Warehousing and Physical Stock Management

Common Terms in Warehousing

Stock Keeping Unit (SKU)	A unique code or nomenclature that designates a single line item of a larger consignment. SKUs may be tied to a specific production run or expiration date, and may denote only a product of specific characteristics. A single storage facility with multiple SKUs will require very different handling procedures than a storage facility with few SKUs.
Inventory Unit	The lowest unit at which stored cargo items may be counted at. An inventory unit may be an individual item (example: blanket), storage container (example: bottle of pills) or kit.
Handling Unit	The lowest unit at which a stored cargo item is handled. In the context of a warehouse, the handling unit may be a carton that contains many inventory units. A handling unit may be a single unit, or an entire pallet.
Material Handling Equipment (MHE)	MHE is any form of mechanical equipment used to facilitate the loading and offloading of cargo, or the movement of cargo around an open space such as a port or a warehouse. MHE includes forklifts, cranes, pallet jacks, and more.
Pick Order	The order generated by a requestor and communicated to a warehouse indicating the quantity and type of SKUs to be pulled from inventory and shipped.
First In / First Out (FIFO)	An inventory and asset management system in which the oldest received inventory items on hand are the first removed from inventory.
First Expired / First Out (FEFO)	An inventory and asset management system that emphasizes and the movement of items based on their relative expiration dates.
Non-Food Item (NFI)	Any stored item that is not food in nature. In the humanitarian context, NFI items usually refer to durable, non-perishable items such as household and shelter materials. NFI management in humanitarian settings usually does not require advanced storage solutions, unlike storage of medicines or medical consumables which may require temperature controls.

Warehousing Strategies

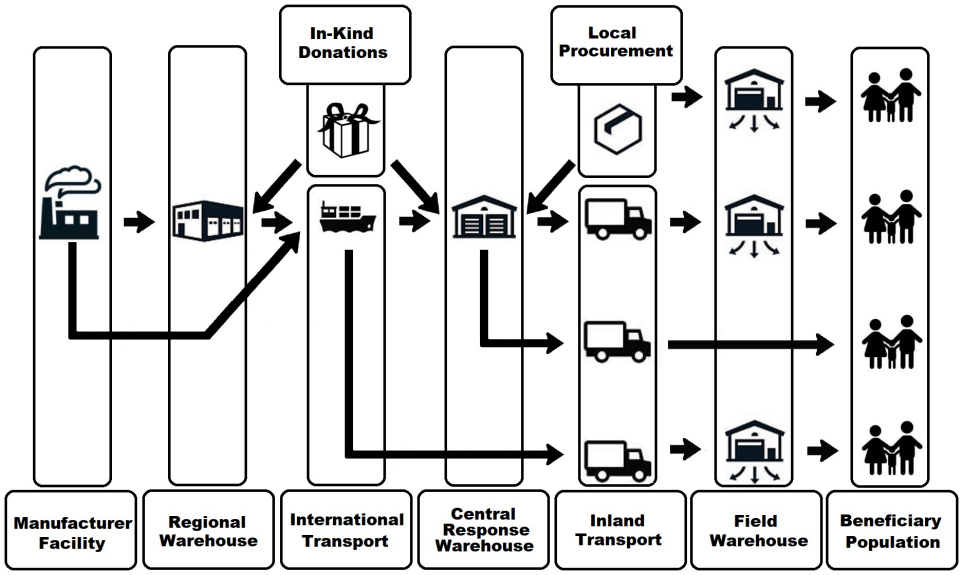
> ‘A warehouse is a planned space for the storage and handling of goods and material.’ (Fritz Institute)

The overall warehousing needs of a humanitarian organisation are generally specific to the needs of individual response activities and the overall objectives of the organisation itself.

Organisations that deal with large volumes of non-perishable goods may need to have multiple warehouses in multiple locations, while organisations that focus on targeted special interventions – such as psychosocial programming – may have very limited need for a detailed warehousing strategy and may choose to procure and deliver directly from vendors as required by the project. Beyond just anticipated volumes of goods, special storage needs will also dictate a warehousing strategy; managing medical commodities requires far more detailed stock management and possibly specialised storage conditions, while durable non-food items (NFIs) may hardly need anything more than basic protection from the elements.

In general, humanitarian aid agency's follow a model for delivering goods to affected beneficiary populations similar to commercial distribution networks, comprised of international and local warehouse facilities that serve as consolidation points, feeder facilities and last mile distribution points.

Example: Overview of a general humanitarian supply chain and warehousing needs.



Regional/International Warehouses

Many international humanitarian response organisations have adopted a strategy of pre-positioning relief supplies in large warehouses not located in the countries of response operation, usually located in one or more strategic regional locations. The development of regional warehouses as lead to a general reduction in time required to respond to rapid-onset emergencies, as well as promotes a more reliable and consistent supply of physical relief items for countries of operation located around the region served by the warehouse.

An international or regional warehouse serves as consolidation point for items as they are received from vendors, donors or partners, enabling humanitarian response organisations to inspect, kit, segregate, repackage, or otherwise prepare cargo for further onward movement. In doing so, regional and international warehouses function as both pre-positioning facilities – holding cargo in case of a rapid unforeseen emergency – and as a feeder facilities – warehouses that slowly resupply warehouses further down the supply chain.

Though many agencies have adopted the regional facility strategy, regional warehouses should not be considered an automatic or default solution. Maintaining a large warehouse - especially one in a remote location not necessarily in the same country as an agencies headquarters – can be quite expensive, and requires additional staffing and time to ensure basic standards are met

and the facility properly functions. If an agency is not prepared to commit to paying for multiple years of storage in a remote location, or cannot support the technical oversight or man-hours associated with the proper running of a facility, the agency may choose to completely outsource its regional warehouse management, or forego a regional response warehouse altogether.

Positioning a Regional Warehouse

When deciding on the location of a regional warehouse, the following points should be considered:

- Readily available access to a high volume of intermodal international transport – Is the warehouse near seaports and airports of sufficient size and throughput capacity?
- Relative location to the area of response – Does the region have sufficient response activities and does the location match the overall area of planned intervention?
- The nature of planned interventions – Will the warehouse serve rapid response activities? Or will the warehouse only feed into longer ongoing activities?
- Political climate of the country – Is the government of the country in which the regional warehouse located stable and not prone to conflict, ouster or drastically changing policies?
- Economic feasibility – Is operating in the country cost effective? Are there incentives such as free trade zones or humanitarian exemptions that reduce costs of international operations?
- Access the correct amenities – Does the location have facilities of the right size and quality required? Is there need for climate controlled or bonded storage?
- Access to sufficient technical support – Are there skilled labourers/companies readily available on the market who can manage and conduct special tasks like repairs?

Any of the above mentioned points can have adverse effects on the ability of a regional warehouse to perform its core functions.

Operations of a Regional / International Warehouse

Regional/international warehouses can be purpose built or purpose designed facilities operated by permanent staff that has been trained in all the areas necessary to run an efficient facility, or stock can be held utilising some version of a third-party logistics provider (3PL) staff and facilities. Ideally, any regional or international warehouse would use computer-based inventory management tools, with software to help in the planning and management of the warehouse. The operating environment of a primary regional or international warehouse used for pre-positioning should typically be relatively stable, and overall attention focused on the efficient and cost-effective warehouse operation. Numerous organisations have centralised pre-positioning facilities strategically located globally. Some of these offer extended services to other humanitarian organisations on a cost-plus operating charges basis, such as the United Nations Humanitarian Response Depot (UNHRD) Network.

Central Warehouse – Area of Response

The need and number of warehouses required in an area of response depends on volume and type of activities undertaken and locations of operation. Many response organisations prefer to keep at least one central warehouse in a country or area of response.

A central warehouse in the area of response is typically in either the capital city of the country of response, or in a major commercial hub within the country of response with sufficient

infrastructure. The ultimate location of the central warehouse can be anywhere, insofar as it meets the needs of the organisation and the response objectives. In large areas of response, or in large activities, organisations may want a large warehouse in more than one location. The general position of a large central warehouse usually includes its relative proximity to sea and airports, manufacturing facilities, highly skilled or specialised labour or services, and readily available in-country transport services. Central warehouses can be directly managed by the agency, including staffing, rent and security, however in contexts with sufficient commercial activities, a central warehouse may be contracted out to a third-party provider.

The central warehouse serves as the primary reception point for goods flowing into a country, as well as a consolidation point for goods purchased locally. The size of a central warehouse depends on the anticipated volumes of goods themselves, the expected throughput of cargo, and the ancillary activities such as kitting that may occur on site. The overall purpose of a centralised warehouse strategy would be to provide sufficient and controlled flow of relief items to more remote or harder to access locations, keeping enough on hand to meet demand at all times. Some organisations may wish to forego a central warehouse strategy all together in lieu of arranging direct deliveries from vendors or international ports of entry to field warehouses or beneficiary distribution sites.

Field Warehouses

Field level warehouses are another strategy many response organisations have adopted. A field level warehouse is usually towards the end of the supply chain, near the last point of distribution to the beneficiary. Field warehouses can come in a variety of formats, ranging from tents and mobile soft sided structures to small hard sided structures. Some field warehouses might be just as large as a central facility depending on need; what defines a field facility is its proximity to programmatic activities and its role as the last stop en route to beneficiaries.

Field level warehouses usually do not have same level of built up infrastructure as central or international warehouses. Storage conditions at the field level are usually limited at best, and significant improvement might be required for special storage such as temperature-controlled requirements. Security in field level warehouses is also a primary concern, and additional infrastructure such as built up fences and additional guard services may be required. Cargo will likely be moved and stacked by hand with limited storage equipment such as shelving available.

The warehouse work force may be casual labour that has never worked in a warehouse before, while and the inventory system is more likely to be paper based. Often, the situation while setting up a field level warehouse initially chaotic, sometimes dangerous and coupled with a humanitarian need which may be very urgent. The management style must therefore be practical and action oriented with a focus on making the humanitarian goods available as quickly and efficiently as possible, while remaining accountable at the same time.

Storage Arrangements

When approaching warehousing, either at an international or response level, there are a variety of options available. Some options – such as government partnerships or temporary structures – make sense for short term or emergency contexts, while larger more sophisticated warehouse solutions might require long term investment and substantial resources over time. Below some of the solutions available to humanitarian agencies.

Self-Owned / Self-Managed Storage – Many humanitarian agencies with long term strategies

and well-defined response plans choose to run their own warehouse facilities on a permanent basis. Self-managed solutions include owning an entire warehouse structure and the ground surrounding it, owning a warehouse structure but leasing the grounds upon which it's built, or renting or leasing an entire warehouse/storage facility and the grounds surrounding it.

Self-managed warehouses can bring total control to an aid agency, but come with their own challenges:

- Needing to identify and manage physical space.
- Identifying, training and managing personnel.
- Assuming most or all cost and risk associated with running the facility.
- Establishing and adhering to warehousing and stock management policies.

