



## Chapter 5: Warehouse Management

### Objectives

- Define and understand the role of warehouse in logistics systems.
- Examine the functions and activities of warehouses.
- Examine the planning dimension of warehouses.

### 1. Introduction – Warehousing

Logistics exists to move and position inventory to achieve desired time and place benefits at the lowest total cost. Inventory has limited value until it is positioned at the right time and at the right location to support customers.

Figure 5-1 provides a visual representation of the interrelated nature of the five areas of logistical work:

- Order processing
- Inventory
- Transportation
- Warehousing (Materials handling, Packaging)
- Facility network.

As described below, work related to these functional areas combines to create the capabilities needed to achieve logistical value.

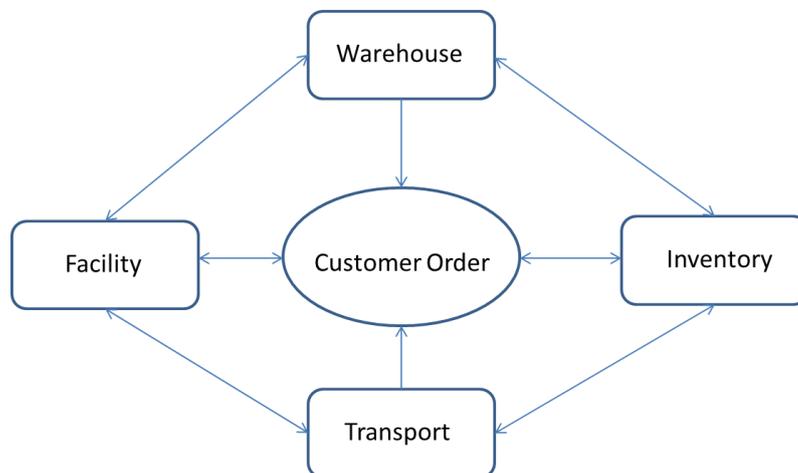


Figure 5-1: Relationship between Warehousing and Other Functions

The first three functional areas of logistics in the supply chain – order processing, inventory, and transportation – can be engineered into a variety of different operational arrangements.

Each arrangement has the potential to contribute to a specified level of customer service with an associated total cost. In essence, these functions combine to create a system solution for integrated supply chain.

The fourth functionality of logistics – warehousing, materials handling, and packaging – also represents an integral part of a logistics operating solution. Warehousing, materials handling, and packaging are an integral part of other logistics areas.

## **2. Warehouse Strategy and Functionality**

A warehouse is typically viewed as a place to hold or store inventory. However, in contemporary supply chain systems, warehouse functionality can be more properly viewed as inventory mixing.

This chapter provides a foundation of the understanding how warehousing contributes to logistics.

## **3. Warehouse Operations**

Once a warehouse mission is determined, managerial attention focuses on establishing the operation. A typical warehouse contains materials, parts, and finished goods on the move. Warehouse operations consist of break-bulk, storage, and assembly procedures. The objective is to efficiently receive inventory, possibly store it until required by the market, assemble it into complete orders, and initiate movement to customer. This emphasis on product flow renders a modern warehouse as a mixing facility. As such, a great deal of managerial attention concerns how to perform storage to facilitate efficient materials handling.

The primary activities are discussed below.

### **4.1 Receiving**

The first handling activity is unloading. At most warehouses, unloading is performed mechanically, using a combination of a lift truck and manual processes. When freight is floor stacked on the transport vehicle, the typical procedure is to manually place products on pallets or to use a conveyor. When inbound product has been unitized on pallets or containers, lift trucks can be used to facilitate receiving.

### **4.2 In-Storage Handling**

In-storage handling consists of movements within the warehouse. Following receipt and movement to a staging location, product must be moved within the facility for storage or order selection. Finally, when an order is processed it is necessary to select the required products and move them to a shipping area.

### **4.3 Order Picking**

Order selection is one of the major activities within warehouses. The selection process requires that materials, parts, and products be grouped to facilitate order assembly.

### **4.4 Shipping**

Shipping consists of order verification and transportation equipment loading. Similar to receiving, firms may use conveyors or unit load materials handling equipment such as lift trucks to move products from the staging area into the transportation vehicle.

## **4. Warehouse Planning**

Initial decisions related to warehousing are planning based. The basic concept that warehouses provide as an enclosure for material storage and handling requires detailed analysis before the size, type, and shape of the facility can be determined. This section reviews planning issues that establish the character of the warehouse, which in turn determines attainable handling efficiency.

### **4.1 Site Selection**

The first task is to identify both the general and then the specific warehouse location. The general question focuses on the broader geographic area as illustrated by the need to place a warehouse.

Drivers in site selection are service availability and cost. Land cost is the most important factor. A warehouse need not be located in a major industrial area. In many cities, warehouses are among industrial plants and in areas zoned for light or heavy industry.

### **4.2 Materials Handling Considerations**

A material handling system is the basic driver of warehouse design. As noted previously, product movement and assortment are the main functions of a warehouse. Consequently, the warehouse is viewed as a structure designed to facilitate efficient product flow. It is important to stress that the materials handling system must be selected early in the warehouse development process

### **4.3 Layout**

The layout or storage plan of a warehouse should be planned to facilitate product flow. The layout and the material handling system are integral. In addition, special attention must be given to location, number, and design of receiving and loading docks.

