truck comes into touch with substances that are extremely abrasive, such as salt water, fertilisers, chemicals, cement, etc., it should be thoroughly cleaned after each work cycle. Using cold compressed air and detergents is advised. Clean the body parts with rags that have been dampened with water.

Avoid cleaning the truck with direct water jets and avoid using solvents and oils that might harm the truck's components.

#### Battery Replacement

Make contact with the authorised sales network prior to replacing the battery.

#### Instructions:

- Switch off the truck and carry out the initial maintenance procedures.
- Lift the cover above the battery compartment.
- Remove (2) the plug from the outlet (3).
- Place the hooks in the two battery points (4).
- The whole sling needs to be sized appropriately for the battery's weight.
- Lift the battery using a hoist that is sized properly for the battery's weight.



- Reverse the aforementioned procedures to replace the battery and reinstall it.

Check the battery characteristics supplied in the "Instruction Manual" to determine which type of battery to use.

**Danger:** Utilize a crane with a lifting capacity adequate for the battery's weight. Only trained individuals should execute lifting operations. AVOID standing close to the truck or in the path of the crane. Never place yourself in the hazardous region beneath dangling loads. Make use of NON-METALLIC slings. Verify that the slings' lifting capacity is enough for the battery's weight. It is necessary to pull the rope slings vertically. Batteries with polar terminals or connections that are not protected from short circuits should be covered with a rubber pad to avoid them.

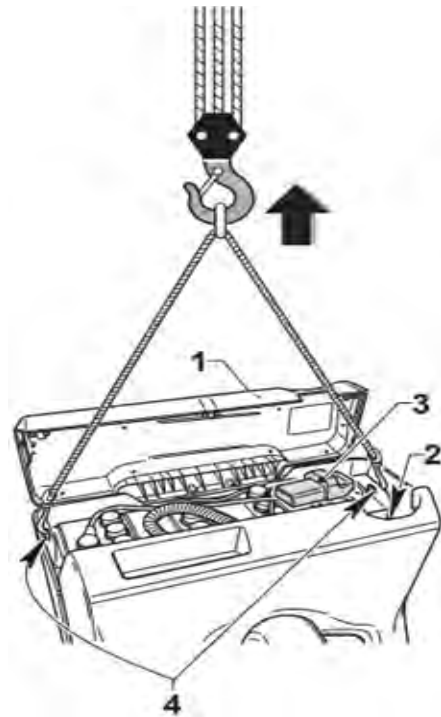


Fig. 3.3.3. Battery Replacement

#### Changing the battery from the side (optional)

Place the truck in park before replacing the battery. Make sure the truck is stable and cannot move unintentionally.

Make sure the unlocked battery can't come loose and land on the floor. risk of foot and hand crushing!

Perform the initial maintenance procedures while the truck is off.

Raise the battery compartment cover (1).

Disconnect the plug from the socket (2), positioning it as shown in the label (3).

Precaution: Avoid plugging the batteries in.

By placing a hand in the handhold and removing the panel (5), (6).

Place the battery side removal roller unit, which has been approved by the manufacturer, next to the truck; position it so that it is still and stable; and set the roller unit's height so that it is level with the battery's underside at the battery compartment:

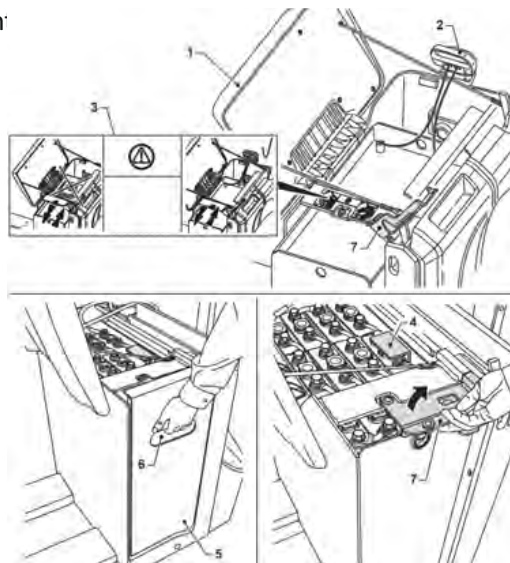


Fig. 3.3.3. Battery Replacement - Optional

Remove the battery holddown (4).

Lift the battery stop (7).

Risk of hands being crushed! The battery can only be removed by one person at a time. The operator must stand on the same side as the roller unit for battery side removal and follow the operating guidelines listed in this section.

The battery should be taken outdoors, placed on the unit with the ready external roller, and then moved along the truck's rollers. For further information, see the "stand with side battery removal roller unit" section.

Use a sling or chain to hook the battery at the two places (8).

Lift the battery and remove it.

**DANGER:** Utilize a crane with a lifting capacity adequate for the battery's weight. Personnel with the necessary training must undertake the lifting activities. **AVOID** standing close to the truck or in the path of the crane. Make use of **NON METALLIC** slings. Verify that the slings' lifting capacity is enough for the battery's weight. By performing the above steps in reverse, you can replace the battery and reinstall it.

Make sure the battery plug cables are properly positioned before closing the battery cover to prevent damage to them.

Check that there is little to no space between the battery holddown (4) and battery stop (7) and the battery compartment after placing them in their proper locations.

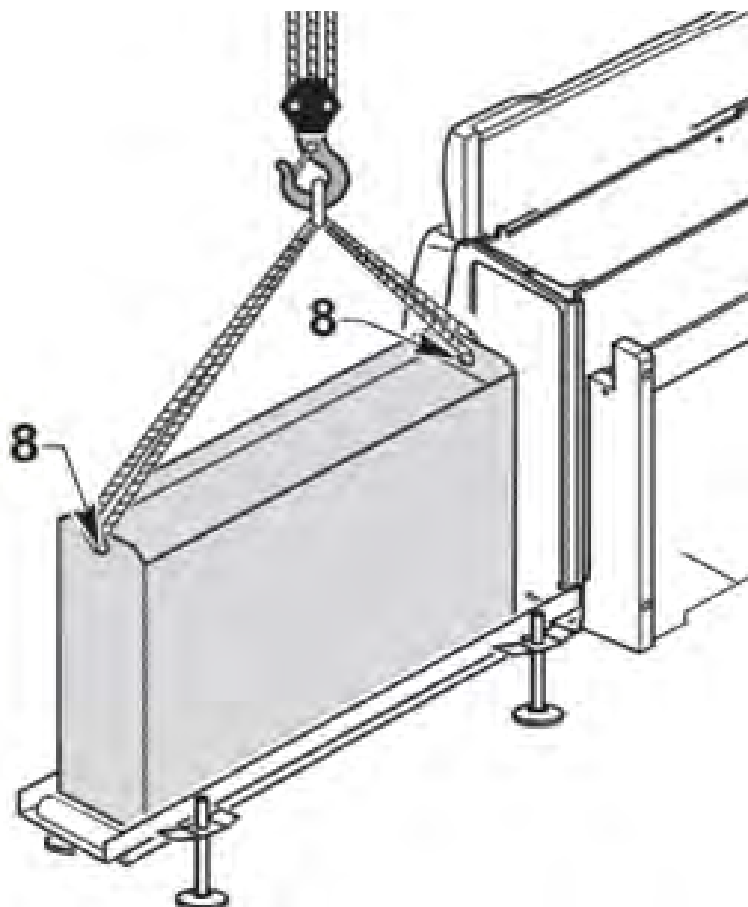


Fig. 3.3.4. Battery Holddown Position

### Fuse replacement

Perform the initial maintenance procedures while the truck is off.

Eliminate the reason of the fuse blowing before replacing it. Only a fuse with the same amperage can be used to replace a blown one. No electrical system of the truck should be tampered with.

As described in the "Internal Accessibility" section, reach the fuses.

Replace the blown fuse after removing the cover from fuses (1) and (2), then put the cover back on.

Replace the power fuses (3) and (4) by loosening the screws, doing so again after doing so.

Fuse values:

- Fuse = 7.5 A
- Fuse = 5 A
- Traction motor protection fuse = 200 A
- Lifting motor protection fuse = 150 A

### Decommissioning

Detailed information about the procedures to be followed for both temporary and permanent decommissioning.

#### Temporary Putting Out of Commission:

When the forklift won't be used for a while, the following tasks must be completed:

- Wash the forklift as directed in the "Maintenance" chapter, then store it in a place that is dry and dust-free.
- Releasing the forks
- Lightly oil or grease all of the unpainted components.
- Carry out the lubricating procedures recommended in the maintenance chapter.
- Take out the battery and store it somewhere that won't freeze. At the least once each month, recharge the battery.
- Raising the forklift will prevent the wheels from making contact with the ground, which will cause them to flatten out at that location.
- Place a sheet that is NOT plastic over the forklift.

#### Checks and Inspections After a Long Period of Inactivity:

Before using the forklift, carry out the following actions:

- Thoroughly clean the forklift truck.
- After reassembling the battery in the forklift, check the battery's charge level and coat the terminals with Vaseline.
- Lubricate the chains and all the components equipped with lubricating nipples.
- Perform the fluid level inspections.
- Use the forklift's safety devices and all of its functional manoeuvres, both when it is loaded and when it is empty.

For the previously mentioned operations, adhere to the maintenance chapter's recommendations.

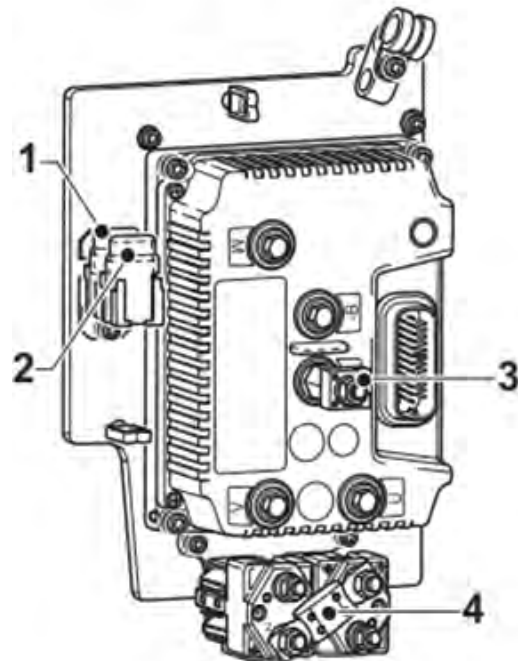


Fig. 3.3.5. Fuse Replacement

### Permanent Putting Out of Commission (Demolition)

The forklift needs to be destroyed in accordance with local laws. To dispose of the forklift in accordance with local regulations, get in touch with the authorised service network or authorised businesses.

Batteries, fluids (such as oils, fuels, and lubricants), electrical and electronic components, and rubber components in particular, must be disposed of in accordance with the relevant local laws for each type of material.

The forklift's disassembly for recycling is very dangerous.

### Technical data

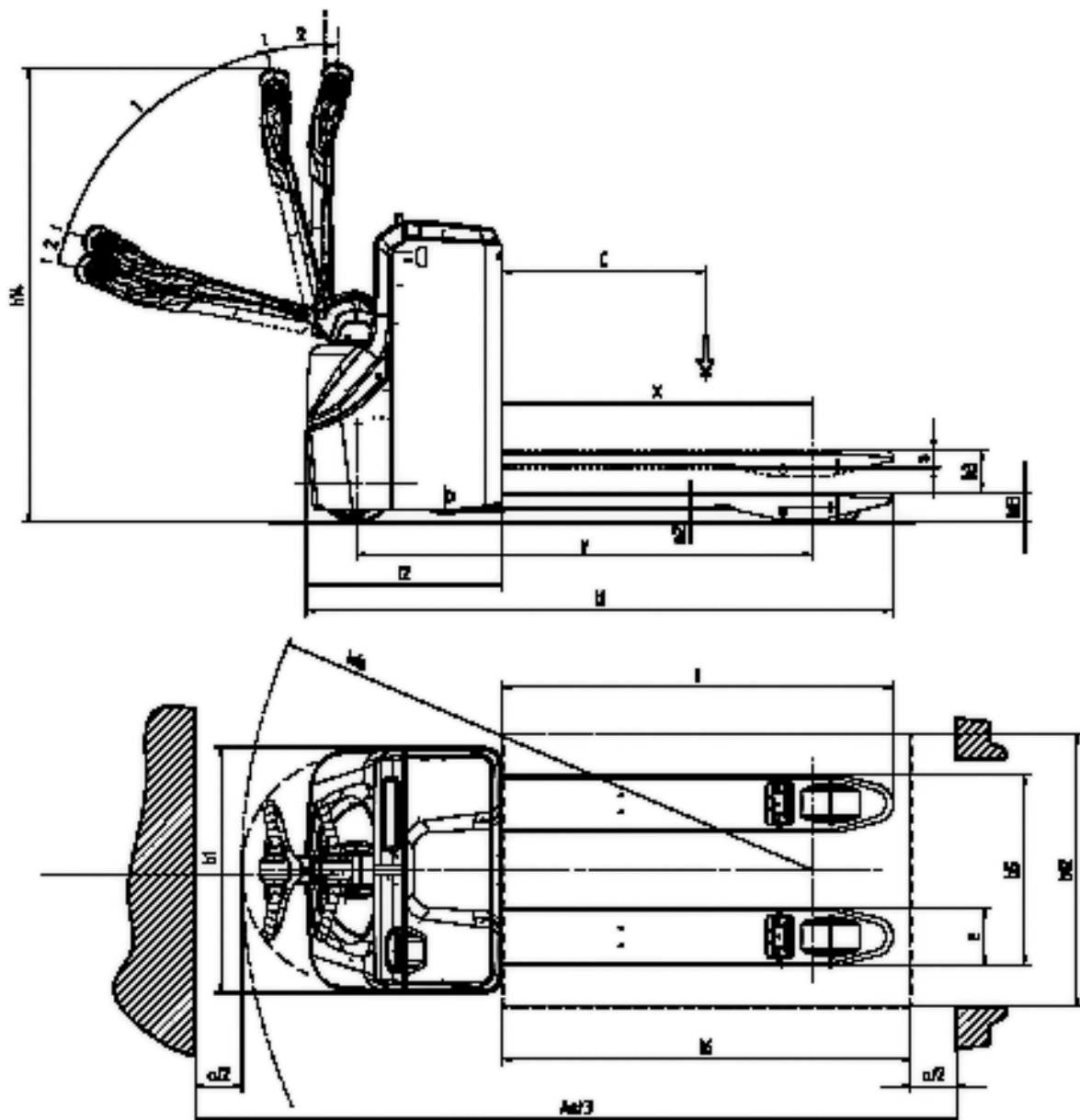


Fig. 3.3.6. Technical Analysis

Truck type	-	EME 12	
Drive	-	Electric	
Operation	-	Pedestrian	
Capacity / Load	Q	1200KG	
Load Centre	c	600	
Load Distance	x	985	
Wheel Base	y	1218	
Weights	Service weight	KG	165
	Axle load with load in front / back (incl. battery row 6.5)	KG	498 / 867
	Axle load without load in front / back (incl. battery row 6.5)	KG	139 / 26
Wheels	Tyres, solid rubber, superelastic pneumatic, polyurethane	-	PU
	Tyre size front	(O x B)	230 x 65
	Tyre size back	(O x B)	82 x 95
	Additional wheels	(dimensions)	-
	No. of wheels front / back	X = powered	1 x / 2 (4)
	Track width front	b10	-
	Track width back	b11	370 / 500
Basic Dimensions Data	Lift height	h3	95
	Handle height in travel direction min / max	h14	861 / 1156
	Lowered height	h13	82
	Total length	l1	1555
	Length incl. back of forks	l2	378
	Total width	b1	700
	Fork Dimensions	s/e/l	50 x 150 x 1177
	Width across forks	b5	520 / 650
	Floor clearance centre wheelbase	m2	32
	Working aisle width with pallet 1000x1200 transverse	Ast	1640
	Working aisle width with pallet 800x1200 lengthways	Ast	1840
	Turning radius, lowered	wa	1425