Due to the nature of most humanitarian contexts, agencies tend to own or operate their own facilities in the affected countries. As such, humanitarian agencies focus on and develop strategies largely for country and field level warehouses, sometimes with an emphasis on the lowest operating parameters. Agencies may choose to self-own or self-manage larger regional or international warehouses too, however this comes with increased complexity and operational knowledge.

Commercial – Commercial rented or leased warehousing space can be a very attractive option for many agencies, either for rapid short-term solutions or for remotely managed facilities. Renting commercial space brings several advantages:

- Permanent storage structures already built.
- MHE and racking/storage equipment already installed.
- Advanced warehouse management software may already be in place.
- Warehouse workers already trained and readily available.
- Security precautions already taken.
- Flexibility.

Storage with a commercial third-party provider can vary based on contract type; humanitarian agencies may wish to rent an entire warehouse facility for themselves, or they may wish to only pay for the physical space inside a warehouse that they use. The nature of billing for commercial warehouses varies between contracts as well, but the following rates are common:

- In and out charges per pallet or cubic meter.
- Storage rate per day/week/month, charged per pallet position occupied or cubic meter.
- Packaging and labelling fees.
- Offloading/Loading charges per vehicle.
- Monthly/annual security and insurance charges.

Buying into a warehouse arrangement – especially one managed by a large international company is a good way of increasing covered storage space quickly, and is useful for storage sites in regional or international settings where permanent employees of the respective aid agencies are not based. Commercial warehouse solutions tend to only be useful in more developed contexts, or areas not prone to civil unrest. Commercial warehouse providers are also not humanitarians by nature, and may engage in activities that humanitarian organisations disagree with, such as support to military activities. Each of these factors will need to be considered by agencies entering a commercial option.

Government or State Facilities – Government or state-run facilities include any storage situation in which a state or acting agent on behalf of as state manages part or all of a storage facility. Storage in customs facilities at ports, harbours, airports, and cross border transit

depots will be government managed or run, and humanitarian cargo passing through such storage facilities is quite common. Some humanitarian organisations may choose to partner with local and national governments in non-customs or security settings, utilising government storage and/or augmenting government capacity through equipment and training. When partnering with governments, agencies must balance the anticipated capacities of the government in question as well as the need for impartiality and neutrality. Such decisions are entirely up to the mandates and tolerance thresholds of the individual agencies who may choose to do so.

Partner/Common Storage Facilities – Some humanitarian agencies may wish to participate in communal or partner managed common storage options, such as those offered by Logistics Cluster partners in field settings or the United Nations Humanitarian Response Depot Network in key and strategic regional locations. Humanitarian agencies may also wish to enter into storage agreements between each other, however this typically requires individual agencies reaching contractual terms on risks and liabilities of each. Partner storage agreements might be extremely useful in the early days of an emergency, when warehouse space is limited or agencies may only have a limited presence of days or weeks at a time.

Types of Warehouse Space

Within the different storage arrangements available to partners, there are different functions that each of these facilities may provide. Some of these functions might include:

- **Transit** - for temporary storage of goods destined for different locations and need storage for a very short time.
- **Pre-positioning** – stock meant for unknown emergencies, usually sitting for long periods of times before being called forward. Stock in these facilities is usually designed with long term storage in mind.
- **Bonded Storage** – for storage of goods whose duty is unpaid and especially where the goods are destined to another country. Pre-positioned stock is often held in bonded storage to facilitate export. Customs holding facilities are usually bonded, but private companies can be certified bonded as well.
- **Open Storage** – storage contained in the open air, usually in a secure area. Not ideal for perishable products. In emergencies, sometimes open storage is the only alternative.
- **Temporary Structures** – usually capable of being established quickly in areas where regular permanent storage solutions aren't available. Temporary structures might include tents or Mobile Storage Unites (MSUs).

Warehouse Management

Once a warehouse or storage location has been selected meeting the needs of the humanitarian organisation, and the overall response plan, and the facility has been fully restored or renovated to match the storage requirements, agencies will have the opportunity to design the physical layout of the warehouse space and any associated MHE or storage aids. It is important to understand the basics of a warehouse layout upfront to avoid problems later.

Physical Warehouse Layout

A proper warehouse layout should not impede the physical flow of work, increase the risk of damage to items, or impact physical safety of any persons in or around the warehouse.

Warehouses ideally follow the 70/30 rule – around 70% of the floor space of a warehouse will

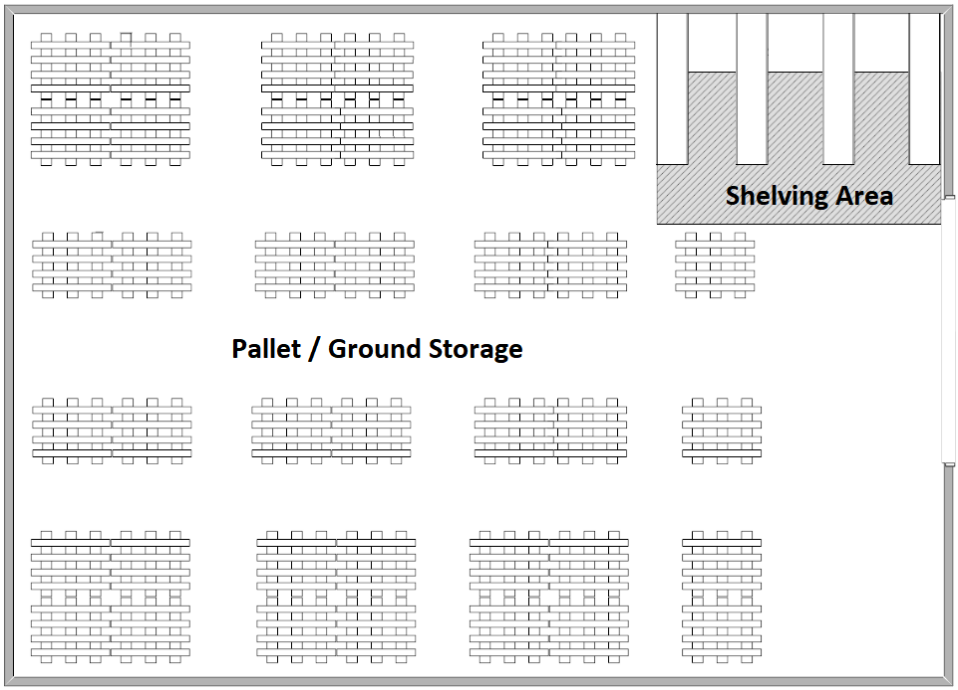
typically be used for storage of physical cargo, while around 30% will be open space for movement and work. The percentages are of used floor space are only guidelines, and space utilisation can be slightly more as needed. A warehouse should never be so full that cargo cannot be accessed, or persons cannot walk around safely inside. All cargo storage should be clearly visible and easy to navigate, and any person in a warehouse should be able to quickly identify locations of items and conduct piece counts with minimum effort.

Warehouses are usually arranged in easy to navigate grid like patterns, with “lanes,” “aisles,” and “rows” - open spaces between racks, rows and stacks of items that enable the free flow of people cargo and MHE. The width of aisles and rows depends on context; lanes in small storage facilities utilising ground stacking and no MHE should be .5 – 1 meter wide to enable access to human movement, while lanes in a large warehouse with racking may be up to 4-5 meters wide to enable access to forklifts or hand trucks. Lanes and aisles should be free from debris or cargo that could block the movement of people or handling equipment. There should be what is known as a “fire lane” – a free and open space between cargo and walls of a suggested 40 cm or the safest available space through which an adult human can move to enable quick exit. Exits in a warehouse should never blocked, and in large commercial facilities exits should be clearly marked.

Cargo must never be pushed up against walls or touching ceilings. In addition to making accessing cargo difficult, stored items touching the sides of structures runs a greater risk of mould or water damage, and cargo touching the ceiling can be an indication of cargo stored at unsafe heights. It is also advisable to keep a space at the loading/offloading areas of the warehouse to facilitate handling of cargo as it comes into/exits the facility. The size of the open space near loading areas depends on the size of the warehouse and anticipated activities – small facilities may only need a few square meters to manage sorting, while large facilities may need whole kitting arrangements.

For smaller remote warehouses or mobile storage units (MSUs) -Small field warehouses are likely going to be stocked and managed completely by hand. Proper layout can help ease the hand management process. Heavy or bulky items may be stored closer to exits of storage units to minimise efforts to manually move, while frequently used items should be moved closer to the front of the storage site to minimise distance required for porters to manually load/offload.

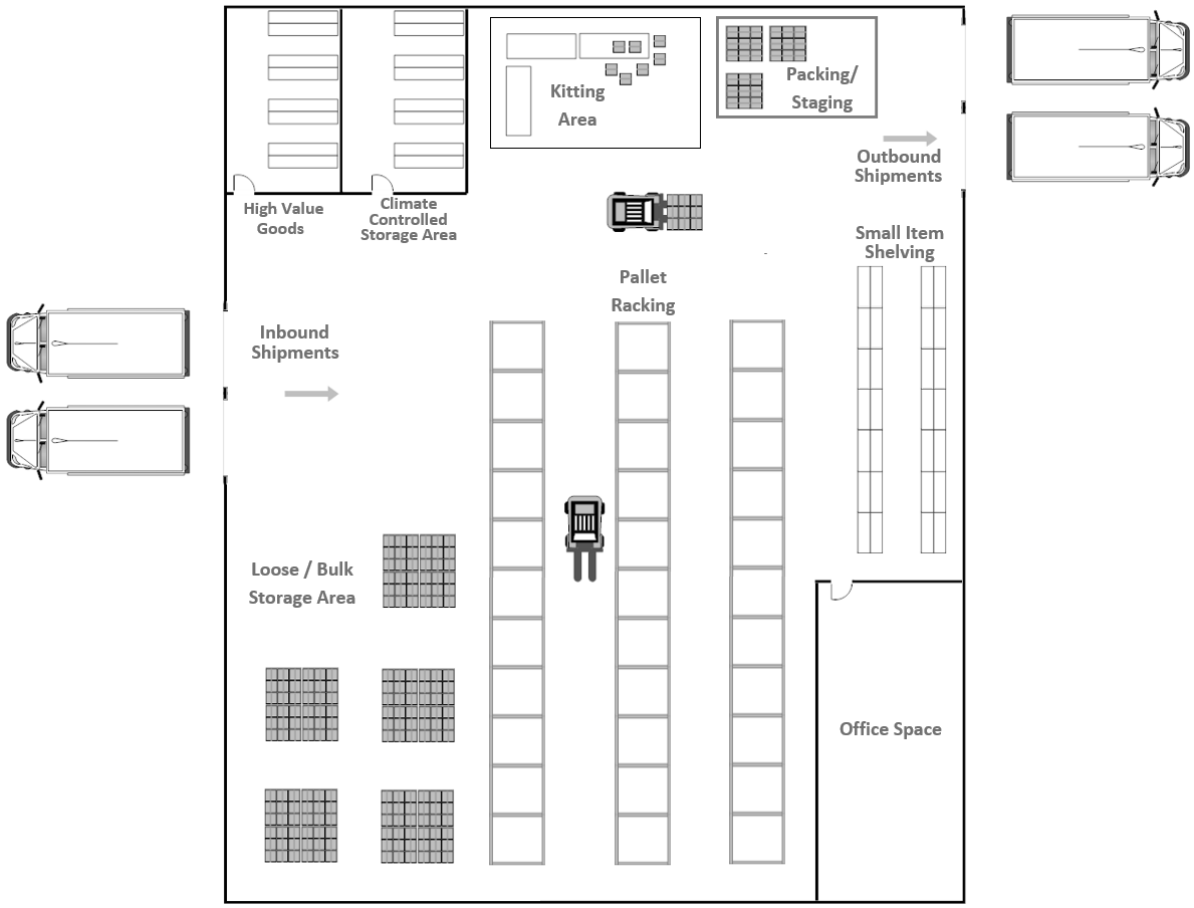
Example small field storage facility with ground stacking:



