

Material Storage – Safe Practices In Warehouse & Logistics

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1. Introduction

Material storage in a warehouse is a critical aspect of warehouse management, focusing on the efficient organization, protection, and handling of materials to ensure smooth operations and timely distribution. The primary goal of material storage is to maximize the use of available space while ensuring the safety and accessibility of stored goods.

Key Aspects of Material Storage in a Warehouse:

1. Space Utilization:

- Effective material storage involves optimizing the use of warehouse space. This includes the strategic placement of materials to reduce wasted space and enhance retrieval efficiency. High-density storage solutions like pallet racking systems, shelving, and mezzanines are often used.

2. Material Handling:

- Proper handling techniques are essential to prevent damage to materials and ensure safety. This includes using the right equipment such as forklifts, pallet jacks, and conveyors, along with training warehouse staff on best practices.

3. Inventory Management:

- Accurate inventory management systems track the location and quantity of materials. This helps in maintaining optimal stock levels, reducing overstock and stockouts, and ensuring that materials are easily accessible when needed.

4. Safety and Compliance:

- Safety is a top priority in material storage. This involves adhering to safety regulations, proper labelling, and storage of hazardous materials, ensuring that all materials are stored in a manner that minimizes risk to personnel and property.

5. Environmental Considerations:

- The design and layout of material storage areas must also consider environmental factors such as temperature, humidity, and lighting. Special storage solutions may be needed for perishable goods or materials sensitive to environmental conditions.

6. Technology Integration:

- The use of technology, such as Warehouse Management Systems (WMS), RFID, and automated storage and retrieval systems (AS/RS), plays a significant role in improving the efficiency and accuracy of material storage. These technologies help in real-time tracking, faster retrieval, and better space management.

7. Cost Efficiency:

- Efficient material storage reduces operational costs by minimizing the time and labour needed to store and retrieve materials, lowering damage rates, and maximizing the use of space.

Effective material storage in a warehouse ensures that the right materials are available at the right time, in the right condition, and at the right cost, contributing to the overall efficiency and productivity of the supply chain.

2. Pallet Packing System

A pallet racking system is a storage system that stores pallets of items in horizontal rows on multiple levels, allowing for better storage density by taking advantage of available vertical space.

Pallets are loaded onto the racks and unloaded into the rack typically by a forklift truck.

Types of Racking Systems -

- Selective Pallet Racking
- Double Deep Pallet Rack
- Carton Flow Pallet Racking
- Cantilever Pallet Rack
- Multi-Tier Pallet Rack
- Drive-In Pallet Racking
- Pallet Flow Rack
- Push Back Pallet Rack
- selective racking

A. Selective Pallet Racking: The Most Popular Racking Solution for Warehouse Storage Needs

The selective pallet rack, also known as static racking, is the most popular pallet storage system among warehouses. Its popularity is due to its low



cost and wide selection of upright heights and beam sizes for customer configuration.

It allows you to store loads at various heights, and it allows for access to 100% of the loads. Because you have direct access to each load, you have 100% "selectivity."

Selective pallet racks have been around since the 1950s, but they continue to be popular because of their relatively low cost and many benefits.