Performance Data	Travel speed with / without load	km/h	4, 2 / 5, 0
	Lift speed with / without load	m/s	0,02 / 0,03
	Lowering speed with / without load	m/s	0,03 / 0,02
	Max. gradient performance with / without load	%	3,5 / 15
	Operating brake	-	Electromagnetic
Emotor	Drive motor, performance S2 30 min.	kw	0,3
	Lift motor, performance at S3 10%, 10 min.	kw	0,4
	Battery in line with DIN 43531/35/36 A,B,C, n	kw	Maintenance free
	Battery voltage, nominal capacity	V/Ah	2 x 12/42
	Batteryweight	KG	2 x 18,5
	Energy consumption in line with VDI cycle	kWh/h	0, 29
Others	Type of drive control	-	ac~impulse
	Noise level , drivers ear	dB (A)	65

### Forklift Maintenance:

If a forklift is found unsafe then it must be removed from service until repaired by an authorized person. In addition, the forklift owner's manual will have routine checks and preventive maintenance tasks that must be done by a skilled maintenance person to keep the forklift in safe operating condition. Keep a record of this maintenance as well as any repairs that are made.

When you replace parts, make sure they are equivalent to the original manufactured part. Do not alter or eliminate any forklift parts or add any accessories such as additional counterweights or lifting attachments unless approved by the manufacturer in writing. Make any necessary changes to the load capacity plate and operating instructions.

## Operator's Daily Checklist: Gas or LPG Forklift

Check each item before the shift starts. Put a check in the box if the item is OK. Explain any unchecked items at the bottom and report them to a supervisor. Do not use an unsafe forklift! Your safety is at risk.

Forklift Serial Number: \_\_\_\_\_

Operator: \_\_\_\_\_

Hour Meter Reading: \_\_\_\_\_

Date: \_\_\_\_\_

✓	Visual Check
	Tires are inflated and free of excessive wear or damage. Nuts are tight.
	Forks and mast are not bent, worn, or cracked.
	Load back rest extension is in place and not bent, cracked, or loose.
	Overhead guard is in place and not bent, cracked, or loose.
	Attachments (if equipped) operate OK and are not damaged.
	Forklift body is free of excessive lint, grease, or oil.
	Engine oil is full and free of leaks.
	Hydraulic oil is full and free of leaks.
	Radiator is full and free of leaks.
	Fuel level is OK and free of leaks.
	Battery connections are tight.
	Covers over battery and other hazardous parts are in place and secure.
	Load rating plate is present and readable.
	Warning decals and operators' manual are present and readable.
	Seat belt or restraint is accessible and not damaged, oily, or dirty.
	Engine runs smooth and quiet without leaks or sparks from the exhaust.
	Horn works.
	Turn signal (if equipped) operates smoothly.
	Lights (head, tail, and warning) work and are aimed correctly.
	Gauges and instruments are working.
	Lift and lower operates smoothly without excess drift.
	Tilt operates smoothly without excessive drift or "chatter".
	Control levers are labeled, not loose or binding and freely return to neutral.
	Steering is smooth and responsive, free of excessive play.
	Brakes work and function smoothly without grabbing. No fluid leaks.
	Parking brake will hold the forklift on an incline.
	Backup alarm (if equipped) works.



## Operator's Daily Checklist: Electric Forklift

Check each item before the shift starts. Put a check in the box if the item is OK. Explain any unchecked items at the bottom and report them to a supervisor. Do not use an unsafe forklift! Your safety is at risk.

Forklift Serial Number: \_\_\_\_\_

Operator: \_\_\_\_\_

Hour Meter Reading: \_\_\_\_\_

Date: \_\_\_\_\_

✓	Visual Check
	Tires are inflated and free of excessive wear or damage. Nuts are tight.
	Forks and mast are not bent, worn, or cracked.
	Load back rest extension is in place and not bent, cracked, or loose.
	Overhead guard is in place and not bent, cracked, or loose.
	Attachments (if equipped) operate OK and are not damaged.
	Forklift body is free of excessive lint, grease, or oil.
	Hydraulic oil is full and free of leaks.
	Battery connections are tight.
	Covers over battery and other hazardous parts are in place and secure.
	Load rating plate is present and readable.
	Warning decals and operators' manual are present and readable.
	Seat belt or restraint is accessible and not damaged, oily, or dirty.
	Motor runs smooth without sudden acceleration.
	Horn works.
	Turn signal (if equipped) operates smoothly.
	Lights (head, tail, and warning) work and are aimed correctly.
	Gauges and instruments are working.
	Lift and lower operates smoothly without excess drift.
	Tilt operates smoothly without excessive drift or "chatter".
	Control levers are labeled, not loose or binding and freely return to neutral.
	Battery charge level is OK while holding full forward tilt.
	Steering is smooth and responsive, free of excessive play.
	Brakes work and function smoothly without grabbing. No fluid leaks.
	Parking brake will hold the forklift on an incline.
	Backup alarm (if equipped) works.

## Multimeter Parts and Components

A technician's accuracy depends on the measurement tools they are employing. The measurements will be off if the machinery is broken or utilised improperly. The technician will come to the wrong conclusions if the measurements are off. You must handle, use, and store metres appropriately to prevent getting erroneous readings. A multimeter should always be turned off when not in use to preserve battery life.

Both digital and analogue metres must be used with these safety measures.

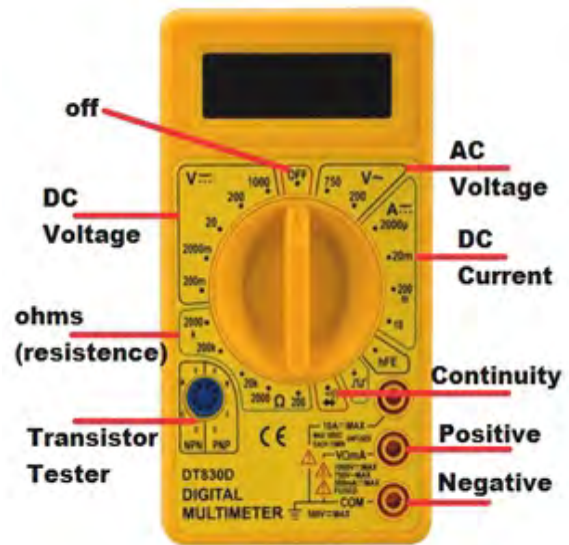


Fig. 3.3.7. Digital Multimeter

- Don't let any meters fall.
- Avoid overloading any meters. Use a high range that won't be overloaded if you're unsure. If necessary, you can always change to a lower range.
- Avoid tampering with fine equipment. Allow a skilled instrument technician to maintain precision equipment.
- Make sure the range switch is in the proper position before connecting a meter to a circuit.
- Before supplying electricity to meters, thoroughly inspect the circuit connections.
- Take care not to touch any other electronic parts of the apparatus.
- Take care to avoid touching the probe tips while they are linked to something else.
- When the probes are connected to the circuit, never change the settings (for instance, from voltage to current).

Here are some dos and don'ts for using a meter.

### Dos:

- Acquaint yourself with its characteristics. Before using, read the instruction manual.
- Verify that it is safe to use and that neither the metre nor the metre leads appear to be damaged.
- Ensure that the rotary switch is set to the appropriate position for the required measurement and that the test leads are in the appropriate sockets.
- When taking measurements, keep your fingers inside the test probes' finger protections.
- As soon as the battery indicator displays, change the battery to prevent misleading readings that could cause shock or other harm.

### DON'Ts:

- Never measure a circuit's resistance unless the circuit has been closed out and is certain to be dead.
- Never apply more voltage between any input jack and ground than the rated voltage.

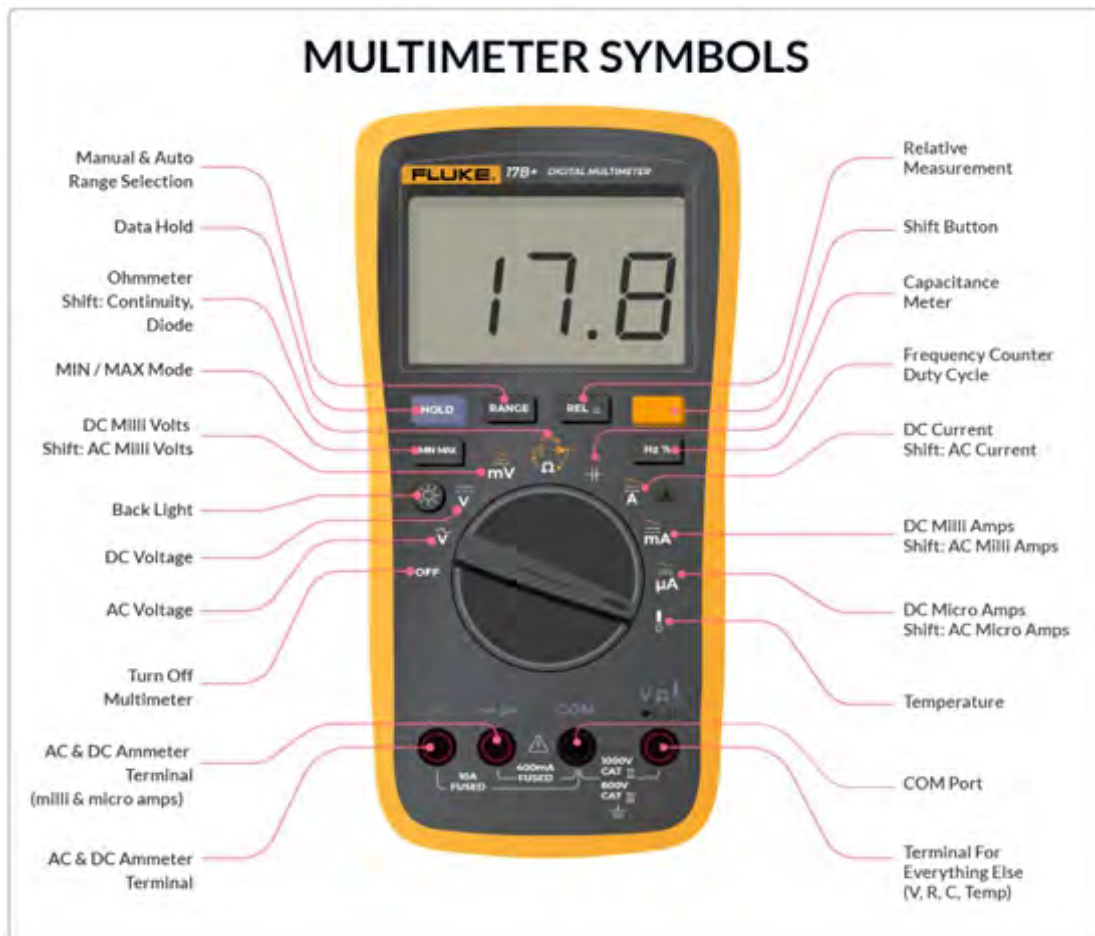


Fig. 3.3.7. Multimeter Symbols

### Measuring Voltage

- 1) The COM and V terminals should receive the test leads. Always place the black test lead in the terminal marked "COM" (for "Common"). Always attach the red test lead to the terminal with the letter "V" for "Voltage" since you are checking the voltage.
  - a. In this configuration, the test leads are used to detect both AC and DC voltage.
- 2) Turn the dial to the setting for AC or DC voltage. Set the dial to V or V with a wave sign while measuring AC voltage. Set the dial to V or V with a horizontal line next to it to measure DC voltage.
  - a. Things like wall outlets, microwaves, and other household electrical gadgets are measured using AC, or alternating current, voltage.
  - b. Direct current, or DC, voltage is frequently used to gauge battery capacity. In addition, many small gadgets and automobiles use DC voltage.
- 3) Extend the voltage range beyond what is expected. If you lower the voltage range too much, you won't get a precise reading. Choose a setting on the dial that is the closest to but just slightly above the anticipated voltage of the thing you are measuring by looking at the dial's numbers.
  - a. For instance, if your multimeter has settings for 2V and 20V and you're measuring a 12V battery, set the dial to 20V.
  - b. Simply set the multimeter to its greatest voltage rating if you don't want to memorise the voltage of what you're reading.