Larger Built-up Warehouses – Larger, more built up warehouses and storage facilities have a variety of layout and space management options. The overall need for the various components of a warehouse are dependent on the needs of the agency and the physical features of the available space. Some of the things aid agencies may wish to consider when looking at larger warehouses might include:

- Kitting areas identified and clearly demarcated. Kitting can occur inside the facility or outside the facility, depending on weather and available space.
- (Potentially) offloading and loading will occur in a different loading bays to facilitate the flow of cargo.
- Clearly defined staging areas for consolidation, loading and offloading.
- Climate controlled and other lockable facilities built or converted inside the warehouse, out of the way of the main warehouse flow.
- If any racking, shelving and bulk storage configurations are used at the same time, they are separated in clearly demarcated areas.
- If handling equipment such as forklifts are used, there are clearly defined areas where the forklift drives, ideally marked on the ground in visible paint or tape.
- Pre-defined parking and storage spaces for MHE. If MHE is using electricity, parking spots can also be charging locations.
- Use of drive up loading bays. Bays should be kept free from debris. Recessed bays prevented from flooding with proper drainage, and ramps must be adequate to fit and hold trucks.
- Roll up or swinging doors big enough to accommodate any handing equipment or cargo size.

Example warehouse floor plan of a larger warehouse operation:



Zonal Storage

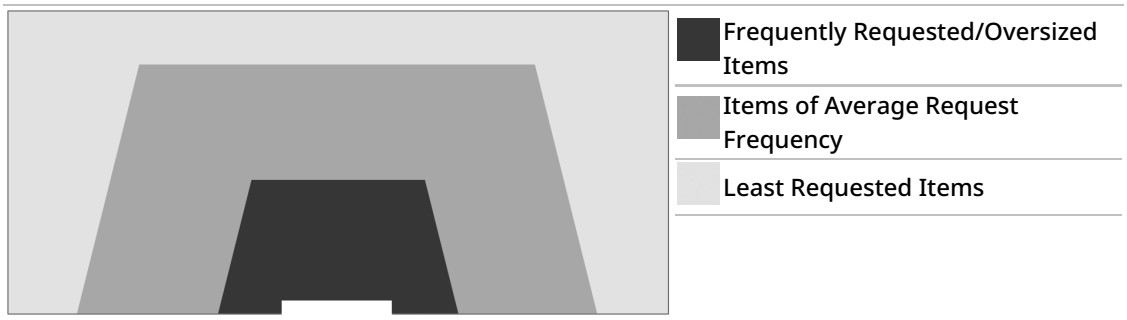
Irrespective of the structure type or the size, space planners should consider planning the physical location of stored items relative to the amount of effort required to move or load them, including:

- Their size / weight
- Their frequency of usage

SKUs that have the highest volume of turn over - meaning the highest numbers of in and outs - should be stored closer to the cargo loading points of the warehouse or storage facility. The time and effort saved when moving these items between storage location and points of loading/unloading will have long term impacts on the overall timeliness of operations. Inversely, less frequently used items should be stored further away from the storage facility points of loading.

An exception to storing infrequently used cargo in the rear of a facility is planning on storing extremely heavy or difficult to move items near the front of a warehouse or storage facility, even if they are used only rarely. Items like machine parts or generators might be cumbersome or even dangerous to move around inside of a storage site, and keeping them closest to the exit is an advisable strategy. This is especially true for storage locations that are entirely managed by hand - planners should think of the physical capabilities and safety of loaders.

Storage Space Zonal Plan:



Site Selection Planning

There are many things to consider while selecting a location and/or a structure in which to establish a warehouse/storage facility. Rapid assessment templates for identifying storage space can also be found in the Assessments and Planning section of this guide.

Anticipated Cargo Needs

When planning a new warehouse space, organisations should consider what the anticipated cargo needs will be. Cargo needs will at least include the maximum anticipated volume at any given time, however they should also factor for special handling requirements or special activities, such as kitting. Understanding the full scope of the warehouse may require consultations between program and logistics personnel, and a mapping of programmatic activities over the coming period of time. Even a relatively small volume of cargo may require a large area in which to operate.

When anticipating the cargo and relief item storage needs, some of the following items should be considered:

- Total anticipated volume of cargo for the specific storage location.
- Numbers and types of independent types of goods (SKUs) needing to be accounted for.
- Interior space adequate for the anticipated flow of work.
- Need for handling equipment (MHE) for cargo items – MHE parking spaces, recharging, etc.
- Duration stored goods will stay for / the duration the storage site may be required for.
- Need for ancillary activities – repacking, labelling, kitting, break bulk, etc.
- Speed at which throughput/ancillary activities may be required – multiple loading bays, large dispatch area, etc.
- Need for special storage - cold chain, dangerous goods, etc.
- Additional planned buffer stock required.

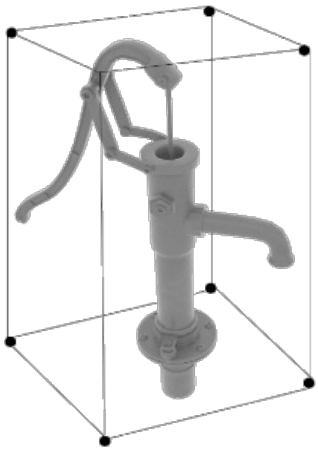
More information on identifying and estimating cargo can be found in the sectionFinding Cargo Dimensions.

Irregular and Special Storage

As agencies attempt to plan out space need in storage locations, they may encounter bulky or irregular items. In addition to planning generic outside dimensions, space planners should also estimate the fully required volume to adequately store an item, not just the outside

dimensions.

Irregular Shapes - Some irregular items, such as mechanical or farm equipment may have complex physical attributes that make space planning hard. When looking at highly irregular shapes, planners should consider the outside measurement of only the longest, widest and tallest parts of the item, as those are the parts that will come in contact with other stored items in a warehouse. To do this, planers should imagine an invisible box that is barely large enough to fit the irregular item, and use the "edges" of the "box" to calculate the total required space. In this way, the overall space requirement may actually be larger than they first appear.



Nested Cargo – Some cargo items can be neatly "nested," meaning that they can rest inside of or occupy space inside of each other. Buckets – a common humanitarian item – can fit inside one another, taking up considerably less space when stored appropriately. When planning space, organisations should account for nested storage by measuring the outer dimensions of the items while stacked/nested, and not the outer dimensions of the individual unit. In this way, overall space requirement may actually be less than they first appear.



Physical Storage Space Aspects

Once the anticipated project and volume needs are established, organisations planning storage should review and assess the physical aspects and amenities associated with a potential storage space. Though there may be enough interior space to accommodate purely volumetric calculation, warehouses and storage sites may be lacking key infrastructure, or require substantial improvement to meet operational needs. A non-comprehensive list of physical space needs might include:

Physical Terrain:

- Ample space for trucks to enter, park, load/offload and turn around.
- Warehouse/storage site is not prone to flooding or other extreme weather events.
- Impact on the soil/sand/ground in the truck parking/offloading areas and kitting areas during routine activities – will the ground remain unaffected, or will improvement and maintenance be required.

Utilities/Amenities:

- Location/Building has access to basic unities - electricity, water, communications.
- Location has bathroom facilities on site.
- If required, the storage space has separated compartments for different storage areas/different storage needs – climate controlled, secured areas, etc.
- A usable office space of appropriate size.
- The capacity to refuel trucks – does the site have existing refuelling tanks, or do tanks need to be installed.
- An employee break/rest area.

- Prayer rooms (if required).

Structures:

- Proposed warehouse site has an existing physical structure.
- Existing structure and surrounding grounds are in good condition – if not, consider required upgrades.
- If required, location has drive-up loading bays for vehicles.
- Location has adequate walls, doors, and ceilings – if not consider cost and complexity of required repairs.
- If required, location has existing racking/shelving.
- Storage space floors smooth and free from cracks, and capable of supporting required activities.
- Walls are flat and free from pipes, exposed electrical wiring, support beams or other protrusions that might impact storage.
- Structure is free from any perforations that may lead to water or pests coming into the facility.
- There is proper drainage around structure – if not, consider cost and complexity of making drainage.

General Storage Location

The geographic location of the proposed site is also important – a poorly situated site may impact costs and time to adequately delivery humanitarian aid, and generally reduce opportunity to access markets and services. General things to consider when selecting a storage site are its proximity to key things, such as:

- Proposed site location is near the primary areas of intended use.
    - If in a capital city, consider the need for the warehouse to be near the airport/seaport.
    - If in a field setting, consider the need for the warehouse to near the intended distribution sites.
- Proposed storage site is near major arterial roads used for transport.
- Proposed location as easy access to transporters and casual labour.
- Storage facility will be easily accessed by organisation personnel.

Safety and Security

Overall safety concerns should be included in planned warehouse and storage space. Safety measures might include the physical components of a warehouse, but also the prevailing security surrounding the proposed location. When considering safety needs of a proposed site, organisations should also include security personnel in the planning process.

- Physical structure has a fire suppression system, and emergency exits – if not consider costs of installing fire suppression equipment.
- Storage location has built up walls/fences and access gates.
- Storage location has guard post and guard quarters, and possibly available guard service – many storage sites will require agencies to contract their own guards.
- Warehouse is not near any known or anticipated major targets - military bases, police stations, government offices, etc.
- Warehouse is not near potential hazards – chemical processing depots, fuel stations, landing strips, etc.

- Area is not known for security incidents in the past.
- Proposed location is not exposed and relatively inconspicuous, if possible.

Facilities Management

Once a facility has been fully selected and is operations begin, agencies will need to continue to maintain, or ensure that the third-party associated with running the facility maintains the physical structure, supporting equipment, and immediate grounds around the facility.

Site Grounds

The grounds around any storage facility should be kept open and free from objects as much as possible; debris, rubble, trash and weeds should be cleared out to avoid damage to vehicles and structures. Exposed wires or pipes should be properly buried or sealed; pipes or electrical equipment that cannot be buried should be well marked, painted red and/or have a secure or caged structure built around them. Drainage ditches should be clean and in working order at all times. Clogged or blocked drainage must be fixed to prevent flooding, and inadequate drainage must be dug if not already available.