The second step in planning warehouse layout involves pallet positioning. The most

common practice in positioning pallets is 90 degree, or square, placement. Square positioning is widely used because of layout ease. Square placement means that the pallet is positioned perpendicular to the aisle. Figure 5-6 illustrates this method of positioning.

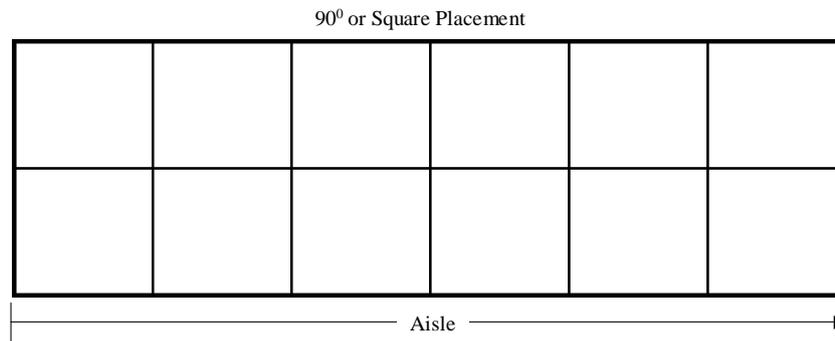


Figure 5-2: Basic Method of Pallet Placement

Finally, the handling equipment must be integrated to finalize layout. The path and tempo of product flow depend upon the materials handling system. To illustrate the relationship between materials handling and layout, two systems and their respective layouts are illustrated. These examples represent two of many possible layouts.

#### 4.4 Sizing

Several techniques are available to help estimate warehouse size. Each method begins with a projection of the total volume expected to move through the warehouse during a given period. The projection is used to estimate base and safety stocks for each product to be stocked in the warehouse. Some techniques consider both normal and peak usage rates. Failure to consider usage rates can result in overbuilding, with corresponding increase in cost.

### 5. Initiating Warehouse Planning

To initiate warehouse operations, management must plan and perform initial stocking, personnel staffing, and work procedures, as well as implement a Warehouse Management System (WMS) and outbound distribution operations. Although this focuses on the warehouse start-up process, many of these activities are relevant for ongoing warehouse operations as well.

#### 5.1 Stocking

The ideal initial stocking procedure is to receive and stock all inventory items prior to initiating operations. Individual products to be distributed through the warehouse and the quantities of each inventory SKU are determined during warehouse planning. The challenge in initial stocking is to schedule and sequence product arrival. Time required to initially stock a warehouse depends upon the number and quantity of products.

#### 5.2 Training

A major concern in logistical operations over the past several decades has been labor productivity. The basic nature of raw materials, parts, and finished goods flowing through and between a vast network of facilities makes logistics labor-intensive. In fact, warehousing is the single largest consumer of logistics labor.

Hiring and training qualified personnel to operate a warehouse is a challenge. Regardless of how efficient the proposed warehouse system is in theory, in practice it will only be as good as its operating personnel. Part of the challenge is to attract competent, productive workers to a warehouse environment. Because warehousing is demanding physical work completed at times and in locations that are less than ideal, it becomes particularly difficult to attract workers in periods of relatively full employment.

### **5.3 Warehouse Management Systems**

The development of work procedures goes hand-in-hand with training warehouse personnel. Most firms implement a WMS to standardized work procedure and encourage best practice. It is management's responsibility to see that all personnel understand and use these procedures.

Work procedures are also important for receiving and shipping. Established procedures for receiving and ensuring product entry into inventory records are critical. If pallets are used, the merchandise must be stacked in appropriate patterns to ensure maximum load stability and consistent case counts.

### **5.4 Security**

In a broad sense, security in a warehouse involves protection against merchandise pilferage and deterioration. Each form of security requires management attention.

### **5.5 Pilferage Protection**

In warehouse operations it is necessary to protect against theft by employees and thieves as well as from riots and civil disturbances. Typical security procedures used throughout a business should be strictly enforced at each warehouse. Security begins at the fence.

As standard procedure, only authorized personnel should be permitted into the facility and surrounding grounds. Entry to the warehouse yard should be controlled through a single gate. Without exception, no private automobile, regardless of management rank or customer status, should be allowed to enter the yard or park adjacent to the warehouse.

### **5.6 Safety and Maintenance**

Accident prevention is a concern of warehouse management. A comprehensive safety program requires constant examination of work procedures and equipment to locate and take corrective action to eliminate unsafe conditions before accidents result. An OSHA program must be in place.

## 6. Conclusion

The role of warehouse is more than a temporary storage. It offers both protection and preservation of inventory in the supply chain. Hence, its role as a custodian is not to be underestimated. Along with this role is its value-added role of time and place utilities.

Real-time and on-line information is necessary to make inventory visible to all entities in the supply chain.

The role of warehouse is incomplete without the inclusion of material handling equipment and systems. These MHE operates as part of the entire warehouse system which snugs appropriately into the layout of the warehouse.