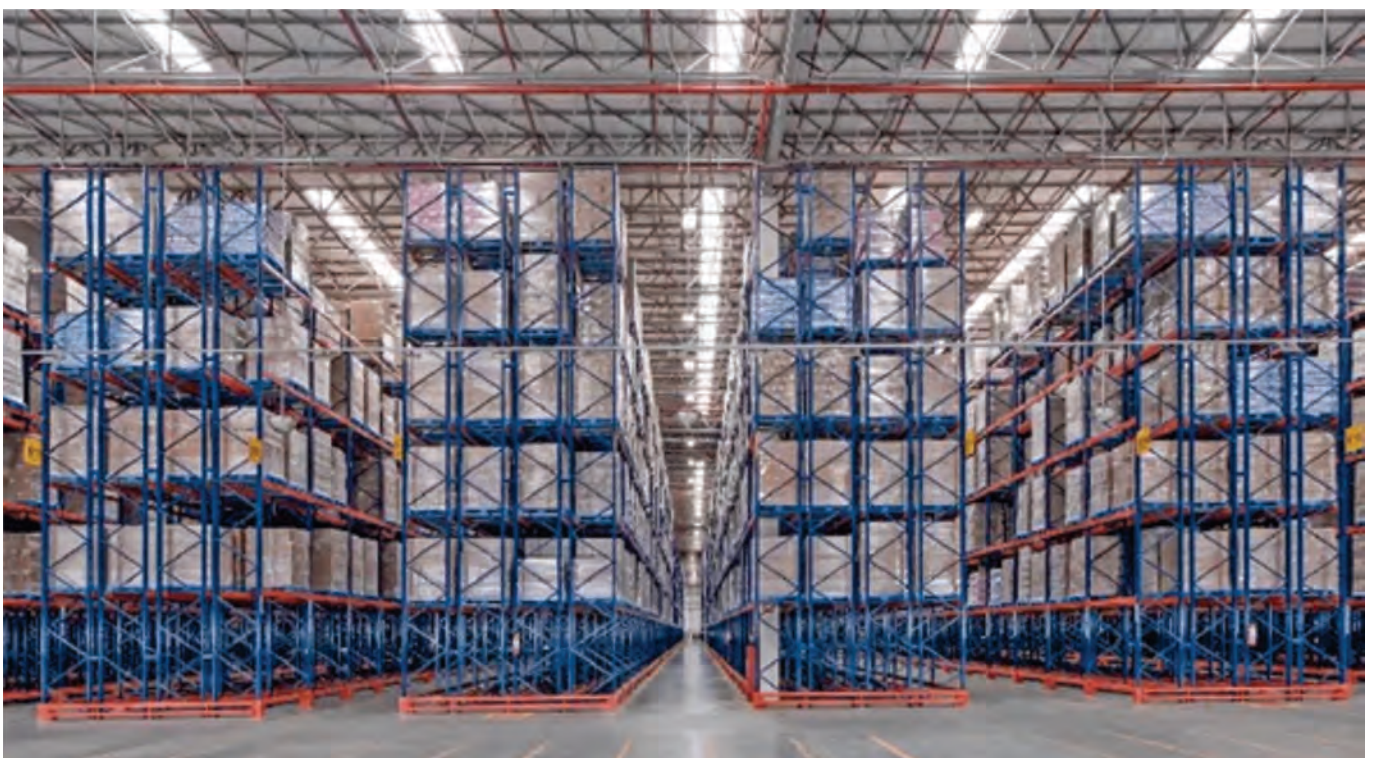
Advantages of Selective Pallet Racking

- Easy assembly and de-install
- It can be configured in different ways for your industrial equipment

- Lower entry price compared to more complex racking systems
- Disadvantages of Selective Pallet Racking
- Lower storage density compared to other types of racking
- Less efficient use of floor space due to many aisles

B. Double Deep Pallet Rack: Increase your Storage Space

Double deep warehouse racking systems share the same components as a selective racking system, except for one thing: the two rows of rack are installed adjacent to one another, which means a higher storage density is possible.



However, since they are two loads deep you will need a double deep reach truck with an extendable pantograph to load and unload from these pallet rack systems.

Advantages of Double Deep Pallet Rack

- Easy assembly and de-install
- Greater storage density than selective pallet rack systems
- It can be configured in different ways for your industrial equipment
- Lower entry price compared to more complex racking systems
- Disadvantages of Double Deep Pallet Rack
- Reduction in selectivity to 50%
- Requires either a bottom beam level or longer beams to accommodate the outriggers of the double deep reach truck

- Requires more expensive loading and unloading equipment
- carton flow rack
- Carton Flow Pallet Racks: The Ideal Storage Solution for Businesses With High Turnover Rates
- If your business has high turnover rates for its products, you may want to consider using a carton flow rack system.

C. Carton flow racks –

This are designed specifically for businesses that deal with small non-palletized, lightweight items and need to pick orders frequently and quickly.

It typically uses uprights and beams like a selective rack system; however, the lower levels are equipped with rollers mounted to rails to transport the cartons from the loading side to the picking side of the system, allowing workers at a ground level easy access when loading or unloading cartons.



