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# BUILDING YOUR WAREHOUSE THE HOLISTIC WAY

**Warehouses are structures built to provide a suitable environment for storing goods and materials. Hence, they must be designed to accommodate bulk quantities of materials, the associated handling equipment, the receiving & shipping operations and associated trucking, and the needs of the operating personnel. The design of a warehouse should be planned in such a way that it perfectly accommodates business service requirements and the products to be stored or handled. In order to build a well-managed warehouse, it is first essential to define its purposes, design it to suit those purposes and build it as per those designs. Ensuring this will help a warehouse become safe, and offer efficient and optimal performance.**

**YES,** I want to build a warehouse and I know how to do it... This may be the general impression of most people who have taken a decision to build a warehouse to support their current businesses and expand them as per their business strategy. Most of us know how to build a warehouse to suit one's business requirements. This knowledge comes from their business intelligence, intelligence quotient, analytical skills, visits to other operations and observations made during these visits. With this understanding, many warehouses are built as per local trends & practices prevailing in those specific regions and some are

built using conversions and modifications to existing or sick units. But does such a warehouse support their current business needs? Can it handle future needs? These are some of the questions that need to be asked.

Building a purpose-built warehouse is not as simple as it looks. There are many factors, which have to be considered to suit specific purposes. Since building a warehouse involves huge investments, it is important that we understand what a purpose-built warehouse is. Building such a warehouse is an important aspect and every business must give due considerations to these aspects while

taking such a decision. This concept is a combination of two aspects – purpose i.e. 'why' to build and warehouse i.e. 'what & how' to build. Let us now discuss and understand these two aspects:

## PURPOSE

This could be understood through the following questions:

- a) Why am I building a warehouse? Of course, to support my business.
- b) What business am I in? Many answers – you know your business better than anyone else.
- c) What sector do I serve? Choose your sector.

- d) Which customer do I serve? List all the customers that you serve or intend to serve. Understand them, their businesses and business needs.
- e) What services do I offer? List down all the services that are offered or you intend to offer to each of the above listed customers.
- f) What value-added and associated services are required? This could include repacking, banding, kitting, etc.
- g) Which products do I handle? Make a list of all the products that you handle. This is the first step towards the creation of an 'item master'.
- h) What are the product characteristics that I handle? Here you update the above nascent stage 'item master' by including more specific information for each product, which is called stock keeping unit (SKU) i.e. an item whose stock is maintained in the warehouse. This will generally include SKU size, weight, packaging types, inner & outer case types, storage condition requirements, such as temperature or humidity, hazard types, stacking norms, handling norms, inventory norms, shelf life, etc.
- i) What are my key performance indicators (KPIs) to satisfy my customer? KPI in simple terms means the criteria against which performance is measured and which are critical for a customer's business performance. Make a list and categorise these KPIs into List A, B & C depending on the importance to your client.
- j) What volumes am I supposed to handle today, tomorrow and probably, in future? This volume is measured in terms of throughput, inventory, metric tonne (MT), number of cases, etc.
- k) Understand the type of your warehouse operation? Is it going to be 100 per cent manual, semi-automatic or fully automatic?
- l) How is the operation likely to change over a period of time? Will it move from manual to semi-auto and eventually, to fully auto?
- m) Is selecting the location in my control? If not, which is the assigned location and what are its key characteristics? This generally includes size, dimensions, plot profile, terrain conditions, vicinity conditions, area, directions (north-south & east-west), strata conditions,

adjacent industries or land use, proximity to markets, residential & commercial zones, hospitals, fire stations, banks, hotels & restaurants, climatic conditions, wind directions,

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rainfall and flooding history, presence of major power & communication poles, availability of power, water, drainage, communication systems, availability of public transport facilities, etc. Collect and tabulate all the above information. All this is required while defining 'what and how' to build.

n) What is the timeline available to bring the warehouse into operation? Understand the customers' requirements and define the timelines. This will help to 'plan' the project.

