

## CHAPTER - 7

### WAREHOUSE AND STORE YARD

#### 7.1 Introduction

Warehousing is the function of storing goods between the time they are received/produced and the time they are needed for consumption and services. The warehouse is a planned space for efficient storage and handling of material.

Warehousing is the safe storage area of goods, inventory, information, etc. within a specified area or building. In a well-managed warehouse, emphasis is given for good layout, greater utilisation of cubic space.

This chapter broadly lays down the structure of good layout and the types of storage system. Each Stores Unit may have to design the warehouse to suit their requirement during project as well as operational and maintenance period.

#### 7.2 General Layout

The stores functions should be organized to meet the primary objective of serving the user departments for their timely material requirement with minimum handling. The governing criteria in stores layouts are easy movement of materials, good housekeeping, sufficient space for men and material handling equipment, optimum utilization of storage facilities, proper preservation of materials, the volume and variety of material to be handled, and accessibility to mode of transportation.

Each Unit should allot a specific space and location best suited for easy accessibility to all user divisions. A warehouse, as a general principle may be of single storey building due to following reasons

1. The cost per cubic foot storage space is much cheaper because the structure can be lighter construction than with a building having upper floors.
2. Material handling is easy and cost effective.
3. Abundant natural light
4. Adequate ventilation
5. Inventory verification is easy.
6. Fire risk is less in comparison to multi storey building.

The material flow in and out of a warehouse should follow a straight line as far as possible. The overhead space should be utilised to the maximum extent either by installing mobile storage system, or high racking systems or installing mezzanine floor.

The width of the aisles should be directly related to the type of handling equipment used and the nature of material handled, i.e., fragile, light, heavy, and bulk. The size of the aisles should also have reasonable safety margin.

Aisles should be clearly marked with paint. The aisle lines generally used are 1 metre wide and yellow in colour.

Generally the height of a warehouse ranges from 8 to 10 meters. The layout design should ensure proper ventilation and good natural lighting.

Based on the type and nature of materials, the warehouse layout should facilitate effective control and easy retrieval of stores/materials to various work centres and projects. Warehouses can be broadly classified as given in the succeeding paragraphs.

### 7.3 **Type of Warehouses**

Warehouses can be categorised under two main heads

1. Covered Storage
2. Open Storage

#### 7.3.1 **Covered Storage Area:**

Covered storage area can be further divided into complete closed storage area and roofed storage area. The size, structure and the type of closed storage area depends on various factors such as nature, type and quantity of inventory, volume of transaction, etc. Critical review of storage requirements may be taken before designing of storage space.

### 7.4 **Design of Storage Space**

While designing for storage space, the following points may be taken into account:

- a) The Warehouse should preferably be rectangular.
- b) Material should move the shortest possible distance.
- c) Loading and unloading docks should be positioned alongside.

The dimension of a warehouse depends on the material procured/under procurement for different ongoing projects and procurement projected for future projects, which are in pipeline and subsequent O&M needs.

Generally, this is the area that requires careful attention of DPS Unit while making a statement of case for a new project. The requirement of storage space for materials to be procured for that project should be projected in the statement of case, which will avoid problems later. Hence, it is imperative that requirement of storage space is projected in the statement of case.

As mentioned earlier, two factors play vital role in arriving at the total space requirement. They are aisle (passage) width and height of stacking allowed. Sufficient care should be taken to utilize the stores area as cubic space and not by calculating square area.

The material handling equipment planned for use in that warehouse determines the aisle space to allow for turning radius and other safety requirement.

Design of Warehouse depends on the following factors.

- a) Type and nature of materials handled

- b) Type of storage needs
- c) Frequency of operations
- d) Type of safety precautions

Design of warehouse for an R&D Unit may differ from warehouse design for a production unit. In a production unit varieties are less but quantities are more, whereas in R&D Unit, varieties are more but quantities are less and their storage may be for longer periods.

7.4.1 **Complete Closed Storage Area:** This is the general method of warehousing covering maximum types of materials. Stationery items, laboratory wares, hardware, electrical, general spares, etc. are ideally stored in these completely closed storage area.

#### 7.5 **Central Store**

The Central Store is a repository for bulk of materials provisioned for the Unit and provides coverage for meeting day-to-day and long-term material needs of all the groups/divisions/projects. While considering the location of Central Store, the following important aspects will be taken into account:

7.5.1 As the central store is to meet the varying type of requirements of multiple users, separate warehouse space will be provided for different category of stores.

7.5.2 The main central store comprising of different warehouses should be so located that these are easily accessible for all types of incoming consignments as well as making issues to various Zonal Stores/user groups.