- 4) Use the probes to apply pressure to the load or power source from both sides. For instance, insert the tip of the black probe into the negative lead of a battery or the right side of a wall socket. Put the red probe, for instance, into the positive end of a battery or the positive side of a wall socket.
  - a. A probe can be placed on each end to see what the multimeter says if you're unsure which end is positive and which is negative. Your positive and negative are reversed if it's a negative number.
  - b. When placing the probes next to a wall socket, keep your fingers away from the probe tips to prevent electric shocks.
  - c. Prevent the probes from contacting one another to avoid creating a short circuit that could result in an electrical fire.
  - d. To avoid shock, hold the probes by their coloured handles at all times.
- 5) Examine the voltage reading on the multimeter's screen. You will see a reading on the multimeter that indicates the voltage of what you're testing once your probes are linked to the positive and negative leads. Find the reading on the digital display by looking at it, and if necessary, note it down.
  - a. The voltage you are measuring can be determined to be average or not by looking at your reading. For instance, if you test the wall socket and the multimeter displays a reading of 100V, this is lower than the average of 120V, allowing you to remember that the voltage in this wall socket is low.
  - b. The voltage of a brand-new 12V battery should be checked, and the value should be close to 12V. The battery is low or dead if it is lower or if there is no reading at all.

### Testing Current

- 1) Attach the test leads to the A or mA ports and COM, then switch the dial to Amps. Plug the black plug into the COM terminal. Put the red plug into the A or mA, marked amps or milliamps, depending on the amperage of the thing you're measuring current from. To locate it, put the multi meter dial to the Amps position.
  - a. Your multi meter probably includes two amp terminals: one for currents up to 10 amps (10A) and one for currents up to about 300 milliamps (300mA). Put your red plug in the amps terminal if you're unsure of the amperage range you're measuring.
  - b. If necessary, you can always change to milliamps for a more accurate reading.
  - c. Some multi meters come equipped with two As, one for alternating current (used for domestic power and denoted by the wave symbol) and one for direct current (used in batteries and wires and represented by a horizontal line with a dotted line under it). The one that is most frequently used for this reading is direct current.
- 2) To interrupt the circuit, unplug one of its wires. This enables you to complete the circuit and use your multimeter's ammeter to measure the current. Unplug or otherwise remove one wire from the terminals it is connected to on one side of the circuit, leaving the other wire attached to its terminals.
  - a. Choosing which side of the circuit to disconnect is irrelevant. The goal is simply to create a gap where your multimeter may be spliced into the circuit in order for it to function as an ammeter and inform you of the amount of current flowing through the circuit.
  - b. Connecting the multimeter to the current flowing straight through the wires is referred to as "splicing in the multimeter."
- 3) To read the current, touch the multimeter's leads to the open terminals. Attach a probe to each of the terminals the wire was previously detached from in order to splice it back into the circuit. Read the screen to determine how much current is passing across the circuit.
  - a. Which probe you touch to which side of the circuit doesn't matter. In either case, your multimeter will give you a reading.
  - b. By inserting your multimeter into various parts of electrical circuits, you can diagnose them. If you get a lower current reading in one part, there may be a faulty wire blocking electrical passage.

### Measuring Resistance

- 1) Insert the black test lead into COM and the red test lead into the terminal. Plug the black test lead into the COM terminal. The terminal identified by the letter "ohm" is where the plug of the red test lead is inserted.
  - a. The sign is probably connected to the V sign, indicating that the terminal used to monitor both voltage and ohms is the same.
- 2) Set the multimeter's dial to a resistance reading. Look for the symbol on the multimeter's dial. Set the dial so that it is close to the section's anticipated resistance. If you are unclear of the anticipated resistance, set it to the highest figure on the scale. You can adjust it as you measure until you get an exact reading.
  - a. The obstacle to current flow in an electrical circuit is known as resistance. Low resistance is exhibited by conductive materials like metal while high resistance is exhibited by non-conductive materials like wood.
  - b. For instance, place the dial just above 0 if you're gauging the resistance of a wire. The predicted resistance for various electrical components can be found online or in an owner's handbook.
  - c. Depending on the specific model of multimeter you have, the values on your device can range from 200 to 2 million ohms.
- 3) Set the probes in place on the resistor and then gauge the resistance. Put the tips of the probes on the resistor's ends. On the digital display of the multimeter, the reading, which represents the resistance in ohms, is shown.
  - a. If your multimeter just displays the number "1," you might need to flip the dial to raise the value of ohms being measured in order to get a more accurate result.
  - b. If necessary, jot down the reading while noting the appropriate unit.

### Testing Continuity

- 1) Remove the batteries from or turn off the device you want to test. While the device is still powered on, you cannot test for continuity. Make sure the device is unplugged from all power sources before moving on.
  - a. Your multi meter continuity feature can be used to check whether wires are still functional. Measure the continuity of a cord or wire if you're unsure of whether it still has a solid connection. This examines the relationship between two circuit points.
  - b. Continuity is the existence of an entire electrical flow route. A brand-new electrical wire, for instance, needs to be completely continuous. However, if it is frayed or broken, it doesn't have continuity because the electricity cannot flow through it.
  - c. This is a good way to see if cables are broken internally or not.
- 2) Attach the probe wires to the multi meter and turn the dial to continuity. The terminal marked with a V, or a continuity symbol that resembles a sound wave, should receive the red plug. Plug the black plug into the COM terminal. Turn the dial to choose the picture that resembles a sound wave.
  - a. A sound wave resembles a progression of progressively larger ("" symbols.
  - b. The continuity option only displays 1 sound wave, not a range of numbers in its area. To make sure the dial is positioned correctly, turn it until it is directly pointed towards the continuity sound wave.
- 3) Join the probes to the ends of the component you're testing. Place the black probe on one end of the component and the red probe on the opposite end. Make sure that both probes are simultaneously touching the ends for the multi meter to work properly.
  - a. A component can be tested for continuity without being detached from a circuit.
  - b. It is irrelevant which probe is attached to which end of the component.
  - c. Some examples of parts whose continuity can be checked include wires, switches, fuses, and conductors.
  - d. In order to check for continuity, you must touch two conductive ends. Consider placing the probes on two bare wire ends.

4) Watch for a beep to signify a strong connection. When the ends of the two probes come into contact, you should immediately hear a beep if the wire is working properly. If you don't hear a beep, there is a short in the wire.

- a. Your wire may be shorted if it has a cut or burned end.
- b. You can infer from the beep that there is essentially no resistance between the two sites.



Fig. 3.3.8. Testing Instrument

### Process of Report Deviations as per Escalation Matrix

When an employee is unable to address an incident on their own and must delegate the job to a more qualified or experienced employee, this is known as incident escalation.

How your company manages these handoffs is addressed by an escalation policy. It specifies who should be informed when an incident alert is received, to whom an incident should be escalated if the first responder is not available, and who should take over if and when the responder is unable to resolve the issue on their own. It also specifies how those handoffs should occur (through the service desk? directly between two technicians? via a tool for incident management?).

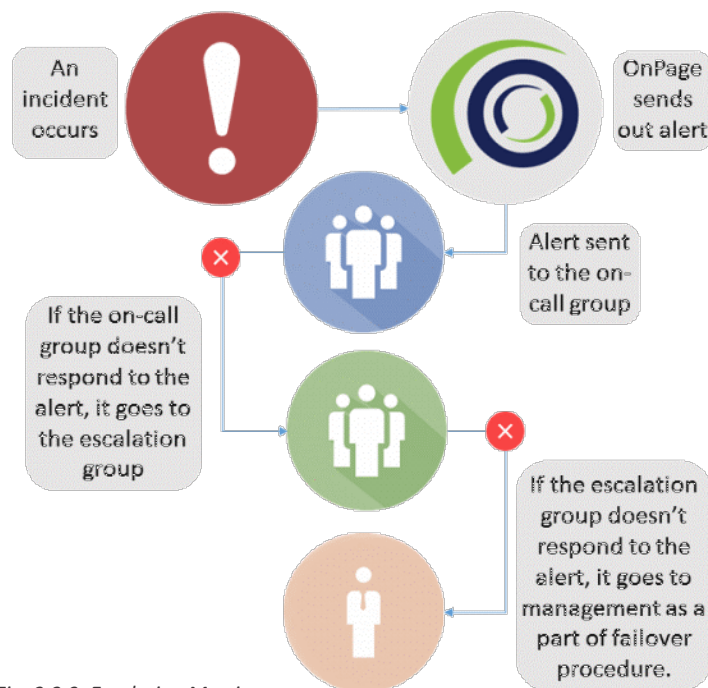


Fig. 3.3.9. Escalation Matrix

A matrix that specifies when escalation should occur and who should handle events at each escalation level is known as an escalation matrix.

A variety of industries use the phrase. Basic Steps are:

- **Step 1 – Identify and Document Issues**

- MHE Maintenance Technician, team members or any other stakeholders can raise issues at any time. This can be via verbal dialogue or email.
- Issues which cannot be immediately resolved within the project team must be entered onto an Issue/Decisions Log on the Teams site.
- All issues are assigned an owner who is responsible to resolve and update the issue on a regular basis.
- All issues are assigned a target resolution date.

- **Step 2 - Review of Issues**

- Address open issues during the scheduled project/organizational meeting or as necessary. Review and identify new issues for resolution since the last meeting.
- Review open issues that have passed their targeted resolution date. Monitor, review and address new or existing issues for possible escalation to the appropriate level.
- Update discussions made regarding each issue in the Issues/Decisions Log.
- The owner of the issue will document and report status of the issue within the project Teams site.
- Issues will be updated weekly or as activities occur to ensure all stakeholders are aware of the progress and status of the issue.

- **Step 3 - Communication of Issues**

- The MHE Maintenance Technician will report on issues until they are closed.
- The MHE Maintenance Technician will share the status of the issues with the team members on a regular basis, as well as the Project Steering Committee.

- **Step 4 - Escalate Issues**

- Determine whether or not the issue needs to be escalated according to the project's escalation path.
- Criteria for escalation include:
  - Issues that affect more than one project
  - Issues that, if left unresolved, may jeopardize a key milestone or deliverable
  - Issues of high priority that are not being resolved in a timely manner
- If escalation is considered necessary, update the Status (to Escalated) and the Resolution/Status Comments of the Issue within the Issues/Decisions Log
- Communicate to the originator and the person originally assigned to resolve the issue that it has been escalated.
- In the event an issue needs to be escalated, it will be escalated according to the following escalation path

- **Step 5 – Issue Resolution**

- Once the issue has been resolved, communicate the resolution to the originator, issue owner and appropriate escalated levels.
- Update the Issue/Decisions Log for the Issue, setting the Status (to closed), the Date Closed, Resolution Comments and note the variance between the Resolution Target Date and the actual Date Closed.



Fig. 3.3.10. Issue Resolution

## Tips



- A written standard to which the job or task should be performed should be included in a standard maintenance process, which should include a step-by-step description of how to perform a maintenance task.
- Keep forklift properly maintained:
  - o Change your oil regularly. Just like any vehicle, you should also change the oil in your forklift regularly.
  - o Check the tires.
  - o Check the fluid levels.
  - o Don't forget to lubricate.
  - o Check your brakes.
- Check your forklift structure for any dents, broken parts or cracks. Check that the floor of the warehouse is clear of objects that may get in the way. You should also check overhead to make sure there is no obstructions that could cause an accident.
- This regulation governs how OSHA must comply with forklifts in general. Operators must check trucks in order to comply with the standard: Daily (at the start of each use day) In a facility that uses continuous use, at the start of each shift.
- 3 Main Guards on a Forklift: In the manufacturer's instructions. Overhead Guard – Protects the operator from falling objects. Load Backrest – Protects the operator and stops the load from hitting the mast. Foot Guard – Protects the operators feet.

## Summary



The procedures that your experts must accomplish during a maintenance check are listed on a preventive maintenance checklist. Time-based (routine) and condition-based (non-routine) tasks will both be on a PM checklist, ensuring that key issues are both prevented and fixed.

EAM (Enterprise Asset Management), CMMS (Computerized Maintenance Management System), and AOM are the three primary types of preventive maintenance software (Asset Operations Management).

Conducting the preoperational inspection is the first step toward safe forklift operation. To make sure the forklift will function properly, forklift operators should do the inspection at the beginning of each work shift. Improper maintenance is to blame for one in every fifteen forklift-related incidents, according to OSHA.

4 Phases of Planned Maintenance:

- Corrective maintenance.
- Preventive maintenance.
- Risk-based maintenance.
- Predictive maintenance.

## Notes




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## Exercise

- 1) What do you understand by Preventive Maintenance?
- 2) Write 3 Key differences between Preventive and Breakdown Maintenance.
- 3) Mention 10 Names of Equipments and Machines used by a Warehouse.
- 4) What do you understand by SOP? Explain in terms of testing process of MHE.
- 5) What are the steps involved in breakdown maintenance.

Scan the QR code to watch the related videos



<https://youtu.be/BBWPIByOefl>  
MHE in Warehouse



<https://youtu.be/2-hNYfX8rcU>  
Digital Multimeter Parts And Functions





## 4. Post Maintenance Activities

Unit 4.1 - Inspection Process of the Work Area

Unit 4.2 - Importance of Housekeeping

Unit 4.3 - Documentation requirements in Post Maintenance



## Key Learning Outcomes

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

1. Summarize the various activities to be performed after maintenance activities
2. Identify the inspection process of the work area
3. Interpret the importance of housekeeping
4. Recognize the documentation requirements in post maintenance activities
5. Interpret how to prepare daily reports regarding damage, condition of equipment etc.