Advantages of Carton Flow Rack Systems

- Fit for a combination of different carton sizes
- Uses gravity as a free power source
- Clear visibility of product inventory
- Enhanced efficiency for order fulfilment
- Disadvantages of Carton Flow Rack Systems
- Carton flow racks are more expensive than standard pallet racking systems
- Typically requires manual unloading of pallets to load cartons into the system

They employ vertical supports on the rear side of their structure and use arms that extend from the back to support loads with no vertical obstruction on the loading side of the system.

Advantages of Cantilever Racks

- Ideal for long loads
- Easy to install and reconfigure
- A broad number of capacity ranges
- No vertical obstruction on the front of the system, allowing the ability to stack materials horizontally

D. Cantilever Rack

Cantilever racking systems utilize arms attached to upright posts to store long items such as pipes, carpet rolls, and lumber.

Built out of a combination of towers, arms, and bases, cantilever racks are ideal for storing long loads.

Disadvantages of Cantilever Racks

- It requires additional flooring or reinforcement
- It requires very wide aisle for material handling equipment access
- It Cannot store pallets
- Load must be self-supporting



E. Multi-Tier Pallet Rack: Leverage Vertical Height

Multi-tier racking (also referred to as a pick module structure) offers an enhanced use of vertical space. They have different levels for manual picking and loading that are connected by stairs.

These systems are great for orders with small items, such as auto parts and fastener distributors and pharmaceutical companies.

Multi-tiered pallet racks create higher density picking. Some means of conveying equipment are typically required to transport the picked goods out of the system.



Advantages of Multi-Tier Pallet Racking

- Maximum use of vertical warehouse space for order picking
- Flexible for different cartons or item sizes
- Direct access to SKUs without the use of industrial equipment
- Safe and enclosed to protect workers

Disadvantages of Multi-Tier Pallet Racking

- Relative expense

F. Drive-In Pallet Racks: Ideal For Businesses with Limited Warehouse Space

Drive-in pallet rack is popular in warehouses because it allows businesses to store many goods in a small area for very dense storage. It's perfect for warehouses with limited warehouse space since it eliminates aisles by having one shared entry and exit point.

The operator "drives-in," to the system, and loads and unloads from one side of the system.

Because the operator drives into the system, there is greater interaction between the rack and the forklift resulting in an increased risk of damage and safety concerns.



Advantages of Drive-In Pallet Racks

- By removing aisles, you increase storage space

Disadvantages of Drive-In Pallet Racks

- Utilizes LIFO (last-in-first-out storage) so older inventory can get stuck in the back of the racking system
- Low selectivity that may require multiple handling
- Since forklifts place and retrieve items within the racks, there is more risk of damage
- Pallet sizes must be the same size to fit in the lanes



This gravity system increases storage capacity and enhances the storage and retrieval process, which reduces the workforce and labour required.

They are commonly seen in applications that have products with expiration dates due to the higher turnover rates these FIFO (first-in-first-out) pallet rack systems provide.

Advantages of Pallet Flow Racks

- It uses the FIFO method, preventing inventory from getting stuck in the back
- Quick and efficient inventory turnover
- Very high storage density with little lost space
- Reduces replenishment for picking (great for fast-moving SKUs)

Disadvantages of Pallet Flow Racks

- Pallets can become jammed if broken pieces get caught in the gravity rollers
- Reliant on pallets as the medium for movement
- Require maintenance on wheels and brakes
- One of the most expensive pallet racking systems

H. Pallet Pushback Rack

Push Back Pallet Racking: Ideal for Storage Density

Push-back pallet rack systems are perfect for warehouses that have a high volume of cargo and

- Pallet condition is very important as it provides the support of the load
- Risk of “honeycombing” with undisciplined storage put-away
- Challenging inventory management

G. Palletflow rack

Pallet Flow Racks: Take Advantage of Gravity

Pallet Flow Rack systems utilize common selective pallet rack components, with the addition of roller tracks.

One side of the pallet flow rack (also called gravity flow racks) is for loading, and the other end is for picking. Pallets are loaded into the back of the system, and they roll to the front of the system by means of gravity rollers.

that are looking for storage density.