7.5.3 The location of central store should be such as to facilitate easy mobility of heavy/bulky items, material-handling equipment e.g., cranes, fork-lifters, trolleys, trailers, etc.

Special purpose racks, bins, storage stands, steel almirahs, partitioned chests, etc., will be provided to prevent deterioration in storage and facilitate easy handling, inspection and verification depending upon the nature of material.

#### 7.6 **Common stock.**

Central Stores will have separate stores for items commonly used for the entire organisation. These stores can be based on the nature of items, end use or system based. This can be like glassware, laboratory items, chemicals, cleaning, stationery, hardware, etc. Central Stores make provisions for all Zonal Stores and Divisions to recoup their stock periodically. In addition to the stores for various common items, Central Stores will have special storage facilities of following categories :-

##### 7.6.1 **Perishable Material Store**

Perishable items will be stored in a separate store created exclusively for these items. Other items should not be mixed with these stores. Depending on the nature and preservation time required, the storehouse may be constructed to have open ventilated type or cold chambers with provision for deep freezers and normal refrigerated cabins. Regular day to-day monitoring is required to ensure that the perishable stores are properly utilised before they become stale/rotten.

The efficacy of refrigeration system must be constantly ensured by timely maintenance, continues monitoring including non working hours, effective supervision with proper recording in Log book.

#### 7.7 **Divisional / Zonal Stores:**

While all the points/instructions covered in para7.4 apply equally to the administration of Divisional/Zonal Stores, the main reason for creation of Zonal Stores is to provide prompt service to the particular user groups/projects. The location of such Zonal Stores should, therefore, be in the vicinity of the end users as far as possible. The prime emphasis on the working of Zonal Stores is to provide simplified and single window service for user's day-to-day material needs with minimum response time, obviating the necessity for them to go to central store for each transaction.

#### 7.8 **Medical Store**

An exclusive medical store with necessary licence will be organised under the administrative and functional control of Hospital / Dispensaries of the Unit. The stores will be kept in well-ventilated room in proper racks in a storehouse, preferably within medical inspection room so as to have easy accessibility. The medical stores may further be sub-grouped such as medicines, drugs, surgical instruments, life saving equipment / apparatus, etc. A refrigerator or air-conditioned accommodation will be provided for the storage of special drugs and medicines requiring refrigeration. All the medicines will be properly stored following medical storekeeping procedure. A regular monitoring system may be followed to identify stock nearing shelf life and follow up action to avoid loss.

The efficacy of refrigeration system must be constantly ensured by timely maintenance, continues monitoring including non working hours, effective supervision with proper recording in Log book.

#### 7.9 **Valuable / Attractive Stores**

Precious materials shall be stored in strong room or safe locker with dual key operation. The strong room shall be operated only when necessary and proper log book shall be maintained for such opening / closing. The log books shall have details like date and time of opening and closing, name and designation and signature of officials present, nature of transaction or reason for opening. The valuables and attractive stores shall be verified in accordance with the extant instructions. If valuable or attractive items are in small quantities, these can be stored in cupboard with inner safe and such cupboard will be under the custody of an officer not below the rank of Assistant Stores Officer.

The following items or items made out these partially or fully are categorized under precious materials:

1. Gold
2. Platinum
3. Silver
4. Palladium

5. Diamond
6. Any other material introduced as precious material.

#### 7.10 **Special Stores**

The following categories of stores will be provided with separate storage space meeting the special safety requirements as applicable.

- a) Inflammable materials e.g., petroleum, kerosene, paraffin, alcohol, paints and other low flash-point chemicals.
- b) Acids and reactive chemicals.
- c) Compressed and liquefied gases
- d) Other combustible stores.

#### 7.11 **Roofed Storage Area:** This can be either normal floor height or ramps and used for items like

- a) Oil drums
- b) Non-ferrous items
- c) Non-perishable packages
- d) Compressed Gas Cylinders.

#### 7.12 **Open Warehousing**

##### 7.12.1 **Open Stock Yard:** This can be used for stocking items like heavy castings, forgings, heavy structural items, ferrous material like mild steel plates, tubes and sections, stainless steel rods, plates, sheets, etc., cable drums, HDPE/PVC/CPVC pipes, etc.