## Unit 4.1 - Inspection Process of the Work Area

### Unit Objectives

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

1. Perform the various activities after maintenance
2. Perform disposal of components as per company policy
3. Inspect the work area for proper maintenance

### 4.1.1 Activities under Maintenance

**Make sure of the following when conducting your forklift's daily inspection. Things to check when the engine is off will be our first focus.**

- Are the tyres properly inflated and free of damage or excessive wear?
- How tight are the lug nuts?
- Are the wheels and other moving parts visible?
- Are the mast and forks not severely rusted, worn, fractured, or bent?
- Are the mast lift rollers and chains in good working order?
- Are there any damages to the hydraulic lines? Are there adequate hydration levels?
- Is the user's guide on board?
- Are there any visible cables or hoses that have damage?
- Is the data plate clear and current?
- Does the seat belt on the forklift actually work?

**Once the aforementioned tasks have been finished, start the engine and do the following operational checks:**

- How well-functioning are the lights, horn, and other safety features?
- How well-maintained are the lift cylinders? Are there no scars on them?
- Shift the forklift along a truck's length. Does it run without a hitch?
- Do the turn signals, brakes, accelerator, and parking brake all function properly?
- Is the steering responsive and smooth?
- Are the forks able to be fully raised and lowered?
- Do the wires and hoses wrap the guiding rails in a smooth manner?
- Examine attachments. Are they secure, functional, and undamaged?
- Is there no chatter when using the tilt control?
- Are the gauges and instruments functional?

Not only does cleaning your forklift improve its appearance, it also improves the efficiency of your warehouse. You can ultimately save time, energy, and money by using a clean forklift.

**Environment Protection:** Before disconnecting or removing any lines, fittings, or associated components, service this lift truck in a designated service area and use an appropriate container to collect coolant, oil, fuel, grease, electrolyte, and any other potential environmental pollutants. After servicing, dispose of those materials in a container and location that are authorised. Use an authorised area for cleaning the lift truck.



Fig. 4.1.1. Environment Protection

Here are some tips for ensuring a safe work area during forklift maintenance and inspections:

- Ensure the area is well lit.
- Remove any nearby obstructions or debris.
- Provide enough space to perform work safely.
- Clean up spilled fluids immediately when topping off.
- Put away any tools or products after use.
- Properly dispose of fluid containers or other trash.

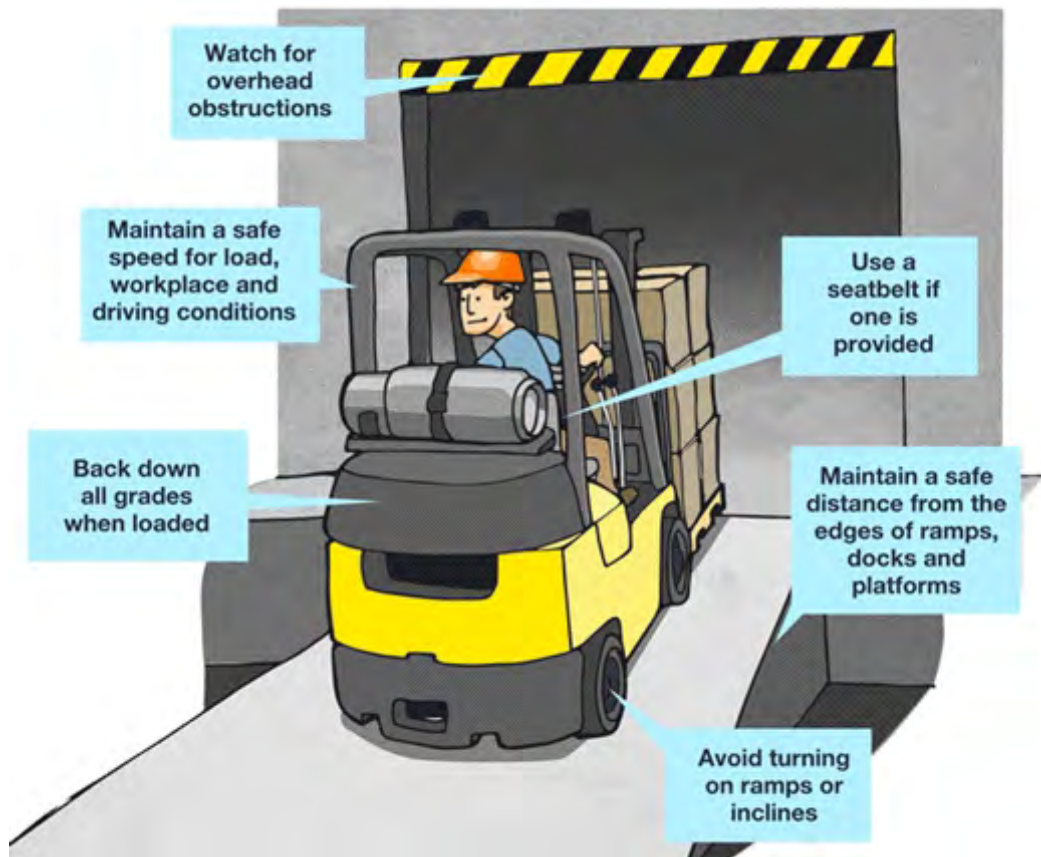


Fig. 4.1.2. Forklift Maintenance





## Unit 4.2 - Importance of Housekeeping

### Unit Objectives

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

1. Interpret the importance of housekeeping

### 4.2.1 Importance of Housekeeping and Cleanliness at Workplace

Industrial safety is directly related to workplace hygiene and cleanliness. The effectiveness with which these activities are administered reflects the organization's safety culture.

In addition to making the workplace safer, good housekeeping and cleanliness can greatly enhance the organization's reputation.

These activities also:

- (i) improve efficiency and productivity,
- (ii) aids in maintaining effective control over the operations,
- (iii) aids in sustaining the product's quality



Fig. 4.2.1. Housekeeping and Cleanliness at Workplace



Fig. 4.2.2. Housekeeping and Cleanliness

There are a number of indicators that indicate inadequate housekeeping and cleanliness at the organization's workplace. Among these indications are:

- i. cluttered and poorly arranged work areas,
- ii. improper or hazardous material storage (such as materials stuffed in corners and overcrowded shelves etc.),
- iii. dusty and dirty floors and work surfaces,
- iv. items lying on the shop floor which are in excess or no longer needed,
- v. blocked or cluttered aisles and exits,
- vi. tools and equipment not being put back in their respective storage locations after use,
- vii. material damage and broken containers,
- viii. full trash cans and containers, and
- ix. spills and leaks etc.

For a workplace to be safe, sanitation and housekeeping are essential. It can reduce accidents, boost morale and productivity, and leave a positive impression on anyone who enters the workplace. A clean, orderly, and safe workplace not only promotes employee health and safety but also has an impact on employee morale and the overall performance of the business. Each employee needs to appreciate the importance of proper workplace housekeeping and cleanliness to the overall operation.



*Fig. 4.2.3. Housekeeping*

Employees are more likely to like their work when their workspace is neat, organised, and appealing. It promotes orderly working practises among employees. It lessens their tiredness. It encourages positive interactions between staff and management. It boosts morale, which is evident in the calibre of output and general effectiveness.

These efforts enhance the organization's reputation since visitors to the organisation have a positive perception of good housekeeping and cleanliness. Customers and other stakeholders of the company are more confident in the company since they observe that work is being done effectively in a tidy, inviting, and organised environment.

Both management and employees are accountable for maintaining order and cleanliness. Periodic and last-minute cleanups are expensive, inefficient, and do not provide a better working atmosphere where staff can function well.

Good housekeeping and cleanliness normally results into:

- better floor space utilization,
- more systematic workflow with significant reduction in non-value added activities,
- better inventory control of tools and materials,

- less handling to ease the flow of materials,
- reduction in material wastages,
- more effective equipment clean-up and maintenance leading to fewer equipment breakdowns,
- minimization of errors leading to lower costs,
- enhanced overall look and feel of the work environment;
- safer working conditions and fewer exposures of employees to dangerous substances (such as dusts, vapours, etc.);
- more hygienic workplace conditions that promote employee health;
- improved morale of employees.

On the other hand, poor housekeeping and cleanliness cause workplace dangers that result in a variety of accidents, including:

- slips, trips and falls,
- caught in-between objects,
- struck by falling objects,
- struck by moving objects,
- cut/stabbed by objects, and
- struck against objects.

Additionally, sloppy housekeeping and cleanliness raise the risk of fire by creating fire hazards.

**A crucial component of proper housekeeping and cleanliness practises is employee training.** Employees must commit to memory the safest working practises for the items they utilise.

They must also learn how to safeguard other workers by posting notices (such as "wet - slippery floor" etc.) and informing management of any unexpected circumstances.

The key components that are typically incorporated into workplace housekeeping and cleanliness procedures are described below.



*Fig. 4.2.4. Housekeeping at office area*

- **Dust and dirt removal** – Working in an unclean, dusty environment is bad for both the workers' respiratory systems as well as for the workplace as a whole. Additionally, if dust and debris are permitted to build up on surfaces, a slip hazard could result. Therefore, routinely sweeping the workplace to remove dust and grime is a crucial technique for maintaining cleanliness. Furthermore, it is forbidden to clean personnel' or equipment's surfaces with compressed air. Dust and dirt particles may become lodged in the eye or beneath the skin as a result of compressed air.

- **Employee facilities** – In order for employees to use them when necessary, adequate employee amenities, such as drinking water, washrooms, toilet blocks, and rest rooms, must be provided at the workplace. An essential component of these amenities is cleanliness at their location.
- **Flooring** – Regular floor cleaning is required, as well as immediate cleanup after spills of any kind. Accidents at work are frequently caused by unsanitary floors. Mats or some other sort of anti-slip flooring should be installed in areas like entranceways that cannot be regularly maintained. Additionally, it's critical to replace flooring that has been torn, worn, or damaged and creates a trip risk.
- **Lighting** – Accident risk is reduced by adequate lighting. To maintain the levels of light intensity at the workplace, it is important to make sure that broken light fixtures are fixed and dirty light fixtures are cleaned frequently.
- **Aisles and stairways** – It is forbidden to store anything in the aisles or stairways. Mirrors and warning signs can increase visibility around blind corners and aid in accident prevention. Maintaining appropriate illumination in stairways is also crucial. Additional staircases must have railings, ideally round rails for a secure grasp.
- **Spill control** – The best way to manage spills is to avoid them in the first place. It is crucial to do routine cleaning and maintenance on machinery and equipment. Additionally, using drip pans in potential spill areas is a smart preventative step. When accidents do happen, it's crucial to wipe them up right away. It is necessary to use the right cleaning solutions or absorbent materials when cleaning up a spill. The proper disposal of the waste materials must also be guaranteed.
- **Waste disposal** – The regular collection of the waste materials helps maintain a clean and orderly environment. Additionally, it enables the separation of materials headed for trash disposal facilities from those that can be recycled. Allowing debris to accumulate on the floor costs time and energy since it takes longer to clear it up. Containers for waste should be placed close to the source of the waste to encourage orderly disposal and facilitate collection. All recyclable wastes must be moved to their appropriate locations following collection in order for them to be sent to their final destination or sold.
- **Tools and equipment** – Prior to usage, all tools and equipment must be inspected. Tools that are harmed or worn out must be removed from service right away. After use, tools must be cleaned and put back in their storage location.
- **Maintenance** – The upkeep of the machinery and the structures that house it is one of the most crucial components of proper housekeeping and cleanliness standards. This include maintaining machinery, equipment, and structures in a safe and functional state. There are cracked windows, faulty plumbing, cracked floor surfaces, and unclean walls, among other things, when a workplace appears to have been neglected. Accidents and changes to work procedures may result from these circumstances. A replacement programme is essential for replacing or mending damaged and broken objects as soon as possible.
- **Storage** – In order to maintain cleanliness and excellent housekeeping, things must be stored properly. All storage spaces must be prominently labelled. Hazardous materials such as those that are flammable, combustible, poisonous, and others must be stored in authorised containers in locations that are suitable for the various risks they provide. Aisles, staircases, exits, fire apparatus, eyewash stations, emergency showers, or first aid stations should not be blocked by the stored items. Additionally, it's critical that all containers have accurate labels. Strain injuries, chemical exposures, and fires all substantially decrease when items are maintained properly.
- **Clutter control** – Poor housekeeping habits are often to blame for cluttered work spaces. This kind of workplace can result in a number of problems, including ergonomics and injuries. It's critical to establish procedures for returning equipment, chemicals, cords, and containers to their proper storage locations after each usage. In a working environment, clutter poses a major hazard to safety in addition to being unsightly. If the standard doors and exit routes are obstructed, the risk to the staff members increases. As a result, all waste materials must be properly disposed of in the proper garbage containers in order to avoid trips and falls. For obvious reasons, impediments should not be placed in aisles.





## Unit 4.3 - Documentation requirements in Post Maintenance

### Unit Objectives

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

1. Interpret about documentation requirements in post maintenance activities
2. Memorize how to prepare daily reports regarding damage, condition of equipment etc.

### 4.3.1 Importance of Documentation

Any record holding data that you might require to execute maintenance chores and inspections is referred to as **maintenance documentation**. It explains what you have, demonstrates how to take care of it, and contains a history of all your previous efforts.

Processing warranty claims can be lot simpler if you keep track of every repair or maintenance procedure carried out on your equipment. As this information will help decide your rights for the warranty claims, keep a record of the sort of maintenance work performed on your equipment as well as the precise time and date repairs were made.

To record a repair or maintenance expense, make a journal entry debiting the repairs and maintenance expense account by the expense's sum. An expense account is credited with a debit. Depending on how you plan to cover the charge, credit either the cash or accounts payable account by the corresponding amount.

Technicians utilise logbooks and maintenance checklists as instruments to record equipment maintenance inspections. To ensure that enterprises can run without interruption, equipment maintenance entails a constant process of checking, repairing, and maintaining operating equipment.