The racks use pallets that are stored on inclined rails with free-rolling carts. As pallets are loaded into the system, the loading pallet pushes or stores pallets toward the back of the system, with the new pallet assuming the storage location of the old. When loads are removed from the front of the rack, the next pallet rolls to the front position.

This type of rack is ideal for storing frequently accessed products since items utilize gravity to move the next group of materials forward.

Since everything can be accessed from the front of the aisle, push-back racks use the LIFO method and require fewer pick aisles.

Advantages of Push Back Pallet Racking

- High-density storage
- Custom designed for your pallet sizes
- Decreased labour costs
- Forklifts do not enter the rack structure, limiting damage
- Increased Pallet Access

Disadvantages of Push-Back Pallet Racking

- Limited to 5 or 6 pallets deep
- Reliance on the load to push the other loads
- Possible product damage when carts slide forward



- Loss of some vertical space due to the slope of the rails
- Higher costs and more frequent maintenance – due to the number of wheels, carts, and bearings used
- Other Types of Dynamic Racking
- Many other types of dynamic racking can be customized to fit the needs of your warehouse.

3. Factor selecting Material storage equipment: -

When selecting material storage equipment, several factors should be considered to ensure that the chosen equipment meets the needs of the facility and operations. Here's a breakdown of key factors:

Type of Materials

- Size and Weight: Heavy or bulky items require stronger, more durable storage solutions, while lighter items might need only simple shelving.
- Shape and Configuration: Irregularly shaped materials might need specialized storage solutions, such as racks or bins.
- Hazardous Materials: Special containment or safety features might be necessary for hazardous or flammable materials.

Space Availability

- Floor Space: The amount of available floor space will influence the type and size of storage equipment.
- Vertical Space: Consider how high you can safely store items, making use of vertical space with shelving or mezzanines.

Access and Retrieval Requirements

- Frequency of Access: Items that are accessed frequently should be stored in easily accessible locations.
- Manual vs. Automated Retrieval: Depending on the volume and frequency of retrieval, automated

systems like vertical lift modules or carousels may be necessary.

Environmental Conditions

- Temperature and Humidity: Some materials require climate-controlled environments, influencing the choice of storage equipment.
- Cleanliness: In cleanroom or contamination-sensitive environments, storage equipment must meet specific cleanliness standards.

Safety and Compliance

- Load Capacity: Ensure that the equipment can safely handle the weight and volume of stored materials.
- Compliance with Regulations: Storage equipment must meet industry-specific regulations, especially in sectors like pharmaceuticals, food, or chemicals.

Scalability and Flexibility

- Future Growth: Consider how easy it will be to expand or reconfigure storage systems as needs change.
- Adjustability: Adjustable shelving and modular systems offer flexibility for storing a variety of materials.

Cost and Budget

- Initial Investment: Balance the cost of the equipment with the benefits it offers.
- Maintenance Costs: Consider the long-term costs of maintaining the equipment.

Material Handling Integration

- Compatibility with Handling Equipment: Ensure that storage systems are compatible with forklifts, conveyors, or other material handling equipment.
- Automation Capabilities: If you plan to automate your material handling, ensure the storage equipment is compatible with automated systems.

Inventory Management

- **Visibility and Organization:** Equipment that improves visibility and organization can aid in inventory management.
- **Barcoding and Tracking:** Some storage systems can integrate with inventory management systems for real-time tracking.

Aesthetics and Ergonomics

- **Aesthetic Requirements:** In retail or customer-facing environments, the appearance of storage equipment might be important.
- **Ergonomics:** Consider the ease of use for workers, ensuring that storage solutions do not contribute to strain or injury.

Durability and Longevity

- **Material Quality:** The material from which the storage equipment is made (steel, plastic, wood, etc.) affects its durability.
- **Wear and Tear Resistance:** Choose equipment that can withstand the wear and tear of daily use.

Storing materials safely in a warehouse is critical for protecting workers, preventing accidents, and ensuring the longevity of the materials. Here are some general tips for safe material storage in a warehouse:

Organize and Label Materials

- **Proper Labelling:** Clearly label all materials, including hazardous substances, with relevant information like handling instructions, storage conditions, and expiration dates.
- **Organized Layout:** Arrange materials in an organized manner, keeping similar items together and ensuring easy access. This reduces the risk of accidents and improves inventory management.