##### 7.12.1.1 ***Minimum requirement of Open Stock Yard***

The stock yard shall be designed and constructed depending upon the type of material, topography of the area and the location of the yard. To ensure safety, security and efficient functioning a stock yard shall have:

- a. A levelled and well drained ground.
- b. Hard rolled/concrete surface with proper road layout - asphalted or RCC road.
- c. Proper perimeter fencing and in and out gate arrangement with security point.
- d. CCTV Surveillance system, if possible.
- e. Sufficient lighting arrangement with uniform illumination throughout - no dark corner
- f. Adequate and unhindered road access is very important.
- g. The level of security, perimeter fencing, etc., shall be inline with risk pattern depending on whether the yard is located inside the main premises or outside.
- h. The yard should be divided into zones or sectors with the suitable markings.

#### 7.13 **Material Handling**

#### 7.13.1 **Definition**

Material handling is defined as the art and science involving packing, movement and storing of substance in any form, from one point to another safely and economically.

#### 7.13.2 **The basic principle of material handling are:**

1. Eliminate unnecessary handling.
2. Minimise manual handling and use mechanical handling equipment where possible.
3. Use right equipment for handling so as to minimize the cost and avoid damage.

#### 7.13.3 **Material handling:**

Material handling is one of the important links in the logistic chain. It will not contribute any value addition to the stores/items being handled, but it can prevent damage to the item and personnel. Officer In-Charge should make a proper selection of material handling equipment to ensure economy and safety. Following aspects may be considered while selecting material handling equipment:-

- a) Type and nature of material to be handled.
- b) Safety precautions to be observed.
- c) Distance to be covered.
- d) Existing location of the material and place where the material is to be moved.
- e) Type of packing, size and shape of material.

#### 7.13.4 **Precautions to be observed for Material Handling:**

1. Safe working loads should be marked on all lifting appliances like crane, forklift, etc. and load should not exceed the permitted limit. These appliances should be tested periodically and certified.
2. Only trained persons should operate the appliances.
3. Tools and tackles should be tested periodically, properly maintained and certified for its utility. However, before using its serviceability to be ascertained. The tools and tackles should be commensurate with the load to be handled.
4. Do not use unsuitable slinging methods. Ensure that the material is adequately secured and supported.
5. Prohibit personal movement under the loads being lifted/moved and also within 6metresof loading/ unloading operations.
6. Load should not be suspended longer than required and certainly not over night.
7. All Material Handling operations shall be carried out in sufficient light.
8. Personnel engaged in the material handling operation shall use proper safety protective gear.

#### 7.14 **Packaging:**

It is the process of enclosing the material for protection, identification and handling.

#### 7.14.1 **Functions**

Packaging occupies a very important place in Integrated Logistic support concept. Packaging plays a crucial role in custody, handling and transportation of material. Packaging of any material is done to perform four functions.

**a. Protection:**

Shield the product from hazards that occurs during handling, storage, transportation and exposure to atmosphere.

**b. Containment:**

It is the package ability to hold its contents safely and securely.eg. loose material like cement, grains, etc. or any liquids / gases.

**c. Communication:**

Conveys information about the product inside the package either through printed information or visuals of the product on the package.

**d. Transport:**

Proper packaging is necessary for safe loading, unloading and transportation of material and to withstand peril of transportation.

**e. Security:**

Packaging can play an important role in reducing the security risks of shipment.

**f. Economy:**

A standard packing helps in economising transportation and warehousing.

#### 7.14.2 **Objectives**

Packaging planned for any item either for receipt or despatch should satisfy the following conditions:-

Packaging should keep a provision for requirements of material handling equipment.

It should take into account the requirement of transporter who carries the goods.

It should satisfy the provisions of law.

**This may be achieved by observing the following conditions:-**

- Packaging should enclose the item completely to avoid mix up with other items.
- Exterior surface should have provision for proper markings and safety precautions to ensure the item reaches correct destination safely.
- It should ensure that the weight distribution is done properly to avoid accident while handling the consignment. In case of uneven distribution of weight a proper marking with highlights to be given on the package.

- Exterior package should be capable of supporting other similar packages during stacking.
- Packaging should be such that it will not give any room for pilferage.
- Warehouse uses a variety of material handling equipment viz., forklift, conveyor, chain pulley block, cranes, wheelbarrows, pallet trucks, etc., each type has a specific requirement regarding lifting and handling. The packaging should incorporate these provisions.
- Transporters lay down essential requirements in packaging to avoid damage to the consignment and ensure safety of the personnel handling the packages. Compliance with their requirement will reduce the chance of damage and loss.
- Stores Unit should ensure that the items are stored in their original packing after preliminary inspection and survey if any, till such times the items are taken for erection and commissioning. The packages can be reused for different purposes other than storing of material.
- The packing material shall be eco-friendly.
- Exterior marking should assist in unloading and stacking of material.
- Tropical packing is required when the transportation is through different climatic zone.
- The exterior marking should comply with statutory requirement.