Fig. 4.3.1. Record Checking

Page 1: Forklift Accident/Incident Form

## Forklift Accident/Incident Form

Location of forklift		
Address: _____	City: _____	State: Zip: _____
Facility Location Where Accident Occurred: _____		
Contact person: _____		
Phone Number: (_____) _____		

Operator Involved		
Name: _____	Title: _____	
Address: _____	City: _____	State: Zip: Phone
Number: (_____) _____	DOB: ____/____/____	
Was operator trained to operate forklift? <b>Yes / No</b>		
Supervisor's Name: _____		
Time accident occurred: _____ am / pm   Shift: Day / Night / Swing		
Individuals involved: (See page 3)		

<u>Company Name:</u>	<u>Date:</u>	<u>Name of Person Preparing Form:</u>
<u>Make of Forklift:</u>	<u>Model #:</u>	<u>Serial #:</u>
<u>Year of Manufacture:</u>	<u>Hour Meter Reading:</u>	<u>Capacity Rating:</u>
<u>Fork Length:</u>	<u>Fork Condition:</u> <b>Good / Fair / Poor</b>	<u>Tires:</u> Pneumatic / Solid / Cushion
<u>Tire Condition:</u> <b>Good / Fair / Poor</b>	<u>Tire Tread Remaining:</u> Drive %: _____ Steer %: _____	<u>Operator's Manual:</u> <b>Yes / No</b>
<u>Nameplate/Data Tag:</u> <b>Yes / No</b>	<u>Safety Warnings:</u> <b>Yes / No</b>	<u>Seatbelt:</u> <b>Yes / No</b>

Page 2: Forklift Accident/Incident Form

<u>Location within facility:</u>	<u>Treated in ER:</u> Yes / No	<u>Weather:</u>
<u>Road Surface Condition:</u>	<u>Photos:</u> Yes / No	<u>Time Employee Began Shift:</u> _____ am / pm

Name of injured person(s)/people involved: (see page 3)

Nature of injury: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Person to whom accident was reported: \_\_\_\_\_

Witnesses: (see page 4)

Extent of Damage: Forklift / Property / Other

Incident Outcome: Injury / Vehicle Incident / Environmental Incident / Extent of Damage

Equipment involved:

Description of accident / incident:

Remarks / Comments:



Page 1: Pallet Truck Log Form

Electric Pallet Truck Log Form "A"				
Log On	Date:			
	Time Start:			
	Hour Meter Start:			
	Inspection Required:			
Log Off	Time End:			
	Hour Meter End:			
<b>Visual Check</b>				
Battery	Battery connector:			
	Vent caps:			
	Cables & connectors:			
	Battery charge level:			
	Battery lock (if applicable):			
Forklift	Control handle:			
	Safety reverse switch:			
	Tires/wheels:			
	Stabilizers:			
	Forks:			
	Capacity data plate:			
	Other:			
<b>Operational Check</b>				
Operator Controls	Steering:			
	Forward & reverse controls:			
	Service brake:			
	Safety reverse switch:			
	Lifting & lowering controls:			
	Horn & warning devices:			
	Gauges:			
	No oil leaks:			
	Optional - Attachments:			
	Other:			
Pass / Fail	Pass:			
	(See Form "B") Fail :			
	Operator's initials:			



### Quarantine Area in a Warehouse:

You can store rejected products, prototypes, objects that have been stored for future review, etc. in the quarantine area.

A location connected to the shop floor or the goods-in area where stock is to be held while being investigated for quality (typically).

Quarantine is a "state of enforced isolation" that is used to separate and limit the movement of people. This portion of the warehouse is restricted to approved individuals only. The supervisor must ensure that the products are correctly separated in this space. Any object that has been mistakenly labelled as quarantined must be set aside for additional inspection. Therefore, the binners (individuals who would move objects in this area) should put them in the proper location.



Fig. 4.3.2. Quarantine Holding Area Label

### Check whether quarantine has been done properly:

- Quarantine is a "state of enforced isolation" that is used to isolate and limit the movement of people.
- Only authorized persons are allowed to enter this area in the warehouse.
- Supervisor needs to make sure the goods are properly segregated in this area.
- If any item is wrongly marked as quarantined item, it needs to be kept aside for further check.
- Finally he needs to ensure disposal of quarantined items as per the company policy through housekeeping staff.

A quarantine is a "state of enforced isolation" that is used to isolate people and restrict their movement. When discussing people who may have been exposed to a communicable disease, for example, this is frequently used in reference to illness and disease.

### A place of quarantine used to store products that have been returned or are being discarded.

Follow these steps:

- Segregation of items in the quarantine area
- Keep only quarantined items in the quarantine area
- Use binners move the wrongly quarantined items and store them
- Inventory tracking sheet updation
- Disposal of quarantined items through housekeeping staff



### Quarantine Stock:

Items in the inventory that are designated for special or urgent usage and are not offered for sale or used for other purposes.

### If you found any item, which is wrongly quarantined then

Release the incorrectly quarantined inventory/SKU using the software's removal option or manually in the register.

### Quarantine tag / Quarantine sticker:

A warehousing inbound order line beginning with a manufacturing order corresponds with a quarantine ID, as does a warehousing inbound or outgoing inspection. Additionally, one or more reports of non-conformance material can match a quarantine ID (NCRM). The originating order and, if relevant, the inspection are also included in the NCRM.

When managing quarantine inventory, you must choose the Process option for a quarantine ID or for the specified disposition line(s), and you must give a disposition, a cause code, and other data as necessary.

QUARANTINE TAG		
Quarantine I.D. :	_____	Date: _____
Manufacturing Process	_____	Sequence No.: _____
Running Product:	_____	Specification: _____
Description of Problem:		
_____		
_____		
_____		
Employee ID	_____	Department: _____ Sign. _____

Fig. 4.3.3. Quarantine Tag

Disposition	Disposition order/result	Description
Use As Is	Receipt procedure	LN creates a receipt into the warehouse. The receipt is automatically confirmed and put away. If locations apply, inbound advice is created after the receipt is confirmed. This applies if the quarantine inventory originates from purchase orders or purchase schedules and the payable-to-supplier setting is not activated.
-	Inbound advice	LN creates inbound advice to a pick or bulk location without a receipt procedure. If no locations apply, the items are unblocked in inventory. This applies to items originating from purchase orders or purchase schedules for which the payable to supplier method is activated and to items from all other order origins, regardless of the payable-to-supplier setting.
No Fault Found	The same as Use As Is	The same as Use As Is
Scrap	Adjustment order	Removes the items from the inventory.
Return to Vendor	Purchase return order	Returns the items to the supplier.
Rework (to Existing Specification)	Production order	Issues the items to the work center that rejected the items.
Rework (to New Specification)	Production order	The item's new ID code is specified by the user. The order sends the items back to the facility that turned down the first shipment.
Reclassify	Item transfer order	The item's new ID code is specified by the user. The new target item is kept in the same warehouse as the original order. You can specify a pick or bulk location if locations are relevant.



## Notes



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## Exercise



- 1) Write various activities comes after Maintenance/Service activity?
- 2) What is the importance of Documentation in regards of Maintenance?
- 3) What do you understand by daily reports and damage reports?
- 4) Explain the advantages of Housekeeping & Cleanliness in Warehouse.
- 5) What is the importance of Inspection in Work Area?







## 5. Compliance to Health, Safety and Security Measures

Unit 5.1 - Safety Instructions to be followed in Workplace

Unit 5.2 - Importance of PPE

Unit 5.3 - Inspection Procedure for Activity Area



## Key Learning Outcomes

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

1. Analyze health, safety and security procedures while carrying out maintenance activities
2. Interpret the importance of safety equipment including protective gear, helmets etc.
3. Apply the inspection procedure for activity area and equipment

## Unit 5.1 - Safety Instructions to be followed in Workplace

### Unit Objectives

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

1. Demonstrate health and safety procedures while carrying out maintenance activities
2. Identify the reasons for occurrence of accident
3. Follow organization procedures with respect to documentation

### 5.1.1 Health and Safety Procedures

Working in warehouses can be dangerous. Warehouse dangers can cause workers to suffer severe injuries or even pass away.

Manufacturers, importers, exporters, retailers, wholesalers, transportation firms, and other businesses store goods, raw materials, and other commodities in commercial buildings known as warehouses.



Scan the QR code to watch the related videos



<https://youtu.be/-8Nxd9ILKoQ>  
5 Common Warehouse Safety Hazards

Fig. 5.1.1. Site Safety Labels

In a warehouse, tasks often involve manually loading and unloading a variety of supplies and products from trucks onto pallets (racks) and using forklifts.

The majority of accidents and fatalities can be avoided.

Workers must be safeguarded from any dangers in a warehouse by their employers.



Fig. 5.1.2. Safety Measures

Among the dangers to which employees may be subjected are as follows:

#### **Storage and racking systems**

Pallet racks support heavy loads that could collapse and seriously hurt or kill a worker. They are typically made of steel.

Racking hazards include:

- partial or total failure/collapse of racking systems
- lift trucks colliding with racks, causing material to be displaced or causing potential damage to the racking itself
- material falling through the back of racks
- high floor vibration at forge shops, causing loads to crawl and fall off racks if improperly secured

#### **Loading and unloading areas**

In both indoor and outdoor shipping and receiving sections of the workplace, including loading docks, workers may be exposed to a variety of high-risk hazards. According to an assessment of the past ten years' worth of incidents, these dangers continue to cause major injuries and fatalities among employees. These fatalities have included workers being:

- pinned between forklifts on loading docks
- wedged in between a vehicle or trailer and a loading pier.
- wedged between the trailer and the truck.
- being hit by or trampled on by a truck.
- being struck by objects that fell and weren't secured.
- struck by falling dock plate

External trucking companies hired to deliver and carry loads can pose risks to workers in shipping and receiving locations. If the truck drivers are unfamiliar with the workplace, they may be at risk. For example, there may be:

- many techniques and processes for securing automobiles against unintentional movement
- different levels of access to each workplace
- unique features involving the yard layout
- specialized dock levelling and dock locking systems
- lifting devices which drivers may not be trained to use

### Slips, trips and falls

In Ontario, falls, trips, and slips are some of the most common accidents that result in missed work. Slips, trips, and falls account for nearly 20% of all lost-time injury claims made to the Workplace Safety and Insurance Board of Ontario

Common hazards:

- slippery surfaces (e.g., oily or greasy)
- seasonal trip hazards (snow and ice)
- spills of wet or dry substances
- changes in walkway levels and slopes
- unsecured mats
- poor lighting
- debris and items stored in pedestrian walkways
- trailing cables in pedestrian walkways
- smoke, steam or dust obscuring view

### Manual handling

Workers who lift and move heavy or hefty stock items run the risk of back injuries and muscle strains.

### Musculoskeletal injuries (MSIs):

The most typical work-related injury is a sprain or strain, sometimes referred to as a musculoskeletal injury (MSI). These can result from overexertion or repetitive motion, such as working in an uncomfortable position or repeating the same actions (for example, scanning items at a checkout).

Your initial action can be to report to the first aid attendant or joint health and safety committee, depending on the policies of your organisation.

#### Safety Tips

- Avoid long periods of repetitive movement — rotate tasks, take micro-breaks, and change your position.
- Avoid awkward positions — use an adjustable chair or stool, adjust the work area height to a good working level for you, and arrange your tools and equipment to make things easy to reach.
- Wear low-heeled comfortable shoes.
- Avoid twisting your body — move your feet to change position.
- Ask your employer to consider replacing old or worn-out tools with tools designed to prevent MSIs.

### Some general duties of workplace parties:

Employers and other workplace parties are required to abide by the organization/warehouse policy and its rules in all workplaces subject to provincial legislation.

Workplace parties generally have the following responsibilities:

#### Employers

- Educate employees on how to safeguard their health and safety by providing them with information, training, and supervision. This information should include specifics about safe work practises for the environment and the type of work that needs to be done.



Fig. 5.1.3. Musculoskeletal injuries



- Take all necessary precautions for the protection of workers that are reasonable under the circumstances.
- Ensure that protective gear, supplies, and equipment are kept in good working order.
- Ensure that the tools, supplies, and safety measures required by the rules are available.
- Creating and maintaining a programme to carry out a documented occupational health and safety policy that is prepared and reviewed at least once a year.
- Display a copy of the OHSA at work.

### Supervisors

- Ensure that employees follow the OHSA's rules.
- Ensure that employees are using or wearing any equipment, protective gear, or clothes that the employer requires.
- Inform employees of any possible or actual health or safety risks that the supervisor is aware of.
- If required, give workers written instructions on the precautions and processes to be followed to ensure their safety.
- Take all necessary precautions for the protection of workers that are reasonable under the circumstances.

### Workers

- utilise or manage machinery safely.
- note any equipment flaws.
- perform work in accordance with the OHSA's rules.
- notify your employer or supervisor of any OHSA violations or known job dangers.



Fig. 5.1.4. Safety Caution

Workers should also be aware of their rights under the Occupational Health and Safety Act (OHSA), including the ability to refuse dangerous work and the right to memorise any potential workplace risks.

Measuring the safety conditions in the warehouse can be made easier by using safety checklists. Every checklist is a fantastic place to start when addressing current safety risks and identifying potential workplace dangers in the warehouse. These warehouse checklists can also assist employers in determining which areas of workplace safety require additional training for supervisors and employees.