Trucks must be able to enter, park, load/offload and depart the facility without difficulty, and ideally, more than one truck should be able to perform work at the same time. There should be adequate room for trucks to turn around in the allocated parking area; even if space is available, equipment or piles of scraps may hinder movement, possibly leading to delays or accidents. The grounds around truck parking and turning areas may need to be graded, paved or gravel/loam laid down to even the surface. An unimproved truck parking and turning space may lead to large grooves or divots in the ground, causing water to pool, mud to form, and vehicles becoming stuck or even damaging their undercarriages. Depending on weather patterns, truck turning and loading/offloading spaces may require continual maintenance seasonally or throughout the year.

Physical Structures

For storage locations of all sizes, there are a number of considerations to be had.

Electricity will be required to operate office equipment, lights and communications equipment. If electricity is not available on site, generators must be installed if possible. Any installed generator will need to be specified to appropriately meet the anticipated power load of the warehouse; and under powered generator will cause equipment failures and require constant maintenance, while an overpowered generator will end up costing more in fuel and maintenance. If a generator is used, agencies must develop a plan for supporting a generator, including having a supply of fuel and spare parts, and identifying how the generator will be maintained and serviced.

If no bathroom facility is available on site, either one will have to be constructed or access to a restroom nearby defined. If the site has no running water, either a water distribution system will need to be installed and water tankered in, or some other form of water will need to be provided for washing. Drinking water should be made available to warehouse workers, and if no tap or purified water is immediately available, bottled water may need to be provided.

There should be space for office work to occur. Any office space should ideally be separated from the main warehouse floor, and have locking doors and drawers. Office spaces should be provided with basic tools, such as a printer, stationary, desks and chairs, electrical sockets,

filing cabinets and internet access wherever possible. Smaller facilities may lack the ability to keep office equipment on site, and as such basic supplies can kept in a locker, or carried with warehouse crews as needed.

Warehouses may require additional ventilation, based on the weather conditions outside and the types of commodities store inside. Many larger warehouses have soffit vents to enable hot air to escape as it rises towards the ceiling. Smaller storage spaces may not have the proper structures to support permanent ventilation, and may need doors open during working hours.

For Mobile Storage Units (MSUs):

MSUs must be properly installed and maintained. Installation of MSUs must be facilitated by someone with experience in the process. Beyond just knowing how to assemble an MSU, MSUs must:

- Be built with either the front or back facing prevailing winds to minimise wind pressure.
- Should not be constructed in a low point, or in a location prone to flooding.
- (Ideally) MSUs Should be built on free standing slabs to elevate the MSU above waters caused by rains or flooding.
- MSUs must be properly secured, lockable from the outside and difficult for anyone to climb under the outer apron.

Damage to physical MSUs such as warping of beams or tearing of vinyl siding must be assessed, and repairs conducted by a knowledgeable person. Cracks or damage to MSU foundations must be repaired quickly to prevent further compromising the structure.

For Built-up Hard Sided Structures:

Damage to physical structure should be addressed and repaired. Cracks or holes in ceilings and walls should be addressed as soon as they are identified. Storage facilities should have solid, locking doors and windows. Windows that are low enough to be easily reached and accessed by an adult human should be covered with bars or grating of some kind.

Storage structures should have adequate inside lighting:

- If ambient lighting isn't sufficient for daytime usage, agencies should consider installing additional lights for daytime use.
- Light should be sufficient for operating at night time. Larger facilities may need extensive lighting installations.

Vector Management

Vectors are defined as rodents, insects, or anything that may spoil or damage stock on hand. Proactive vector control is important; rats and insects don't just impact food – they can also damage anything woven from organic material such as blankets or clothing, and can completely destroy stocks of medical grade consumables. An untreated infestation of can lead to large problems down the road, any identified infestation or pest must be dealt with immediately. Warehouses will need enact some form vector control depending on the nature of the stock, including:

- Fumigation – external companies may be able to be contracted to provide fumigation services.
- Rat traps/glue – placing pre-made traps around the warehouse to capture rodents.
- Keeping warehouse floor clean at all times.
- Removing spoiled/rotten items from the general stock and disposing as soon as possible.

In the event an infestation is identified, records should be taken of the date and type of treatment used. Records can help schedule routine fumigation or product inspection, but also may indicate seasonal problems as well.

Fumigation

The overall need for pest and infestation control depends on the duration, storage conditions and type of commodities stored. Food in particular is sensitive to attracting pests, and agencies specializing in food may have special fumigation schedules. A general best practice is to enact fumigation once every six months, however ideally stock should rotate quickly enough to avoid the need for fumigation. In other instances, fumigation may be required every 3-4 months, or as soon as an infestation is discovered. As a general rule most insect pests under humid tropical conditions can be expected to multiply about 50 every six weeks, meaning an untreated infestation can become a large problem very quickly.

Fumigation can be for an entire warehouse or storage site, or for just one portion of stock, however it is strongly advised to fumigate all perishable SKUs at the same time. Fumigation in storage contexts is usually done using what are called "fumigation sheets" or "gas tight sheets" - large impermeable tarps that cover stored items. When using these fumigation sheets, chemicals specifically used for fumigation are pumped under the edge of the tarp, while the edges of the tarps are weighed down to prevent air movement. Use of these tarps concentrates fumigation efforts into specific areas and maximizes impact.



When undergoing fumigation, workers and managers should always consider the following:

- Fumigation should only be carried out by a trained professional, or a specially licensed company. Agencies requiring fumigation services should enquire with their procurement team about what may be available on the market. At no point should an agency attempt to fumigate themselves without special training!
- Even if fumigation is done under tarps, workers should vacate the storage space until they can safely return, as indicated by a trained professional.
- Proper safety equipment should be used by all persons working with or around fumigation.
- Fumigated items will need to be properly aired out before handling or distribution.

After fumigation, continual inspection may be required. If infestations persist, there may be a need to alter storage or delivery methods. The use of additional liquid based pesticides may be required to spray around the exterior or floor of storage spaces.

Physical Warehouse Maintenance Schedule

Below is a suggested periodic maintenance schedule for warehouse management.

	Clean	Check
Daily	• Floors	• Signs of infestation • Locks
Weekly	• Walls • Sides of racks, shelves, fridges	• In-depth check for pest • Stability of racks, shelves • Exterior lighting systems • Perimeter walls/fences
Monthly	• Stored Items • Roof • Gutter • Truck parking areas • Facility grounds	• Wall cracks • Water leakages • Fire Extinguishers/Sand Buckets • Condition of handling equipment

Warehouse Equipment Maintenance Schedule

All equipment in warehouse facilities - including racking and shelving - will require periodic maintenance. This may include replacing parts, applying lubricants, checking batteries, conducting daily charging or cleaning, or just conducting ongoing inspection to ensure that service equipment and physical holding structures are not displaying signs of damage and distress. Generally, the service schedule for different equipment items will be provided by the manufacturer, however the overall need to conduct daily or weekly inspections may also depend on the size of the warehouse and the overall daily handling requirements. The larger the facility, the more pieces of equipment will likely require maintenance. Additionally, warehouses with high degrees of throughput may also require more regular maintenance. Warehouse managers should develop a maintenance schedule for warehouse equipment breaking down daily, weekly and monthly/yearly service needs, and should also maintain separate logbooks for key pieces of equipment, such as forklifts. Proper tracking of maintenance will increase the lifespan of expensive items, and will increase overall safety of the warehouse environment.

Handling Equipment and Storage Structures

The ways in which cargo is physically stored in a warehouse can dramatically increase usable storage space, increase efficiency, and impact safety. Generally, there a few main categories through which cargo is physically stored and handled.

Shelving

Unlike racks which are used to manage pallet sized loads, shelving used in warehousing is useful for:

- Small, low quantity, loose items – example: vehicle replacement parts.
- Items that are dispensed at small quantities – example: medications.
- High value items – example: computer equipment.

Shelving can easily be constructed in remote field warehouses from local materials, insofar as the local materials can physically support the required stored items. Shelving can also be installed anywhere inside a larger warehouse, however the location should make contextual sense. As an example, shelving may be used as an intermediary stage of order fulfilment; a warehouse may have pallets/large cartons of items small items, but only receive pick orders for low quantities. A reasonable quantity of stock may be moved to pre-defined shelf space to facilitate ease of fulfilling low or item level pick orders. Shelving may require a separated space physically separated from the main warehouse floor; high value items or controlled goods might be better suited stored on shelving in a separate lockable space.

Shelving installations should be ergonomic; shelves should not be so deep that an average height adult cannot reach to the back of the shelf, while shelves should not reach unsafe heights, and if possible, should avoid requiring ladders or stools to reach the top.



Loose Stacking / Ground Storage

Ground storage includes anything that is stored on the floor of a warehouse, often compiled in stacks. Items stored on the ground should never be directly in contact with the warehouse floor; cargo should rest on pallets, or if pallets unavailable, tarpaulin. The general configuration of ground floor stacks will vary based on the storage needs, including:

- The number of different items SKU items that might require accounting.
- The weight of cargo limiting height.
- The physical nature of the cargo; cartons can be evenly stacked, while irregular kits in sacks might be piled like a pyramid.

Ground storage of loose items is quite common in humanitarian settings. Most remote field warehouses are usually too small to accommodate special equipment installation, lack the sufficient infrastructure to properly support MHE, or are temporary structures in nature. A substantial portion of humanitarian relief supplies don't necessarily require advanced handling either. There are several tricks to properly managing stacks of cargo, which are covered in the stock management section of this guide. Humanitarian agencies should resist the urge to use

ground handling in all contexts despite its prevalent nature; commodities such as medication may benefit from not being stacked in a pile. Space planers should also resist the urge to fill up all available space when utilising ground storage; warehouses and storage facilities using ground storage and stacking should still observe the 70/30 rule, keeping lanes and aisles open for safety while making room for loading and offloading.