Use Appropriate Storage Solutions

- **Shelving and Racking:** Use sturdy shelving or racking systems designed to handle the weight and size of the stored materials. Make sure racks are secured to prevent tipping.
- **Pallets and Containers:** Store heavy materials on pallets and use containers to protect items from dust, moisture, and other environmental factors.

Ensure Proper Weight Distribution

- **Load Limits:** Adhere to the load limits of storage racks and shelves. Overloading can lead to structural failure and accidents.
- **Heavy Items on the Bottom:** Place heavier items on lower shelves or the ground to maintain stability and prevent toppling.

Maintain Safe Aisles and Walkways

- **Clear Pathways:** Keep aisles and walkways free of obstructions to allow for safe movement of people and equipment.
- **Adequate Lighting:** Ensure all areas, especially aisles and emergency exits, are well-lit to prevent accidents.

Control Environmental Conditions

- **Temperature and Humidity:** Maintain appropriate temperature and humidity levels, particularly for

sensitive materials. Install climate control systems if necessary.

- **Ventilation:** Ensure good ventilation to prevent the buildup of hazardous fumes or dust.

Implement Fire Safety Measures

- **Fire Extinguishers and Alarms:** Equip the warehouse with fire extinguishers, smoke detectors, and fire alarms. Ensure they are regularly inspected and easily accessible.
- **Flammable Materials:** Store flammable materials in designated, fireproof areas away from ignition sources. Follow local regulations for storing hazardous materials.

Regular Inspections and Maintenance

- **Routine Checks:** Conduct regular inspections of storage racks, shelves, and the overall warehouse environment to identify and address potential hazards.
- **Maintenance:** Perform maintenance on storage equipment, including shelves, racks, and forklifts, to ensure they remain in good working condition.

Training and Safety Procedures

- **Employee Training:** Train all employees on proper storage procedures, emergency protocols, and the safe handling of materials, especially hazardous ones.
- **Safety Signage:** Place clear safety signs throughout the warehouse to remind workers of proper procedures and potential hazards.

Implement Material Handling Equipment Properly

- **Forklifts and Pallet Jacks:** Ensure that only trained personnel operate material handling equipment like forklifts and pallet jacks. Maintain the equipment regularly.
- **Safe Lifting Techniques:** Teach employees safe lifting techniques to prevent injuries, especially when handling heavy or awkward materials.

Emergency Preparedness

- **Emergency Exits:** Clearly mark and keep emergency exits free of obstructions. Ensure all employees are aware of the location of exits and assembly points.
- **First Aid Kits:** Keep well-stocked first aid kits in accessible locations and ensure that employees know where they are located.

5. The Different Types of Equipment Used for Material Storage: -

There are different types of material handling equipment. The types of equipment one order, and how one can organize them in your warehouse, impact your material handling processes.

- **Storage and handling equipment:** Stores goods in the time between receiving and shipping. Examples of such equipment are stacking frames, racks, and shelves.
- **Engineered systems:** Automated units that efficiently move goods through a warehouse and reduce the need for manual intervention. Examples of such equipment are automated storage and



retrieval systems (AS/RS), robotic delivery systems, automatic guided vehicles, and conveyor systems.

- Industrial trucks: Powered vehicles that move materials around a warehouse. Examples of such vehicles are forklifts, hand trucks, side loaders, and pallet jacks.
- Bulk Material Handling Equipment: Equipment that assists workers with handling large loads. Examples of such equipment include bucket elevators, stackers, and silos.

Conveyors move materials from Point A to Point B, limiting the amount of heavy lifting required. They also take goods through different stages of the distribution process including receiving, packaging, and shipping.

Overhead handling methods supplement conveyors. Rather than occupying floor space to move goods,

overhead handling methods, such as hoists and cranes, use overhead space to move goods from Point A to Point B. Additionally, they allow warehouse operators to use floor space for storage rather than as manoeuvring room for shifting shipments.

Industrial trucks, like forklifts, offer more manoeuvrability around the warehouse, allowing stock pickers to navigate aisles and handle pallets.

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