<b>Building Safety</b> <ul style="list-style-type: none"> <li>• Location &amp; Layout</li> <li>• Accessibility</li> <li>• Neighboring hazards</li> <li>• Building stability</li> <li>• Natural Hazards</li> </ul>	<b>Storage &amp; Material handling practices</b> <ul style="list-style-type: none"> <li>• Review of Safe storage practices</li> <li>• Aisle space adequacy</li> <li>• Safety of Material handling equipments &amp; Material Handling practices</li> <li>• Work injury prevention</li> <li>• Cylinder storage and handling practices</li> </ul>	<b>Fire Prevention &amp; Protection</b> <ul style="list-style-type: none"> <li>• Identification of fire hazards</li> <li>• Review of fire prevention practices</li> <li>• Review of Fire Protection system – Active &amp; Passive</li> <li>• Adequacy of fire protection system</li> </ul>
<b>Emergency Preparedness</b> <ul style="list-style-type: none"> <li>• Review of Emergency Management Plan</li> <li>• Emergency Escape routes</li> <li>• Emergency lighting / Emergency Signage</li> <li>• First-aid facilities</li> <li>• Emergency Equipments</li> </ul>	<b>Electrical Installations</b> <ul style="list-style-type: none"> <li>• Identification of electrical hazards (shock, fire, overloading)</li> <li>• Review of electrical maintenance systems and practices</li> <li>• Review of earthing system</li> <li>• Review of Lightning protection system</li> <li>• Statutory compliance verification to Indian Electricity Rules</li> </ul>	<b>Security System</b> <ul style="list-style-type: none"> <li>• Review of existing security system</li> <li>• Intruder Alarm System</li> <li>• CCTV monitoring</li> <li>• Training and Selection of Security Guards</li> <li>• Equipments with Security guards</li> </ul>

Fig. 5.1.5. Workplace Safety

# A Safe Workplace IS NO Accident†

Fig. 5.1.6. Safe Workplace

## Chain of Survival

The phrase "chain of survival" describes a sequence of procedures that, when carried out correctly, lower the mortality rate related to cardiac arrest. The chain of survival is just as strong as its weakest link, just like any other chain.

Early access, early compression and resuscitation (CPR), early defibrillation, and early advanced cardiac life support are the four interdependent links in the chain of survival



Fig. 5.1.7. Chain of Survival

## Recognizing Medical Emergencies

When someone is experiencing a medical emergency, getting immediate medical attention can save their life. The warning signals of a medical emergency are discussed in this article along with preparation tips.

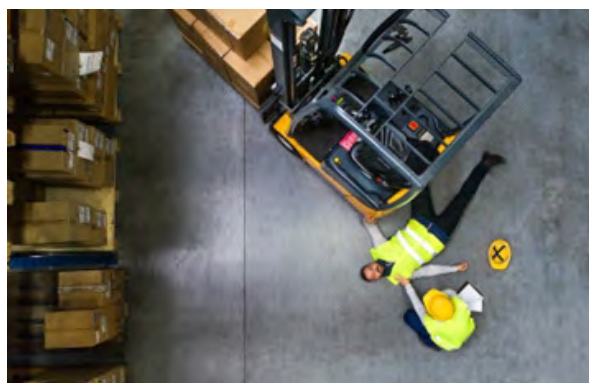


Fig. 5.1.7. Medical Emergencies

**Information**

The following indicate that a medical emergency is imminent:

- Bleeding that will not stop
- Breathing problems (difficulty breathing, shortness of breath)
- Change in mental status (such as unusual behavior, confusion, difficulty arousing)
- Chest pain
- Choking
- Coughing up or vomiting blood
- Fainting or loss of consciousness
- Feeling of committing suicide or murder
- Head or spine injury
- Severe or persistent vomiting
- Sudden injury due to a motor vehicle accident, burns or smoke inhalation, near drowning, deep or large wound, or other injuries
- Sudden, severe pain anywhere in the body
- Sudden dizziness, weakness, or change in vision
- Swallowing a poisonous substance
- Severe abdominal pain or pressure

**BE PREPARED:**

- Determine the location and quickest route to the nearest emergency department before an emergency happens.
- Post emergency contact information near your home phone. Add the numbers to your mobile device as well. You should teach your family members—including kids—when and how to dial these numbers. Included in this list are the phone numbers for the fire department, police department, poison control centre, ambulance centre, your doctor, as well as the numbers for local friends, relatives, and neighbours.
- Write down the hospital(s) where your doctor works, and if possible, go there in case of an emergency.
- If you have a chronic illness, wear an identification tag or check for one on someone who exhibits any of the listed symptoms.
- If you're an older adult who lives alone, invest in a personal emergency response system.

- **WHAT TO DO IF SOMEONE NEEDS HELP**

- Remain composed and dial the local emergency number (such as 102).
- If CPR (cardiopulmonary resuscitation) is required and you have learned the correct technique, begin rescue breathing.
- Until the ambulance arrives, place a person who is unconscious or semiconscious in the recovery position. However, if there has been or might have been a neck injury, DO NOT move the person.

When someone enters an emergency room, they are immediately evaluated. Conditions that endanger life or limb will be treated first. People with ailments that don't endanger their lives or limbs could have to wait.

**CALL YOUR LOCAL EMERGENCY NUMBER (SUCH AS 102) IF:**

- The patient's condition is critical (for example, the person is having a heart attack or severe allergic reaction).
- While being transported to the hospital, the patient's condition could become life-threatening.
- Moving the person could result in more damage (for example, in case of a neck injury or motor vehicle accident).
- There may be a delay in bringing the patient to the hospital due to traffic or distance; the patient requires the expertise or equipment of paramedics.

**Cardio-Pulmonary Resuscitation (CPR):**

When someone's breathing or heartbeat has stopped due to an emergency, such as a heart attack or a near-drowning, cardiopulmonary resuscitation (CPR) can save their life.

CPR in Adult



Fig. 5.1.8. CPR in Adult

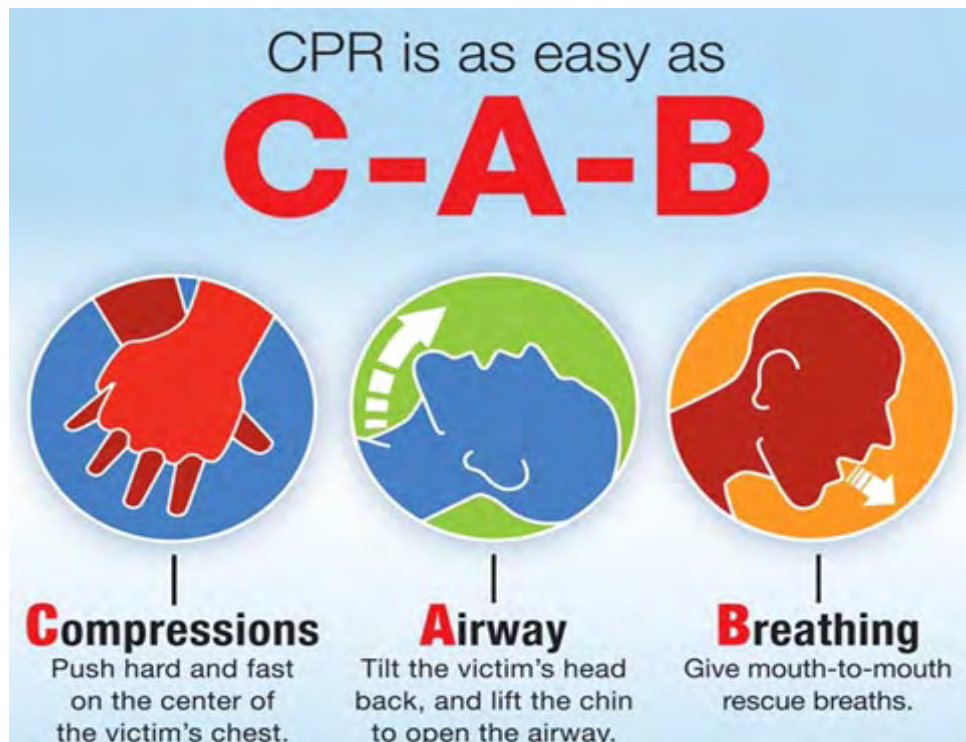


Fig. 5.1.9. CAB Label

**First Aid**

Anyone can experience an illness or an accident at any time, whether they are at home, at work, or at school. The actions made to assist an ill or injured individual within the first few minutes after the incident are referred to as first aid. This first aid can frequently make someone feel better, recover faster, and even save lives. First aid can be beneficial in a variety of situations, including sprains, electric shocks, and heart attacks.

**Why learn first aid?**

- If you get familiar with the fundamentals of first aid, you might one day help a friend, coworker, or total stranger.
- First aid may involve a straightforward action, such as positioning a person so that they can breathe easily. If they have stopped breathing, it might require a more complex procedure, such as cardiopulmonary resuscitation (CPR).



**First Aid Kit:**

Think about getting a first aid kit from the store or making your own. It's crucial to keep one on hand around the house, in your car, and at work.

Common items found in a first aid kit are:

- Bandages, roller bandages and tape
- (Sterile) Gauze
- Antiseptic wipes and swabs
- Absorbent compresses
- Antibiotic cream
- Burn ointment
- Mask for breathing (rescue breathing/CPR)
- Chemical cold pack
- Eye shield and eye wash
- First aid reference guide that includes local phone numbers.



Fig. 5.1.10. First Aid & Evacuation

**Evacuation**

The only reasons for leaving a building due to earthquake are as follows:

- The building is on fire.
- There is structural damage to the building (for example, newly cracked or buckling walls).
- There is a gas leak.



Fig. 5.1.11. Evacuation Label

**Fire and Types of Extinguishers**

The Fire Triangle, Combustion Triangle, and "Fire Diamond" are straightforward models for interpreting the components of the majority of fires. Heat, fuel, and an oxidising agent—the three components a fire needs to start—are represented by the triangle.

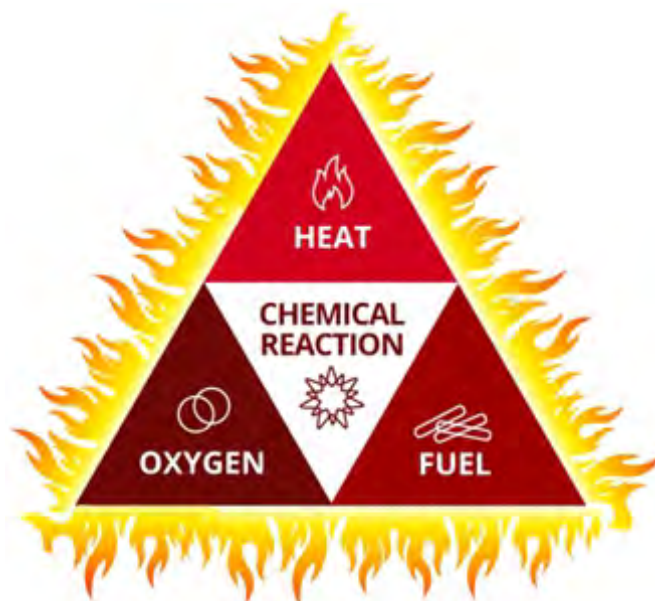


Fig. 5.1.12. Chemical Reaction



You must be familiar with the three MOST typical classifications of fires, which are based on fuel type, in order to effectively put out a fire.

- Ordinary combustibles, such as wood, fabric, paper, rubber, and many polymers, are classified as Class A.
- Class B - Liquids that burn at room temperature and require heat to ignite, such as oil, kerosene, and gasoline
- Electrical fires, Class C

Pressurized dry chemical (ABC or BC) and carbon dioxide extinguishers are the MOST prevalent types of extinguishers utilised in healthcare settings (CO<sub>2</sub>)

Due to the presence of class B and C ignition sources, water-filled fire extinguishers may NOT be suitable for use in some parts of a healthcare facility.



Fig. 5.1.13. Usage of Fire Extinguisher

In order to stop a fire from spreading, fire extinguishers use a substance to reduce the heat of the flames, smother the fuel, or cut off the oxygen supply.

If used by a competent person, a portable fire extinguisher can swiftly put out a minor fire.

The six primary types of fire extinguishers are wet chemical, water, foam, CO<sub>2</sub>, powder, and water mist. Each type of fire extinguisher is appropriate for a certain class of fire.

# KNOW YOUR FIRE EXTINGUISHER

## CHOOSING THE RIGHT EXTINGUISHER CAN PREVENT PROPERTY DAMAGE AND SAVE LIVES

Extinguisher Type →	Type of Fire ↓	 <b>Water</b>	 <b>Foam</b>	 <b>CO<sub>2</sub></b>	 <b>Dry Chemical</b>
<b>A</b> Paper, Wood & Plastic 	✓	✓	X	✓	
<b>B</b> Flammable & Combustible Liquids 	X	✓	✓	✓	
<b>C</b> Electrical Equipment 	X	X	✓	✓	

Fig. 5.1.14. Knowledge of Fire Extinguisher



## Unit 5.2 - Importance of PPE

### Unit Objectives

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

1. Interpret importance of safety equipment including protective gear, helmets etc.
2. Memorize the usage of safety equipment including protective gear, helmets etc. when checking inbound/outbound consignments

### 5.2.1 PPE Importance in Warehouse

Personal protective equipment is referred to as PPE. It includes any apparel or equipment that is intended to be worn by the employee to shield him or her from one or more threats that could endanger their health at work.

Operators of warehouses face dangerous situations on the job. Without PPE, individuals are considerably more vulnerable to dangers like falling heavy objects, corrosive liquid splashes on their skin, foreign objects in their eyes, and extended noise exposure. PPE is designed to safeguard the body's most vulnerable areas, mainly the head, hands, and eyes.



Fig. 5.2.1. Safety Equipments

#### Head protection

When an object is falling, helmets offer good protection. The many models and helmet styles (without a visor, with a long, medium, or short visor, etc.) are made to withstand punctures and flames while also absorbing impacts.

#### Hand protection

Given how easily fingers can be hurt, special attention needs to be paid to hand care. Moving pallets and boxes may seem straightforward, but they can actually cause deep cuts.

#### Eye protection

This is responsible for shielding the operator's eyes from any foreign object that might come into contact with the eyeball, namely chemical splashes, airborne dust particles, liquid aerosols, and UV radiation.

#### Foot protection

It is crucial to wear appropriate footwear. Not only does it shield users from falling objects, blows to the instep and heel, and treading on sharp or pointy things, but it also lessens weariness and fends off illnesses brought on by prolonged standing.

#### Hearing protection

Working in a noisy setting can cause hearing loss, but it can also have less obvious negative impacts on one's health. Operators must protect themselves with earmuffs, earplugs, or helmets with earmuffs that lower the noise level because warehouses are noisy places.