Answer all these above questions in a structured manner. Interact with all the stakeholders concerned and get their key inputs recorded on what we can call our 'purpose document'. Once the 'purpose document' is ready, a major part of the job is accomplished.

## WAREHOUSE

This aspect will try to understand 'what & how' to build? A warehouse consists of three basic elements viz., building, floor and docks. Most of the warehouses are built considering only these basic elements. But, in reality, apart from these, there are other finer points that need to

be considered for a warehouse to fulfil its intended purpose. All these finer points get defined or validated by our 'purpose document'. Once taken care of, the warehouse is in a better position to fulfil those purposes and satisfy the customer. Now, let us further discuss these finer points:

### Building components

- *Walls:* Impermeable, smooth finish and plane surfaces
- *Wall material:* Depends on the required storage conditions inside the warehouse
- *Floor:* Designed to take the proposed loads of stocks, storage systems, loads moved by material handling equipment (MHE) and any other imposed loads
- *Floor material:* Preferably concrete
- *Floor type:* Smooth & flat to suit MHE and storage system requirements. An uneven and rough floor can adversely impact MHE operations, safety of stock & employees and cost of MHE maintenance
- *Roof:* Impermeable and solid
- *Roof material:* Compatible with stocks. Use of asbestos is not recommended by a majority of users
- *Roof slope:* As gentle as possible. This will not only effectively drain off rain water, but also help save on usable warehouse volumes & provide better maintenance platform over roofs
- *Skylight:* Use of skylight will enhance visibility during the day. In Indian tropical condition, four per cent of skylight area gives excellent results and helps save on lighting & power expenses

Purpose Component	Impacted Design Component
Sector served	Size, storage system, storage conditions, security systems
Customers & services	Entire warehouse design aspects
Value added services (VAS)	VAS area of the warehouse
Products handled	Entire warehouse design document
Product characteristics (SKU details)	Storage & handling systems, VAS area, pallet types & size, refrigeration (for cold storages), ventilation & air-conditioning systems
Product characteristics (inventory norms, throughput)	Size of warehouse, storage system, MHE
KPIs mainly associated with productivity, efficiency, accuracy & scheduling of operations	Most warehouse design aspects with special attention to dock, storage systems, MHE, aisle widths, signage, common facilities, utility services, etc.
Volumes to be handled	Space (not area) requirements, storage systems, MHE, number of docks
Warehouse operation automation	Automation systems, storage system & MHE
Location characteristics	Major warehouse design document
Timeline	Schedule & managing project execution

- **Dock height:** This is a critical component for efficient & safe dock operations. This height is dependent on the bed height of vehicles that are used to move stocks in & out of the warehouse and also the type of dock levellers that are planned. In the Indian context, considering different vehicles types which are in use, the decision regarding dock height should be taken taking these factors into consideration.

#### Equipment used in the warehouse

- **Dock leveller:** A mechanical, hydraulic or even, air bag device can be used to bridge the height gap between the warehouse floor and the vehicle bed. Thus, it is important to select a proper type & model of dock leveller. Another point to be considered here is the selected MHE & its gradeability under maximum load conditions.
- **Other dock equipment components:** These include leveller lip, dock light, dock shelter (in case of refrigerated staging areas), vehicle bumpers, wheel chocks, vehicle restraints, tail gate arrangements, air curtains, strip curtains, etc. A proper selection process ought to be followed to ensure best results at optimum total cost.
- **MHE:** Selection of MHE is probably one of the early decisions to be taken before advancing to detailed warehouse design. The selection of MHE drives many other decisions such as door sizes & their heights, storage system design, aisle widths, dock leveller type, battery charging station designs, pallet types & sizes, etc. Its selection depends on the unit loads (pallet loads), SKU & case details, storage or stacking norms, stacked pallet heights, MHE operators' skill levels, throughput data & calculations, warehouse size, storage system designs, etc. Hence, such a critical decision has to be taken after fully considering all the operational aspects.
- **Types of MHE:** Most of the warehouses use hydraulic pallet trucks (HPT), which are very basic MHEs used for horizontal movement. When the size of the warehouse increases substantially, manual movements using HPT become less efficient. In such a scenario, one has to move to more atomised options such as battery operated pallet trucks (BOPT). A BOPT is used for fast & heavy horizontal unit load movement and requires charging