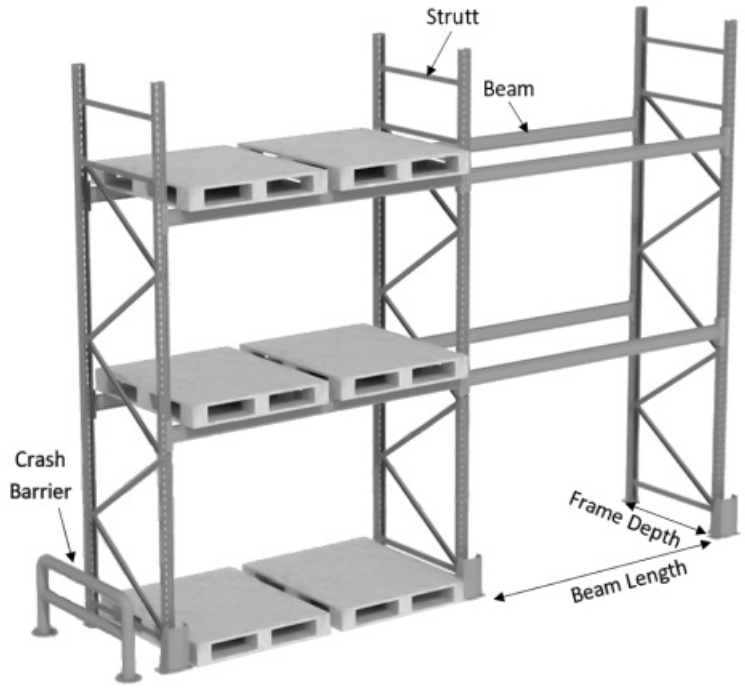
Racking

Warehouse racking – sometimes referred to as pallet racking – is a heavy-duty metal superstructure that is specifically designed to hold large, pallet sized items. Each space where a pallet might fit is referred to as a pallet bay, and pallet bays are generally counted as “pallet positions” when counting warehouse space availability. Palletised cargo, bulky items stored on pallets, or oversized cargo of a specific size can be loaded onto pallet racking using a forklift. The bottom bay can usually be loaded with a pallet jack, or may kept open for hand stacking smaller items. Properly utilised racks can dramatically increase the storage capacity of a warehouse, maximising three-dimensional space to the best of its ability.

Pallet racks can be built to meet the floor plan and storage needs of a warehouse, and the cross beams upon which pallets sit are adjustable to match changing storage height needs. There are different types of racking system that can be considered in accordance with the storage requirements- Very Narrow Aisle (VNA), Selective racking, Drive-in/Drive through, Candiliver, bins, and more - however any agency considering different options should consult with private companies offering installation and management services to better understand the requirements and needs of each. The vertical space between rack cross beams should be reasonable; too high and space is wasted, too low and pallets may become stuck or cannot be properly inserted. An average height is around 1.5 meters, but adjustments may be required based on context of the pallet or items stored. Racks can be built to hold vertical stacks of pallets up to 20 meters tall, however racks should never exceed the safest lifting height of the available forklift on site, nor should they get closer than 2 meters from the ceiling. The horizontal frame depth between rack cross beams should not be wider than the expected pallet type to prevent pallets falling through, and irregular shaped objects may not rest neatly or safely without an additional flat surface resting across the two beams.

Pallet racking systems should only be installed by professional companies with demonstrated experience. Racking systems also require warehouse floors to be sufficiently thick and strong,

as racks will need to be physical bolted to the ground. Racking must be safely operated around and maintained; physical racking structures must not show signs of distress, corrosion or damage. Compromised racking structures can easily collapse causing substantial loss to stored items and serious injury or death. Wherever possible, racks should have some form of physical crash barrier at corners of rows and lanes to prevent damage from handling equipment. Only persons trained and certified to operate a forklift should be engaged in loading and offloading cargo from metal racking structures.



Stacking Frames

Related to pallet racks, stacking frames are pre-made metal super structures that are designed to vertically stack cargo. Unlike pallet racks, stacking frames are free-standing, and are highly customisable and modular.

A single stacking frame is typically cubic in shape, and around 1.5 x 1.5 meters at the base, though sizes vary. Most stacking frames can either be nested into each other when not being used, or even be taken apart, saving space. Stacking frames are useful for:

- Stacking irregularly shaped cargo.
- Warehouse space with constantly changing racking needs.
- Quickly moving entire racks from one place to another.

If loose cargo is stored in the racks, it should be properly braced, secured, or wrapped. The entire frame can be moved by a forklift, and frames can be easily stacked as high as safely possible to take advantage of vertical space. Unfortunately, stacking frames can only be used in warehouses with smooth and stable floors, and where forklifts can safely operate. Many larger facilities use stacking frames to augment racking and shelving, especially for irregular shaped items that cannot be easily stacked otherwise.



Pallets

Pallets have become ubiquitous across transport and warehousing operations globally, however there is a wide variety of sizes, dimensions and physical construction of pallets. Though local warehouse managers may have very little control over the types of pallets that might arrive, an understanding of pallet differences can assist with both space planning, and safe utilisation of racking and MHE.

Pallets generally come in a few standard dimensions. ISO Pallet Standard Dimensions are:

Dimensions (Metric)		Dimensions (Imperial)		Floor Space (Square Meters)	Region Most Used In
W (mm)	L (mm)	W (in)	L (in)		
1016	1219	40	48	1.2	North America
1000	1200	39.37	47.24	1.2	Europe, Asia
1165	1165	45.9	45.9	1.4	Australia
1067	1067	42	42	1.1	North America, Europe, Asia
1100	1100	43.3	43.3	1.2	Asia
800	1200	31.5	47.24	1	Europe

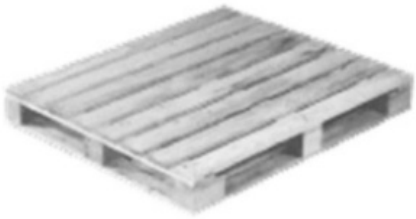
Both the square meters and side dimensions of pallets have implications for how pallets consume floor space in warehouse and trucks, how pallets may fit through doors, and how a pallet might be stored in elevated pallet racking. In addition to differing dimensions, there are

different body constructions and different materials used in building pallets. Common pallet constructions:

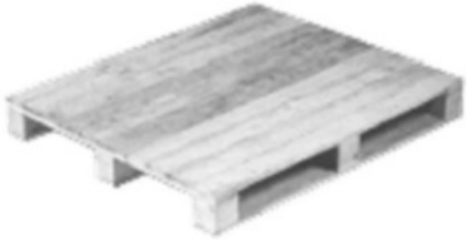
Two-way entry pallet - close boarded, no base board



Four-way entry pallet - perimeter base



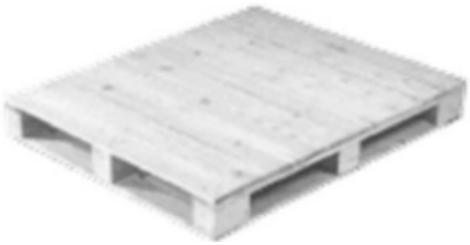
Four-way entry pallet - close boarded, 3 base



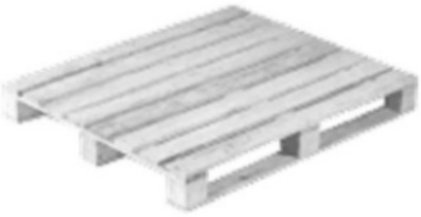
Two-way entry pallet - reversible



Four-way entry pallet - close boarded, perimeter base



Four-way entry pallet - open boarded, 3 base



Four-way entry pallet - wing type



Two-way entry pallet - wing type



- Pallets come in either two-way entry or four-way entry, meaning forks can lift from only two side or all four sides.
- Pallets can be reversible or non-reversible. Non reversible pallets mean only one side has a stable surface upon which cargo can be stored. Non reversible pallets are sometimes called “skids.”

There may also be requirements for pallets to be fumigated, heat treated, or made of plastic.

Pallets are predominantly made of wood, and different wood sources are more prone to infestations that can impact stored goods. Some countries even have regulations prohibiting the use and transportation of untreated wood pallets.

A printable guide to pallet dimensions can be downloaded here.

Material-Handling Equipment (MHE)

Material-Handling Equipment (MHE) is defined as any mechanised or manual machinery to assist with the movement of cargo, either around a warehouse or during the transport process.

Proper use of MHE requires not just the equipment, but the infrastructure to surround it. Pallet jacks, carts and some forklifts will only work on flat, hard and smooth surfaces. Some MHE – forklifts in particular – require external power such as diesel, natural gas or electricity. Without the ability to supply this external power to MHE that requires it, the MHE is essentially useless.

MHE is designed to do heavy lifting; it can help warehouse personnel move heavy loads but can also be very dangerous. Forklifts can easily hurt or kill workers, while a pallet jack may enable workers to move pallets far heavier than they realise, compromising the safety of others. While utilising MHE, warehouse staff should be properly trained and use proper safety equipment.

MHE typically involved in warehousing operations might include:

Forklifts – A mechanised power loader capable of lifting full pallets and heavy equipment. Forklifts come in a variety of sizes to meet a variety of load needs, but generally come with an enclosed cab and a four wheel base. All forklifts will have a hydraulic or chain powered "mast" capable of extending and lifting cargo vertically. The height and lift capacity of the mast depends on the rating of the forklift, and more information can be found from the manual or manufacture website.

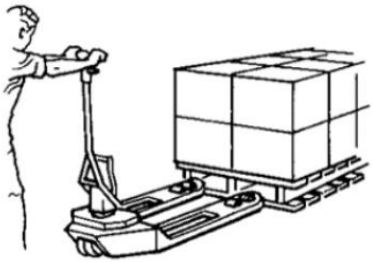


Depending on the make, forklifts can be powered by either battery, compressed gas, or diesel/gasoline. Forklifts are generally designed for either use inside a warehouse with even surfaces, or for all terrain outdoor use.

Before obtaining a forklift, humanitarian agencies should consider:

- The availability of skilled or licensed operators.
- The conditions in which the forklift will operate (indoor or outdoor).
- The available energy source required to operate the forklift.
- The space required to utilize in or around a warehouse.

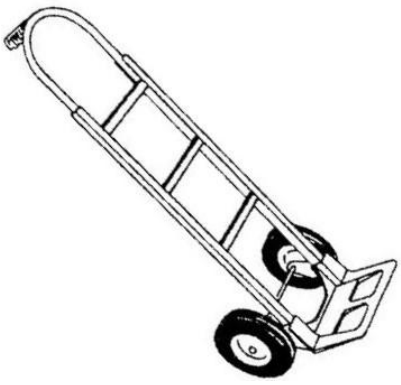
Pallet Jacks – Sturdy, low centre push cart with forks capable of lifting a pallet a few centimetres off the ground. Pallet jacks are typically only powered by hand, using a hydraulic piston to gently lift and lower pallets. Pallet jacks generally require flat surfaces and only work indoors, but can assist with moving large loads quickly and with minimal effort.



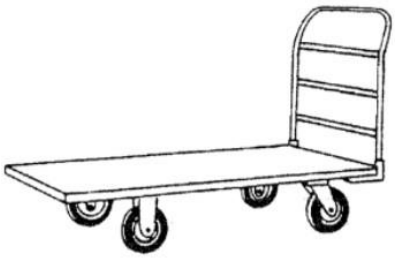
Rolling Warehouse Ladder - Heavy duty, reinforced metal ladder that can be repositioned around a warehouse to enable workers to reach higher shelves/racks. These types of rolling ladders tend to have extremely sturdy and wide steps that enable workers safely and easily carry cartons and other handling units up and down. These types of rolling ladders typically only work on solid, smooth surfaces.



Dollies – Occasionally referred to as hand trucks, dollies allow for moving of stacked cargo without the aid of a pallet. Dollies can be useful for moving relatively small loads, such as a stack of cartons, or a single large item, such as a large roll. Many dollies are designed with heavy duty inflatable ties to assist with operating outdoors.