#### High-visibility clothing

Personal clothing is covered by or worn in place of protective clothing. In facilities where operators often come into contact with handling equipment or in warehouses with limited lighting, hi-vis clothing is a requirement.

Scan the QR code to watch the related videos



<https://youtu.be/loQ9Dbisy2ag>  
PPE in warehouse

### Protected operators = safe warehouse

Accidents are a considerable risk in any warehouse. For starters, drivers of particular types of vehicles run the risk of colliding with other handling machinery or things, getting hurt, or having goods drop on them. Workers who commute on foot run the risk of getting harmed, stumbling, and falling.

It's imperative to implement the necessary safety precautions in addition to employing PPE to prevent these potential accidents. This covers things like operator training, warehouse signs, picking the appropriate kind of racking, and putting a technical inspection of the storage systems in place.



Fig. 5.2.2. Safety Label

### Good Lifting Techniques

Use the recommended manual handling lifting technique, which will help to keep you safe and balanced, whenever you are lifting anything:

- Get into a good lifting posture, so bend your knees – not your back! Then you can use your stronger leg muscles to lift the load and bear the weight, avoiding potential injury to your back.
- You should always spread your feet in order to give yourself a good stable and supportive base from which to lift.
- Always lift your head first to keep you neck straight as it will automatically cause your back to straighten and it allows you to check nothing has changed around you and, of course, you can see where you are going.
- Lift your load smoothly and try to avoid sudden movements. This way if something is too heavy or you begin to feel excessive strain you can reverse the action and lower the load before it causes serious injury.
- When lifting, keep the load as close to your body as possible as the further away the load is held, the more stress you will feel on your lower back.





## Unit 5.3 - Inspection Procedure for Activity Area

### Unit Objectives

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

1. Interpret inspection procedure for activity area and equipment

### 5.3.1 Inspection Procedure for Activity Area and Equipment

#### Receiving Of Materials:

The stores department or the storekeeper is responsible for performing the duties of receiving and inspecting supplies in small and medium-sized manufacturing companies. Large manufacturing companies, however, typically set up a separate Receiving Department. The following duties are assigned to the receiving department:

- i. To receive, unload and unpack the materials.
- ii. To check whether the packages and their contents are intact or not.
- iii. To verify and check the quality, quantity and other specifications regarding materials in accordance with the purchase order.
- iv. To separate the lot of defective products by comparing the delivery note the supplier gave with a copy of the purchase order. Along with the acknowledgement for material receipt submitted to the supplier, any shortage or damage to the material is disclosed.
- v. Giving the inspector the items that the receiving clerk has received so that he can thoroughly inspect them.
- vi. To prepare the 'Goods Received Note' showing the particulars of the materials received.

#### Inspection Note:

Materials are unpacked and compared with the materials requested using the purchase order when they are received by the receiving department. The materials are sent to the inspector for a quality inspection if it is determined that they are in order. The inspector must create an Inspection Note attesting to the materials' quality if it is determined that they meet requirements.

#### Specimen/Format of Inspection Note

The specimen of the Inspection Note is given below:

**A.B. Co. Ltd.**  
**Inspection Note**

Serial No. .... Date .....

Identification No.	Description	Qty. Supplied	Rate (\$)	Amount	Remarks
<p>The above stores have been thoroughly inspected by us at our/supplier's works/godown and we are of the opinion that they are in accordance with our requirements and are fit for use. We recommend their purchase.</p> <p style="text-align: right;">1. .... 2. .... 3. ....</p> <p>Date. ....</p> <p style="text-align: right;">Inspection Officers</p>					

**Rejection Note:**

The inspecting staff rejects the materials for return to the supplier if they are not found to be in compliance with the purchase order or fit for use. A document called a Rejection Note is created for this purpose.

**Specimen/Format Rejection Note**

The specimen of the Rejection Note is given below:

**A.B. Co. Ltd.**  
**Rejection Note**

To be returned to:		Forwarding Note No. ....		Serial No.....
		Date. ....		Date. ....
		Mode of Transportation		P.O No. ....
				Date. ....
S. No.	Identification No.	Quantity	Reasons for Rejection	Returned/Kept in Suspense
Date. ....				1. .... 2. .... 3. ....
				Inspection Officers

**Material Receipt Book:**

It serves as the primary accounting book for stores and maintains a chronological list of the materials received by dates. The following details are provided in the material receipt book:

- a) Name and address of the supplier.
- b) Mode of Transport.
- c) Vehicle No.
- d) Carrier's Note No. and date and number of packages.
- e) Brief description of materials.
- f) Daily Receipt Voucher No. (D.R.V. No.) and date.
- g) Stock Ledger Folio.

**Specimen/Format Material Receipt Book**

The specimen of Material Receipt Book is given below:

**A.B. Co. Ltd.**  
**Material Receipt Book**

Date	Consignor's Name and Address	Mode of Transportation	Vehicle No. (if any)	Carrier's Note No. and Date	No. of Packages and their condition	Brief Description of Goods	D.R.V. No. and Date	Stock Ledger Folio	Receipt Clerk's Initials	Remarks
1	2	3	4	5	6	7	8	9	10	11

**Material Received Note (Or Goods Received Note):**

A loose card known as a Material Received Note is something that some manufacturing companies choose to maintain. The Material Receipt Book won't be used because this letter is serially numbered, is date-stamped, and is dated. The Daily Receipt Voucher is also replaced with the Material Received Note. The Material Receipt Record should still be kept even though the Material Received Note avoids using it because it is an important book for shop accounting and offers helpful information.

Five copies of the Material Received Note are typically created and distributed to the following departments: Purchasing, Accounting, Stores, and the department that requested the purchase. The Receiving Department retains the final copy for reference in the future.

**Specimen/Format Material Received Note**

The specimen of a Material Received Note is given below:

**A.B. Co. Ltd.**  
**Goods Received Note**

G.R. Note No. ....	Material Inspection
Purchase Order No. ....	Note No. ....
Date of Order. ....	Delivery Note No. ....
Received from. ....	Date .....

S. No.	Description	Symbol	Quantity	Code No.	Remarks

Sd. Received by	Sd. Checked by	Sd. Storekeeper	Sd. Store Ledger Clerk
--------------------	-------------------	--------------------	---------------------------

**Damage/Shortage/Excess Report:**

The receiving division of the stores department created this report after opening the packages and comparing the actual materials received with the materials that were ordered with the aid of the purchase order. According to this document, payment to the material supplier must be adjusted. The following is the report's proforma:

**Damage/Shortage/Excess Report**

From:		In correspondence, please quote:
To Carrier: .....	To: Consignor .....	Serial No. .... Date .....
.....	.....	Purchase Order No .....
.....	.....	Date .....
Carrier's Note No. ....	Advice Note No. ....	
Date .....	Date .....	

Tick  in the appropriate box:

- The goods have not yet arrived.
- The goods have arrived late by ..... days.
- The goods have arrived but the quantities shown below were found damaged on receipt.
- The goods have arrived but the shortage shown below were found on receipt.
- The goods have arrived but quantities shown below were found in excess. They are being returned through ..... (mode or transportation).

S. No.	Identification No.	Description	Quantity Ordered	Discrepancy	Nature of Discrepancy	Remarks
1	2	3	4	5	6	7

Date ..... Storekeeper .....

Copy to: Purchase Department for information and necessary action

### Receiving Inspection Responsibilities

- The **Receiving Manager** and **Warehouse Personnel** are responsible for receiving, inspecting materials, and forwarding all paperwork to the Purchasing Manager.
- The **Purchasing Manager** is responsible for accepting or rejecting damaged goods.
- The **Accounting Manager** and **Accounts Payable** are responsible for payment of invoices only after satisfactory completion or delivery of goods or services has been made.
- The **Quality Control Manager** will review and authorize all rejections.

### Testing Equipment for Warehouses

#### Weighing Systems for Warehouses:

Data accuracy, dependability, and efficiency are crucial elements that influence performance and safety in warehousing and distribution operations. Additionally, the bulk of jobs in this industry can be automated with the help of contemporary weighing technology, which lowers operational costs and boosts return on investment.

Here are some examples of contemporary supply chain management applications using weighing technology:

1. **Conveyor/Belt Scales** – The use of lifting and lowering loads is minimised while using a conveyor scale, sometimes referred to as a belt scale. Conveyor scales are thus the ideal option for settings where weighing speed is crucial. Conveyor scales can also have additional capabilities for sorting and labelling, as well as being very accurate and simple to clean.
2. **Bench & Shipping Scales** – For precisely weighing smaller weights and products, bench scales and check weighing scales are the best option. These scales come in a range of sizes and capacities, but they are often made to fit into small spaces and make the most of available space. They are capable of check weighing or counting tasks. In order to "check" that the weight of the final package fits within the established weight perimeters, check weighing is typically performed at the conclusion of the production process.
3. **Floor Scales** – Pallet scales are another name for devices used to weigh heavy loads during arriving or outgoing transit, inventory sorting, and other tasks involving the weighing of bulky items. Floor scales come in a wide range of capacities and are extremely precise. Floor scales can include a wide range of mobility options, washable surfaces, and attachments that can be customised to your specific weighing needs. Floor scales can be installed in a hole that puts the scale flush with the surrounding surface, allowing loads to be rolled or pushed onto the scales without lifting. The alternative would be to set the floor scale on a level surface close to the point of weighing. Lifting the items to be weighed onto the floor scale, which is elevated a few inches off the level surface, is required.
4. **Forklift Scales** – Since they let forklift operators hoist and weigh loads on the vehicle, these small weighing scales are perfect for high-volume operations. Forklift truck scales automatically record information about origin, storage, and weight throughout the transport process as well, saving time because goods can be delivered and then immediately moved to storage.
5. **Vehicle Scales** – Axle scales, truck scales, and other types of vehicle weighing devices assist in ensuring that the weights of cargo and freight are accurately recorded as they are loaded into vehicles. As a result, there are less safety risks for warehouse workers and truck operators, as well as fewer chances of receiving fines for overloading and excessive vehicle wear and tear. Vehicle scales are a common company asset for weighing goods for shipping and receiving.

**Industrial Instruments for Measuring Electricity:** For us to accurately measure the physical amounts around us, accurate electrical measuring equipment is crucial. Accurate measurements are necessary to carry out duties and make choices in a variety of industries, including the automotive, agricultural, weather, and medical. It's crucial to utilise the correct electrical measurement tools if you want to conduct successful electric tests.



The selection of the leads, measuring tools, test probes, voltage detection tools, and lighting must be done with the proper precautions and attention. It's crucial to utilise appropriate industrial measuring instruments because choosing the wrong one could damage your electric facility, result in lost machinery and human life, and hurt your electric facility. It goes without saying that choosing an electrical measuring equipment that complies with global safety requirements is important if you want to undertake electrical tests. There are numerous producers of electrical test equipment.

We have listed below few of the instruments for measuring electricity.

**A) Vapor Pressure Thermometers:** One of the most versatile, economical and widely used industrial temperature measurement. Vapor pressure is a device used to measure temperature by measuring pressure exerted by a given volume of liquid or gas. These thermometers work on the principle of thermal expansion of fluid with the change in temperature to be measured. The change in temperature can be determined using these thermometers, which depend on pressure measurement.

- **Structures:**

- A bulb
- Bourdon tube
- Flexible capillary tube
- Pointer and scale arrangement
- Linkage and gearing mechanism

- **Uses :**

- Boilers, compressors
- Automobile dash board
- Muscle microcalorimetry
- Industrial equipments, piping

- **Benefits :**

- Distance Measurement
- More sensitive and responsive (usually deliver a high-speed response)
- Less expensive
- Fundamental simplicity
- Stable in operation and have a good accuracy
- Direct recording or reading

**B) Flow Sensors:** Mass flow sensors are frequently utilised in numerous technical systems to regulate the precise dosage of liquids or gases. The sensor size is adjusted to the pipe diameter used to carry the gas or fluid. Measurement of flow, whether it be a liquid or gas, is frequently a crucial parameter in many operations.

Remember that in the majority of operations, the appropriate fluid is present at the appropriate location. Few key applications necessitate the ability to perform correct flow in order to guarantee product quality. Fluid flow sensors are devices that measure the rate at which a fluid is moving, and they are a component of a flow metre that aids in flow rate measurement



Fig. 5.3.1. Vapor Pressure Thermometers



Fig. 5.3.2. Flow Sensors

Different flow sensor types are created to monitor pressure sensing and mass flow in various applications, including:

- **Applications :**
  - Chemicals
  - Food
  - Beverages
  - Gas meter
  - Process auto-control
  - HVAC
  - Medical

**C) Gas Expansion Thermometer:** At very low temperatures, gas expansion thermometers perform at their best. The liquid thermometers are the most widely used variety. These industrial metrology tools are easy to use, durable, affordable and capable of measuring a wide temperature range. The most common form of mercury is enclosed in a glass tube that produces nitrogen gas.

- **Applications :**
  - Dairy
  - Industrial
  - Marine
  - Heating Industries
  - Brewing and Food Industries
- **Advantages :**
  - Gases have regular expansion
  - Gas thermometers have wide range of temperature scales
  - Very sensitive because the expansion of gases is considerable
  - Have low thermal capacity
  - Readings are close to thermodynamic scale



Fig. 5.3.3. Gas Expansion Thermometer

#### D) Tachometer

A device that measures how quickly objects—like an engine or shaft—revolve or rotate. extensively utilised in a variety of products, including automobiles, boats, planes, and many more.

This electrical measuring device counts the number of engine revolutions per minute (RPMs).

- **Applications:**
  - In a wide variety of vehicles, including tractors, trucks, cars, trains, and other light rail vehicles.
  - Marine Fleet: used to gauge the rotational speed of shipboard marine diesel engines. The tachometer displays the ship's rotation's direction.
  - A lot of laser equipment and gadgets.
  - Medicine - We can determine the blood flow rate using a tool called a hemotachometer.