of batteries at regular intervals. In fact, battery changing is required for all battery-operated MHEs. Once the storage system changes from ground stacked to a multi-level one, one requires other types of MHEs, which can move unit load in a third direction i.e. vertical. For this, stackers, forklifts, reach truck, very narrow aisle (VNA) & similar types of MHEs may be used. MHE is a highly capital-intensive item and more so, when we move from basic equipment to more advanced ones. Hence, such operationally critical & high-capital value items must be selected after a proper analysis & selection process. In India, there are many local & imported ranges of MHEs available, including low-cost Chinese versions.

- **Storage Systems:** This is used to increase the cube utilisation of warehouse space by using different types of storage systems. Vertical space in the warehouse is utilised by resorting to racking and shelving systems. Racks and shelves are mainly assembled steel components designed & manufactured to suit specific storage combinations. The most common & widely used system is the selective pallet rack (SPR) where 100 per cent selectivity is possible. Systems such as double deep, live (flow) pallet, drive-in, drive-through, mobile rack, satellite (shuttle) are available and are offered by many manufacturers.
- **Other equipment & systems:** These include doors, windows, signage, public address (PA) & building management systems (BMS), value-added services area, other small equipment for product handling, weighing scales, pallets, cartons, packaging equipment, etc.

#### Services

The services required in a warehouse include electrical, air-conditioning, ventilation, refrigeration (in case of cold storage), communications and connectivity, warehouse management system, water supply, drainage, fire protection, access control, etc. It is necessary to design these systems for their correct & intended use and optimised operations.

#### Other aspects

The other aspects worth mentioning here while finalising warehouse design include master planning of the entire plot area, vehicle or truck flow, people flow,

safety & security of people; employees; stocks, gate operations, vehicle and truck parking area, driver's facility, pathways, cafeteria, change rooms, lockers, toilets and washrooms, etc.

#### Location aspects

Location aspects would include master plan components, wind & rain direction, entry and exit gate locations, storm water, road widths and landscaping spaces.

#### Sizing of warehouse

How much to build is a million dollar question. If more is built, it adds on capital & operating costs and if less is built, then it affects operations & business. So optimum size is what one must always look for. Some factors that impact warehouse size are throughput, inventory levels, SKU profiles, ordering profile & order cycles, types of storage system and material handling system. A warehouse could be absolutely flat, which will cover more footprint for a given volumes. On the other hand, it can be slender as well for handling the same volumes. Land cost, investment on construction & operating costs vary according to this flatness & slenderness of the warehouse. An optimum mix of the flat & slender profile offers maximum operational efficiencies & effectiveness and can be achieved through rigorous calculations, simulation & statistical modelling.

#### SERVING A PURPOSE

A proper selection of the above items will create our 'design document'. A purpose built warehouse is not ready unless we properly put these jigsaw pieces together to form a complete picture. It is not ready until and unless all the aspects of our 'purpose document' are addressed by corresponding 'design documents'.

To fulfill every purpose, a corresponding design component has to be addressed. A warehouse thus designed and built as per its intended purpose is bound to impact operational efficiency, throughput, cube utilisation and eventually, investments. A well-managed warehouse fulfills customers' KPIs and keeps him satisfied. Instead of wasting investments on land and warehouse buildings, which are not built to purpose, it is always advisable to define its purposes, design it to suit those purposes and build it as per these designs. Build to purpose & continue operating safely, efficiently and optimally! ■

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