Push Carts and Others – There are a variety of other simple tools to facilitate the movement of cargo around a warehouse or between mode of transits. A very common tool is a standard push cart, however there are many variations on sizes and components, and users should select the support tools most useful to them.



Basic Support Items – Part of a properly functioning warehouse is the ability perform simple

Basic Support Items – Part of a properly functioning warehouse is the ability perform simple maintenance, conduct routine product inspection and address small issues without having to source external support. Basic tools and support items that should be available in any warehouse include:

- Weighing scales.
- Measuring equipment – tape measure or yard stick.
- Sturdy ladders and step stools.
- Rope, twine, plastic binding, and sturdy wire.
- Packaging tape and duct tape.
- (if required) Plastic pallet wrap.
- Cleaning supplies – broom, bucket, mop.
- Face masks and gloves.
- Ear and eye protection.
- High-visibility vests.
- Heavy-duty pens.
- Note pads and writing materials.
- Safety knife and scissors.
- (if required) Industrial fans.
- Chairs and folding table.

A warehouse working with large MHE and palletised cargo will have some different needs than a small field level warehouse. Additionally, larger facilities may have contracts with professional cleaning or repair companies, while smaller facilities will be purely self-managed. The basic tools and equipment of a warehouse should reflect the daily needs of the operation, and the prevailing environmental conditions. Planners should think through their basic supply needs when establishing a warehouse; an overabundance of basic tools may cost more, but a lack of tools can stop an operation entirely.

The Cargo Handling "Human Element"

In the context of humanitarian field operations, cargo is either heavily or exclusively moved and loaded by hand. Humans are far more versatile than typical MHE, including being able to achieve specialty tasks, however there are also limitations to human labour. Logistics personnel tend to calculate needs of warehouse handling based on the maximum performance of hand loaders and ignore the fact they have limitations like anyone else. When working with or scheduling hand loaded cargo operations, a good practice is to remember:

- Hand loaders require “recharging” periods such as water breaks or meals.
- Resource planners may need to factor prayer times into warehouse activities.
- People get bored with repetition which may increase mistakes.
- The overall efficiency and speed of hand driven operations will go down over the period of a day.

Injury and strain are common in warehouse operations, and human managed operations must acknowledge risks and needs of any tasks.

Warehouse Safety and Security

When establishing any warehouse or storage facility, adequate physical security measures must be enacted. In humanitarian contexts, relief supplies are incredibly attractive to thieves – often humanitarian supplies are in short supply and the chaotic environments and limited infrastructure make theft frequent and hard to trace. Additionally, the overall operating

environment may make responding to injuries caused in the workplace difficult. Aid agencies should have solid measures in place ensure a safe and secure workplace for stored items and workers.

Perimeter Security - Storage facilities should have in-tact perimeter walls or fences. The premiers should not have any gaps or holes, and be high enough and sturdy enough to sufficiently prevent casual thefts or easy access. The perimeter areas should be as shaped as regular as possible to avoid potential blind spots where unauthorised access may occur. If possible, sufficient perimeter lights should be installed, and should function throughout the entire night.

Guard Service - The warehouse ideally should have some form of guard service, either privately managed or sub-contracted through a third-party company. Guard services should have sufficient numbers to cover all hours of the day and night with regular 8-10 hour shifts. Having one or a few live-in guards may mean guards reach fatigue and/or won't be alert at all times, especially throughout the night. Any guard service should also control the flow of visitors and vehicles through use of sign in/out sheets, and possibly even the need to ask for permission before letting outsiders in. Guards should also perform routine perimeter checks, looking to see if doors have been compromised, and responding to any suspicious noise or activities.

Fire Suppression – Warehouse and storage facilities of all sizes should have a fire suppression plan in place. Larger facilities may have professionally installed smoke detector and sprinkler systems in place. Sprinkler systems should be regularly inspected by a licensed company, and in compliance with national laws where required. Smaller or remote warehouses may not have the infrastructure or the available utilities to support an advanced fire suppression system, and should be outfitted with basic fire-fighting tools.

Irrespective of the warehouse space, fire extinguishers should be readily available. Fire extinguishers should be clearly visible to the eye, easily accessible, and be placed at least every 25 meters or closer if required by local regulations. Extinguishers should be inspected every 30 days to ensure the pressure valve reads as in the workable range, and that the canister does not display symptoms of rust or corrosion, and that the hoses are not split or damaged. At least once a year, extinguishers should be pressure tested. If at any time extinguishers do not pass inspection, they should be recharged or replaced as necessary. Consult the owner manuals or supplier for proper gauge readings.

At bare minimum, class A extinguishers should be placed throughout the storage space at the correct intervals, and class B extinguishers should be stored near any place reactive substances or flammable liquid such as fuel are stored. Many field location will also use what are known as "sand buckets" – buckets pre-filled with sand and stationed throughout the facility to also enable rapid suppression of a fire. Both are recommended for remote locations where water may be scarce and proper maintenance of extinguishers may be difficult.

Fire Extinguisher Classes Per Region:

American	European	UK	Australian/Asian	Fuel/Heat Source
Class A	Class A	Class A	Class A	Ordinary combustibles
Class B	Class B	Class B	Class B	Flammable liquids
	Class C	Class C	Class C	Flammable gases
Class C	Unclassified	Unclassified	Class E	Electrical equipment

American	European	UK	Australian/Asian	Fuel/Heat Source
Class D	Class D	Class D	Class D	Combustible metals
Class K	Class F	Class F	Class F	Kitchen Grade (Cooking oil or fat)

Occupational Safety – Warehouse workers should be instructed and encouraged to engage occupational safety in any situation where storage is required. Occupational safety includes:

- High visibility vests worn by warehouse workers and visitors as needed.
- Warehouse workers have sufficient and adequate breaks.
- MHE is properly maintained, and support equipment such as ladders is not compromised or damaged.
- Staff who operate MHE are trained and/or certified for that equipment where required.
- Stocked first aid kits available on site.
- Warehouse workers wear proper protective equipment equivalent to the required working conditions, including gloves, hard hats/helmets, close toed safety shoes, ear and eye protection as required.
- Fire exits are clearly marked.
- Lanes for movement of MHE are clearly marked on the floor.

Situational Safety – As the storage site is established, agency security personnel conduct periodic reviews and follow incidents accordingly. Safety and security assessments of the warehouse and the surrounding areas should be conducted at least once a year, and security incidents occurring on site or in the immediate area should be properly reported in a timely manner.

Physical Storage Guidelines

Irrespective of the size of the warehouse/storage facility or nature of the storage arrangements, there are basic rules humanitarian organisations can use to enhance their physical stock management processes.

In any situation where cargo is stored for any period of time, it is strongly advised that humanitarian warehouse managers utilise both some form of inventory Ledger and a paper stock/stack/bin card system.

An ideal inventory Ledger will be electronically maintained, utilising some form of spreadsheet or special use software. The ledger should be constantly kept up to date, and should be easy to access and understand by any team member responsible for accounting for cargo on site.

Stock/stack/bin cards should be clearly visible from the floor of the warehouse, legible, easy to read, and utilise the local language of operation. Stock/stack/bin cards should match the inventory Ledger.

Stock managers must by default practice FIFO – First In / First Out – unless otherwise required to. Some storage facilities may have large volumes entering and leaving the physical facility, and managers must take care to ensure that old stock is not forgotten or ignored.

Perishable items with expiration dates must be closely tracked and dispatched in accordance with the practice of FEFO - First Expired / First Out. Items with expiration dates less than three months in the future or expired items should flagged and communicated to program staff to ensure they are properly utilised.

Stored cargo must always be separated from the ground, using pallets, tarpaulin, shelving, or racking. Warehouse managers should be constantly motoring the status and condition of stock on hand. All handling units should appear in good condition, and be free from avoidable damage of any kind, including water damage, punctures or rusting. If cartons or items appear to be crushed, punctured or experiencing damage from regular wear and tear, they must be separated, repaired (if possible), and returned to inventory in a manner that prevents future damage.

Stock Counts

There are a variety of methods for conducting physical inventories. Agencies should review different inventory methods, and set up guidelines and time intervals for conducting inventories, including ad-hoc and regularly scheduled annual inventories.

Damaged Items

Throughout the course of managing physical stock, damaged items will be discovered, either as a result of age, expiration, mishandling, or even from items that were defective in the first place. As damage items are discovered, they must be clearly marked and addressed. Some damaged items can be repaired, especially if damage is only to outer packing. An item that is ultimately still usable, but has damaged outer packing can be repacked into new cartons/bags where available, the packaging itself can be taped or sealed. Even if there are no replacement cartons/bags available, the usable items can be stored loose on the racks/shelf/stack and be marked for usage first during the next pick order.

If the core item is ultimately not usable due to extensive damage, spoilage or expiration, the item will need to be separated from the rest stored goods. Damaged goods should be clearly marked, and stored in a separated area. Depending on the severity of the damage, a loss report may need to be generated, including the number of units damaged and the associated values. As damaged items are removed from the general inventory, inventory Ledgers should be fully updated, with damaged items clearly indicated as being deducted from the full inventory count.

Damaged items may need to be returned to a vendor, handed over to third party authorities, or be disposed of.

Expiration Management

Under normal circumstances, warehouses are advised not to accept goods that have less than 6 months expiry period left, and should seek to rotate out items approaching 6 months left before expiring. Warehouse/stock managers should routinely generate regular reports that identifies those items that are due to expire within a user specified period, identifying each SKU, lot, quantity and date of expiry.

General Expiry Management Rules

Ordering Items	Incoming orders that contain expiration dates should be flagged and notified to the warehouse teams, and shared with relevant persons or departments that own the stock.

General Expiry Management Rules

At Reception	All incoming stock items should be inspected for expiration dates at the point of reception.
Ongoing Physical Checks	Checking expiration dates should be part of the physical inventory process, including looking for new expiration dates not already identified in the stock/inventory tracking system.
Items with 1-3 Months Expiry	Persons or departments storing Items with expiration dates should be notified when they reach 1-3 months left until expiration on a weekly or monthly basis, through email or other formal communication.
Items with 0-1 Month Expiry	For items with less than one month until expiration, it is advisable to notify the person or department that owns the stock - either in person or telephone - reminding them of the situation and suggesting that the goods are removed as soon as possible. Multiple reminders may be required.
Expired Goods	Any items that have expired must be segregated from the rest of the stock, and all orders put on hold so that no expired items are accidentally delivered. The person or department that owns the stock must be notified by phone, email or in person, and all proper disposition steps must be followed in accordance with local regulations and organizational policy.

Disposition

As warehouses continue throughout their operations, they will inevitably need to dispose of damaged, expired, recalled, or no longer required goods. Disposition of any item must be done in an ethical, environmentally friendly and legal manner, all in compliance with the internal policies of the organisation managing the facility. Options for disposition:

General Disposition Management Rules

Donation/Resale	Items still in usable condition can be sold or donated to other agencies or local populations in accordance with donor regulations and internal financial policies.
Dispose	Some items can be thrown directly into the trash without concern, such as small quantities of expired food stuffs or cardboard.