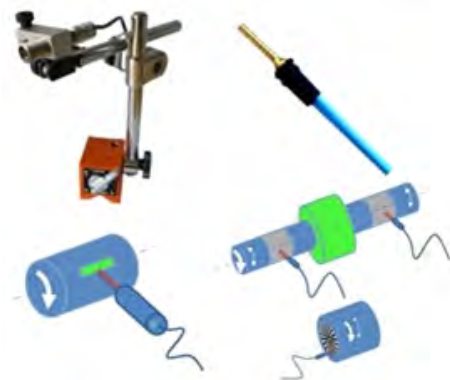


Fig. 5.3.4. Tachometer

**List of electrical and electronic measuring equipment:**

Below is the list of measuring instruments used in electrical and electronic work.

Name	Purpose
Ammeter (Ampermeter)	Calculate current
Capacitance meter	Calculate the capacitance of a component
Current clamp	Calculate current without physical connection
Curve tracer	Applies swept signals to a device and allows display of the response
Cos Phi Meter	Calculate the power factor
Distortionmeter	Calculate the distortion added to a circuit
Electricity meter	Calculate the amount of energy dissipated
ESR meter	Calculate the equivalent series resistance of capacitors
Frequency counter	Calculate the frequency of the current
Leakage tester	Calculate leakage across the plates of a capacitor
LCR meter	Calculate the inductance, capacitance and resistance of a component
Megger tester	Calculate Resistance Of An Winding Of Motor Or Generator And Calculate Earthing's Resistance
Microwave power meter	Calculate power at microwave frequencies
Multimeter	General purpose instrument Calculate voltage, current and resistance (and sometimes other quantities as well)
Network analyzer	Calculate network parameters
Ohmmeter	Calculate the resistance of a component
Oscilloscope	Displays waveform of a signal, allows measurement of frequency, timing, peak excursion, offset, ...
Psophometer	Calculate AF signal level and noise
Q meter	Calculate Qfactor of the RF circuits
Tachometer	Calculate speed of motors
Signal analyzer	Calculate both the amplitude and the modulation of a RF signal
Signal generator	Generates signals for testing purposes
Spectrum analyser	Displays frequency spectrum
Sweep generator	Creates constant-amplitude variable frequency sine waves to test frequency response
Transistor tester	Tests transistors
Tube tester	Tests vacuum tubes (triode, tetrode etc.)
Wattmeter	Calculate the power
Vectorscope	Displays the phase of the colors in color TV
Video signal generator	Generates video signal for testing purposes
Voltmeter	Measures the potential difference between two points in a circuit. (Includes: DVM and VTVM)
VU meter	Calculate the level of AF signals in Volume units
CRO(Cathode Ray Ocylocop)	Check transistor

**Get the testing equipment ready:**

- Use the inspection checklist to identify the testing tools that should be utilised for each product.
- Take all necessary portable testing equipment out of storage.
- Examine the testing apparatus visually to determine its suitability for usage.
- On the testing apparatus, change any parameters as necessary.
- Ensure that the equipment is calibrated correctly and in accordance with the suggestions.
- Run a test to make sure the testing apparatus is prepared to conduct the inspection.

## Measurement: Units & Conversions

These are some of the things that we measure in everyday living.

- Time
- Distance Or Length
- Speed
- Temperature
- Area
- Money
- Mass
- Volume
- Capacity

Quantity	Name of unit	Symbol	Value
<b>Length</b>	millimetre	mm	10mm = 1cm
	centimetre	cm	100cm = 1m
	metre	m	1000m = 1km
	kilometre	km	
<b>Mass</b>	milligram	mg	1000mg = 1g
	gram	g	1000g = 1kg
	kilogram	kg	1000kg = 1t
	tonne	t	
<b>Time</b>	second	s	60s = 1min
	minute	min	60min = 1h
	hour	h	24h = 1day
	day	day	
<b>Temperature</b>	degrees Celcius	°C	
<b>Area</b>	square millimetre	mm <sup>2</sup>	1cm <sup>2</sup> = 100 mm <sup>2</sup>
	square centimetre	cm <sup>2</sup>	1 m <sup>2</sup> = 10,000 cm <sup>2</sup>
	square metre	m <sup>2</sup>	1 ha = 10,000 m <sup>2</sup>
	hectare	ha	
<b>Volume</b>	cubic millimetres	mm <sup>3</sup>	1cm <sup>3</sup> = 1000 mm <sup>3</sup>
	cubic centimetres	cm <sup>3</sup>	1 m <sup>3</sup> = 1,000,000 cm <sup>3</sup>
	cubic metres	m <sup>3</sup>	
<b>Capacity (Volume Of Fluids)</b>	millilitre	mL	1000ml = 1 L
	litre	L	1000L = 1kL
	kilolitre	kL	
<b>Speed</b>	metres per second	ms <sup>-1</sup>	
	kilometres per hour	kmh <sup>-1</sup>	--

Below are the list of different units and their conversions.

Volume Unit Conversion	
1 milliliter	0.001 liter
1 centiliter	0.01 liter
1 deciliter	0.1 liter
1 decaliter	10 liters

1 hectoliter	100 liters
1 kiloliter	1000 liters
1 cubic inch	$1.639 \times 10^{-2}$ liters
1 gallon	3.785 liters
1 cubic foot	28.316 liters

Length Unit Conversion	
1 millimeter	0.001 meter
1 centimeter	0.01 meter
1 decimeter	0.1 meter
1 decameter	10 meters
1 hectometer	100 meters
1 kilometer	1000 meters
1 inch	$2.54 \times 10^{-2}$ meters
1 foot	0.3048 meters
1 angstrom	$1 \times 10^{-10}$ meters
1 fermi	$1 \times 10^{-15}$ meters
1 light year	$0.946 \times 10^{16}$ meters
1 mile	1.609344 kms

Mass Conversion	
1 milligram	0.001 gram
1 centigram	0.01 gram
1 decigram	0.1 gram
1 decagram	10 gram
1 hectogram	100 gram
1 kilogram	1000 grams
1 stone	6350.29 grams
1 pound	453.592 grams
1 ounce	28.3495 grams

Time Unit Conversion	
1 minute	60 seconds
1 hour	60 minutes / 3600 seconds
1 day	24 hours
1 week	7 days
1 year	365 days

Energy Unit Conversion	
1 BTU (British thermal unit)	1055 Joule
1 erg	$1 \times 10^{-7}$ Joule
1 foot-pound	1.356 Joule
1 calorie	4.186 Joule



1 kilowatt-hour	$3.6 \times 10^6$ Joule
1 electron volt	$1.602 \times 10^{-19}$ Joule
1 liter atmosphere	101.13 Joule

Area Unit Conversion	
1 sq. inch	$6.4516 \times 10^{-4}$ square meter
1 sq. foot	$9.2903 \times 10^{-2}$ square meter
1 acre	$4.0468 \times 10^3$ square meter
1 hectare	$1 \times 10^4$ square meter
1 sq. mile	$2.5888 \times 10^6$ square meter
1 barn	$1 \times 10^{-28}$ square meter

Power Unit Conversion	
1 erg/sec	$1 \times 10^{-5}$ watt
1 BTU/hr	0.2930 watt
1 foot-pound/ sec	1.356 watt
1 horsepower	745.7 watt
1 calorie/ sec	4.186 watt

Force Unit Conversion	
1 dyne	$1 \times 10^{-5}$ Newton
1 pound	4.448 Newton

Density Unit Conversion	
1 slug/ cubic ft	515.4 kilogram/ cubic meter
1 pound/ cubic in	$2.768 \times 10^4$ kilogram/ cubic meter

Viscosity Unit Conversion	
1 poise	0.1 kg/m.s
1 slug/ft	$4.79 \times 10^1$ kg/m.s

The base units of length (distance), capacity (volume), and weight (mass) in the metric system are the metre, litre, and gramme, respectively. We utilise units that are derived from metric units to measure smaller or greater quantities.

### 7 Things To Check-in A Warehouse Inspection

After understanding the 3 steps above, here are 7 key things you should check when conducting a warehouse inspection:

- **The Building's or Location's Damage:** Inspect the warehouse's windows, floors, doors, ceilings, and walls. Make sure they are damage-free and record any problems you discover.
- **Warehouse Lighting:** For worker safety, warehouse lighting is crucial. Examine the lighting and electricity in every space, including offices, loading docks, lunchrooms, hallways, and fire exits.

- **Cleanliness and Hygiene:** Get rid of any garbage and rubbish that could catch fire or constitute a trip hazard. Additionally, make sure the workplace is sanitary.
- **Fire safety:** Determine whether there is a risk of explosion if the fire gets out of control and whether there are enough fire extinguishers in the right places..
- **Ventilation:** Take care when working around dust. In order to keep your personnel safe, make sure there is adequate air ventilation.
- **Good drainage** is essential for a warehouse. Make sure the trench is clean and the drainpipe is free of obstructions.
- **Storage Racks:** The storage rack needs to be spotless and damage-free. To ensure their security in the storage space, periodically check their condition.

## Tips

- Good safety regulations encourage both workers and employers to protect each other's well-being and financial health. It takes mutual effort to keep everyone safe and productive.
- 5 Ways to Ensure Safety and Security in the Workplace
  - o Implement A Security System And Promote It.
  - o Check All Exit & Entry Points Regularly.
  - o Train All Employees.
  - o Create a Culture Around Safety and Security.
  - o Secure Workspaces.
- A wide range of possible dangers, including falling objects, moving vehicles, dust and debris, electrical equipment, loud equipment, and dangerous substances, can exist in warehouses. By giving employees properly fitted PPE, it is crucial to keep their bodies protected from these risks.
- A visual examination and an operational inspection should both be part of the forklift inspection. The forklift should be visually inspected by the operator, who should also fill out the inspection form. The operator should do an operational pre-use check after the visual inspection to make sure everything is functioning safely.
- Conveyor Belt Inspection: Look for signs of damage or loosened hardware along the entire length of the conveyor structure. The bearings and bearing mounting bolts are particular places that need to be inspected. Examine the mounting hardware and set screws for the head and tail pulleys. Before starting up the conveyor again, fix any damage and replace any missing components.

## Summary

In order to reduce the danger to people's health and safety as well as that of the workplace, health and safety procedures are a collection of standardised activities that specify each step needed to complete a task safely. Every organisation has a health and safety procedure of some kind.

Some of the common PPE for warehouse workers can include: Hard hats. High visibility clothing. Safety goggles/glasses.

Helmets can reduce or minimize the impact of an accident. They are the most important protective gear in an environment where you know that a crash could happen. In the event of a crash or an accident, the head is more prone to get injured than any other body part.

PPE is worn to minimize and mitigate the risks and hazards associated with a wide variety of working conditions. Without proper PPE, workers are left exposed to significant risks of injury or illness. These injuries or illnesses may not present themselves immediately either.

Receiving, putaway, storage, picking, packing, and shipping are the six basic warehouse procedures. You may streamline your warehouse operation, lower costs and errors, and increase the percentage of perfect orders by optimising these six procedures.

## Notes

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## Exercise

- 1) What are the safety procedures in a warehouse?
- 2) Why is safety important in a warehouse?
- 3) What are 5 fire safety rules?
- 4) What PPE is needed in a warehouse?
- 5) What are the four most common safety issues in warehouses?



## Annexure – QR Codes

S. No	Chapter No.	Unit No.	Topic Name	URL	Page No.	QR Code (s)
1	1. Introduction to MHE Maintenance Technician	Unit 1.1 - Supply Chain and Logistics Management	1.1.1 What is Logistics?	<a href="https://youtu.be/kT_toh5NbxE">https://youtu.be/kT_toh5NbxE</a>	3	 What is logistics?
2		Unit 1.2 - Sub-sectors of Logistics Industry	1.2.1 Sub-Sectors of Logistics Industry	<a href="https://youtu.be/NuLzlZuQoLA">https://youtu.be/NuLzlZuQoLA</a>	7	 Sub-sector of Logistics
3		Unit 1.3 - About Warehousing Industry	1.3.1 Understanding Warehousing Industry	<a href="https://youtu.be/tp4TQOBsNgk">https://youtu.be/tp4TQOBsNgk</a>	14	 Types of warehouses
4	2.Preparation for Maintenance	Unit 2.1 - Material Handling Equipment (MHE)	2.1.1 Goods and its Classification	<a href="https://youtu.be/7zFSs4QGNE">https://youtu.be/7zFSs4QGNE</a>	32	 Classification of Goods
5		Unit 2.2 - Documentation & Information collected for Maintenance	2.2.1 Principles of Material Handling	<a href="https://youtu.be/bq9mgk5zLPE">https://youtu.be/bq9mgk5zLPE</a>	39	 Material Handling



6	3.Maintenance Operations	Unit 3.1 - Process of Planning the Sequence for Maintenance	3.1.1 Material Handling Equipments	<a href="https://youtu.be/BBWPIByOEfl">https://youtu.be/BBWPIByOEfl</a>	68	 <p>Material handling equipment in warehouse</p>
7		Unit 3.3 - Testing process of MHE as per SOP	3.3.1 Testing Process of MHE as per SOP	<a href="https://youtu.be/2-hNYfX8rcU">https://youtu.be/2-hNYfX8rcU</a>	79	 <p>Digital Multimeter Parts And Function</p>
8	4. Post Maintenance Activities	Unit 4.2 - Importance of Housekeeping	4.2.1 Importance of Housekeeping and Cleanliness at Workplace	<a href="https://youtu.be/mOUvhstJcRk">https://youtu.be/mOUvhstJcRk</a>	108	 <p>House keeping in work place</p>
9	5.Compliance to Health, Safety and Security Measures	Unit 5.1 - Safety Instructions to be followed in Workplace	5.1.1 Health and Safety Procedures	<a href="https://youtu.be/-8Nxd9ILKoQ">https://youtu.be/-8Nxd9ILKoQ</a>	120	 <p>5 Common Warehouse Safety Hazards</p>
10		Unit 5.2 - Importance of PPE	5.2.1 PPEs Role in Warehouse	<a href="https://youtu.be/loQ9DbSy2ag">https://youtu.be/loQ9DbSy2ag</a>	131	 <p>PPE in warehouse</p>



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