General Disposition Management Rules

Destroy	Some items, such as expired medication, harmful chemicals, bulk foodstuffs, and special "dual use" or military grade hardware, may need to be actively destroyed. Many local authorities have regulations on the destruction of these items, and there may even be authorised companies certified in destroying key materials. Agencies should investigate local laws and seek out disposal companies whenever required.
Re-export	Items, such as heavy machinery, may need to be re-exported from the country of operation. Re-exporting of key items may be required by donors and national authorities, or may be just more cost effective than local disposition.

Warehousing Documentation

The documentation requirements for warehousing can be vast, depending on the type of warehouse, regulatory controls over the stock or the facility, the types of commodities stored, or the specific activities of the agency running the facility. Documentation might include inspection reports, fumigation schedules, repairs, import/export documents related to bonded storage and more.

As an overview, most humanitarian agencies will use at least several standard documents across all of their storage operations, including large professional facilities all the way down to field level storage. These documents are essential for the proper audit and tracing of cargo as it flows in and out of agency managed facilities. It is important that this standard document be accurate, and that copies are properly kept – both at the site of operation, and eventually scanned/backed up in another location for wider historical record keeping.

Waybill/Delivery Note – Warehouses will often use common waybills as part of the overall documentation process. Waybills – also sometimes called "delivery notes" - come in many formats, and can represent either domestic or international deliveries. Waybills also tend to be generated by external third-parties, and are used for their own third-party tracking needs. If properly handled, at least one copy of the incoming waybill should stay with the receiving party (warehouse). If a copy cannot be left with the warehouse, the receiving warehouse should attempt to electronically scan a copy of the waybill, including all signatures and notes on it as evidence of delivery.

As cargo leaves the warehouse, waybills will also be generated. Agencies may wish to generate their own agency specific waybills to accompany cargo they pack and load. In other situations, third-party vehicles may generate their own waybills on the spot. In either case, warehouse workers loading cargo onto vehicles must ensure that the information contained on the waybill is accurate. Situations in which organisations may choose to use self-generated waybills may include:

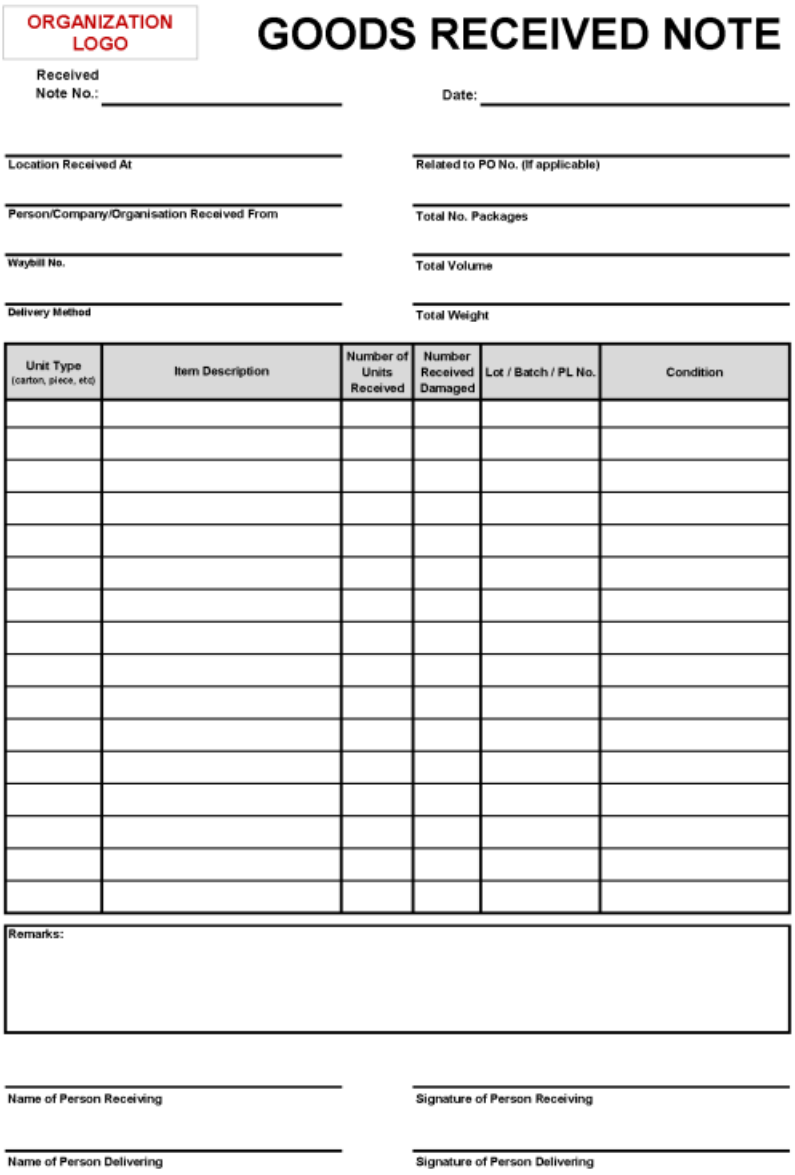
- The vehicle is managed/owned by the agency.
- The destination of the vehicle is a facility or distribution site managed by the agency.
- The contract with the third-party trucking company stipulates that they must use agency specific waybills.

Goods Received Note (GRN) – Some form of GRN is typically generated at the point of reception into a warehouse facility. A GRN will theoretically contain the same information on incoming shipments as a waybill, but a GRN serves a few key functions:

- A GRN may capture information on multiple consignments arriving at once.
- GRNs may take the place of waybills, which may show up with incomplete or incorrect information, or may not come at all.
- GRNs are a form of standardising incoming information in the format most useful to the organisation.
- With proper planning, a GRN can be generated prior to a shipment arrival so warehouse crews know what to expect at the point of offloading.

GRNs should capture dates, locations, persons involved in the transaction and the contents of the cargo entering the warehouse. The exact structure, contents and sequence of a GRN vary depending on needs – as an example, an organisation focused on medical interventions may need to track batch and lot numbers, while an organisation focused on food may choose to track items by the kilogram. Organisations should consider their own internal requirements when drafting a GRN.

Example GRN:



ORGANIZATION LOGO

GOODS RECEIVED NOTE

Received Note No.: _____ Date: _____

Location Received At

Related to PO No. (If applicable)

Person/Company/Organisation Received From

Total No. Packages

Waybill No.

Total Volume

Delivery Method

Total Weight

Unit Type (carton, piece, etc)	Item Description	Number of Units Received	Number Received Damaged	Lot / Batch / PL No.	Condition

Remarks:

Name of Person Receiving

Signature of Person Receiving

Name of Person Delivering

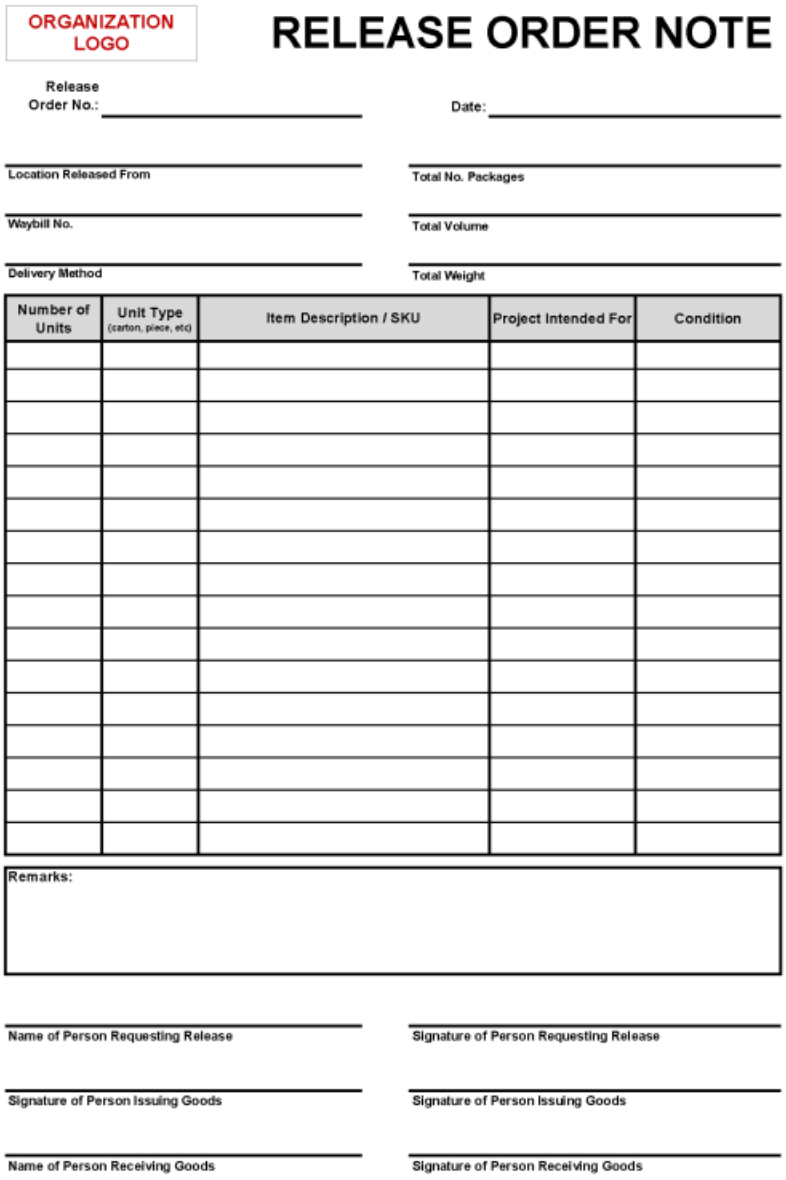
Signature of Person Delivering

Title
Template - Goods Received Note (GRN)
File

Goods Release Note/Stock Release Order – A goods release note serves a similar function as a GRN, however a release note's goal is to capture the information on items as they leave the warehouse. Many organisations choose to use the release note the same as an official pick-order; the requesting party initiates the release note indicating which items are required, and obtains counter signature from the appropriate entity within the organisation. A completed release note will capture the final dates, quantities and persons involved with the loading all the way to the truck. A proper release note will tell a story of what was removed, why and by whom. Many agencies don't actively use release notes, opting to only use waybills at the time

of release or communicating pick-orders via email.

Example Release Order:



ORGANIZATION LOGO

RELEASE ORDER NOTE

Release Order No.: _____ Date: _____

Location Released From _____ Total No. Packages _____

Waybill No. _____ Total Volume _____

Delivery Method _____ Total Weight _____

Number of Units	Unit Type (carton, piece, etc)	Item Description / SKU	Project Intended For	Condition

Remarks:

Name of Person Requesting Release _____ Signature of Person Requesting Release _____

Signature of Person Issuing Goods _____ Signature of Person Issuing Goods _____

Name of Person Receiving Goods _____ Signature of Person Receiving Goods _____

Title
Template - Goods Release Order
File

Stock / Stack / Bin Card– A stock card is a physical, hand written record that stays alongside the corresponding physical cargo inside a warehouse or storage facility. Stock cards are sometimes referred to as “stack cards". The nature of the tracking stock card does not change, however – its purpose is to trace the history of the physical consignment in a quick and easy to reference manner.

Example Stock Card:

ORGANIZATION LOGO

STOCK CARD

ITEM INFORMATION		
ITEM DESCRIPTION	SKU OR PRODUCT CODE	HANDLING UNIT
PROJECT	EXPIRY DATE	BATCH #

DATE	FROM / TO	IN	OUT	BALANCE	REMARKS

This record is not to be destroyed

A stock card should at the bare minimum include:

- The item description.
- Any consignment or procurement relevant information.
- Dates and quantities of cargo items received.
- Dates and quantities of cargo items released.
- Running total balance.

Certain types of goods requiring more meticulous control and analysis, may and need to be tracked using stock cards with specific information, including but not limited to:

- Project or donor earmarks.

- The SKU code (if available).
- Relevant product info - Expiration dates, batch numbers, lot numbers, date of manufacture.
- Reorder threshold.
- Manufacturer references.
- Temperature control requirements.

The stock card has inventory control purposes and is normally managed by the store keeper and updated immediately with each stock movement, including losses. The use of stock cards is imperative in all warehouses, even if the number of articles is short or there is limited rotation. In an ideal context, any warehouse worker on the floor should be able to quickly reference a stock card for the most up to date information on the status and flow that specific good in a warehouse. Quantities and dates on stock card should also match the quantities and dates on a inventory ledger, GRNs and waybills.

For some items, bin cards can be introduced. These may have a similar format as the stock card but are fixed to the bins or shelves where the items are kept. Bin cards track movements of an item stored in a particular bin, shelf or stack. Bin cards are used when big quantities of the same item are stored, requiring some kind of grouping, easing handling, picking and counting processes.

Title
Template - Stock Card
File

Inventory Ledger – A inventory ledger is defined as any system that keeps a running history and current total of all cargo items in a storage facility, as well as all relevant information (expiration dates, donor information, etc). The inventory ledger also tracks inventory transactions (receptions and dispatches) in terms of quantity and value based on the information from the corresponding transaction document. This tool has accounting purposes and is normally managed by an tally clerk or other specialised person focused on accounting for stock, and updated in a regular basis (weekly, monthly).

There is no one standard for a inventory ledger system. Historically, running inventory ledgers were recorded by hand in a book, but modern systems may use computer-based spreadsheets, specially designed software, web-based tracking, and more. The important part is that a warehouse manager can quickly and on-demand find relevant information for any stock item contained in the warehouse through a single centralised system.

Templates of warehouse goods flow documentation can be found in thereference section of this guide.

Goods Flow Management

Planning Reception

In an ideal cargo reception process, incoming shipments should be arranged prior to the delivery vehicle arriving and information on incoming shipments should be communicated to the warehouse team in advance. Ideally, the consignment contents and volume, and possibly even a scanned copy of a packing list and/or waybill will be communicated in advance as well.

- If a single organisation is moving cargo between two warehouses/storage locations it

directly manages, it should be relatively easy to provide advanced delivery information to the receiving location.
- If the warehouse in question is receiving cargo from outside sources such as a vendor, agencies should endeavour to obtain as much information as possible up front.
- In any situation, vehicles approaching the warehouse or storage facility should be instructed to call at least one hour in advance to ensure the warehouse can adequately receive and offload the vehicle. In storage facilities with busy operations, the vehicle will need to be scheduled for a specific time for offloading.

At Cargo Reception

Steps to take at the point of receiving cargo into a warehouse facility include:

- The weights and volumes for each line item are recorded.
- Full count is conducted against the waybill. Discrepancies between the piece count and the waybill or damages should be noted on the waybill.
- All incoming items should be inspected.
    - Items with expiration dates should be recorded on both stock cards and the warehouse ledger, and compared against any purchase orders or packing lists.
    - Dangerous items should be properly recorded on stock cards and the warehouse ledger, properly labelled, and properly segregated according to their storage needs.
- A goods received note (GRN) for the received items is generated.
- Items are placed in appropriate, corresponding place in warehouse/stock room.
- Physical copies of the GRN and Waybill are backed up in a secure location in the office warehouse.
- As item are placed in the warehouse, stock cards should be updated. If no stock card yet exists, a new stock card should be generated.
- Shipments arriving without prior notification may be rejected, depending on security, warehouse capacity and policy of the organisation.
- If damaged or expired items are received, the items should be rejected and returned if possible. If not possible to reject items (internal transfer) damaged or expired items should be separated from the main consignment and placed in a well-marked location, to be repaired or disposed of later.

Planning Dispatch

Much like planning cargo reception, there are steps that warehouses and organisations can take to plan for cargo dispatch as well:

- Cargo dispatch should be planned in advance and communicated to the warehouse.
    - A formal release order should be authorised, and relevant warehouse staff be issued a formal pick order
    - Warehouses should be given time to pull down cargo, compile shipments, and stage for pick up.
- If at any time a dispatch is not possible (damaged, expired items, or item cannot be found) the requesting party should be notified, and the release order modified.
- Vehicles arriving for pick up should be known and scheduled in advance. Vehicles arriving for unplanned cargo pick-ups, or arriving announced for planned cargo pick-ups may be delayed or rejected based on the policy of the managing organisation.

At Cargo Dispatch

Steps to take at the point of releasing cargo from a warehouse facility:

- A physical piece count on the consolidated cargo is conducted to confirm correct number.
- A waybill or a goods released note is generated (if required by the terms of the movement), containing information on the released cargo, dates, and names of person releasing and driver picking cargo up.
- Stock cards and inventory ledger updated with the new piece counts.

Ground Storage / Stacking

Ground storage and stacking is extremely common in humanitarian warehousing operations, especially in field settings near the final distribution points. Storing cargo on the ground and/or in stacks has become a default, largely because the necessary infrastructure to manage special warehouse equipment of storage solutions isn't always available, there are limited skill sets available in the local market, and many of the smaller field warehouses are by nature transitional.

In NFI operations, stacking can be challenging. An average humanitarian program can have dozens of individual SKUs to fulfil a variety of programmatic needs. With an increased number of SKUs, maintaining large piles of cargo can make identifying and managing individual cargo items difficult. There are several mitigation measures agencies can take when faced with generating cargo stacks in a warehouse.

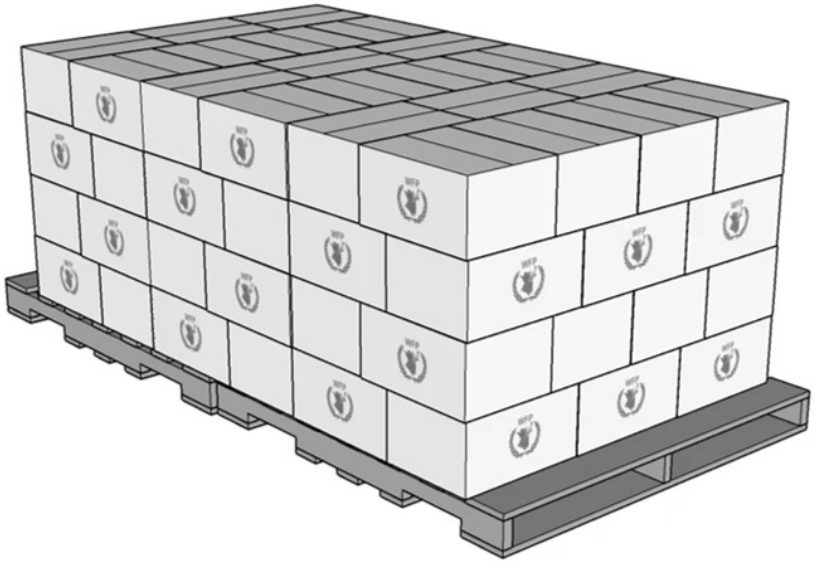
Cargo stored on the ground or in stacks should always be clearly demarcated. A stock card should physically accompany every stored SKU item, and warehouse managers should be able to quickly identify and pick orders without having to sort through piles of non-related items.

Cartons/Bales/Sacks

Wherever possible, stacked cargo should be stored in as uniform manner as possible for quick counting and identification. To facilitate this, warehouse managers must:

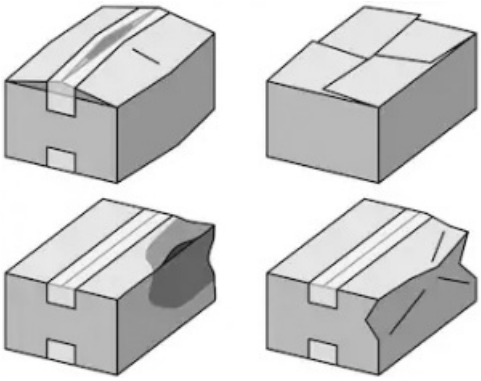
- Identify the pallet configuration; single pallet vs. multiple pallets pushed together on the ground.
- Plan a "layer" system for the stack. Each layer and row of carton/bale/sack should have the same number of handling units.
- Start with a base layer on the lowest level first. Once the lowest later is complete, repeat the second layer in an interlocking pattern for stability.
- Plan stack layers for like item units only. Avoid stacking/layering different items/SKUs.
- Ideally, plan to keep only units from the same consignment in the same stack.
- Cargo should only ever be removed from the top layer to avoid instability.
- Cartons/bales/sacks should not be leaning off the edge of the pallet.

Proper Layered Stack

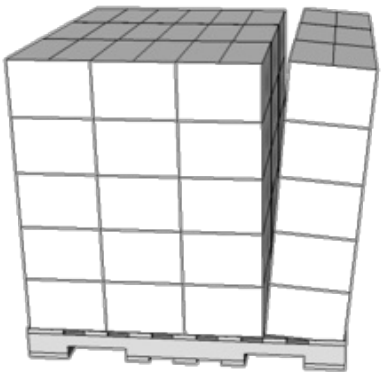


Stacked cargo should be stored as safely as possible. Stacks should be layered in interlocking patterns; a non-interlocking stack is far more likely to fall over and/or put pressure on the lowest layer of cartons. Partially empty cartons should not be stored at the bottom of the stack to avoid the lowest levels from caving in and causing the stack to collapse.

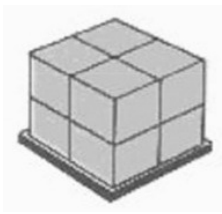
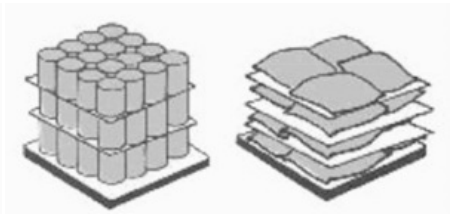
Do Not Use on Lowest Layers



Non-Interlocking Stack

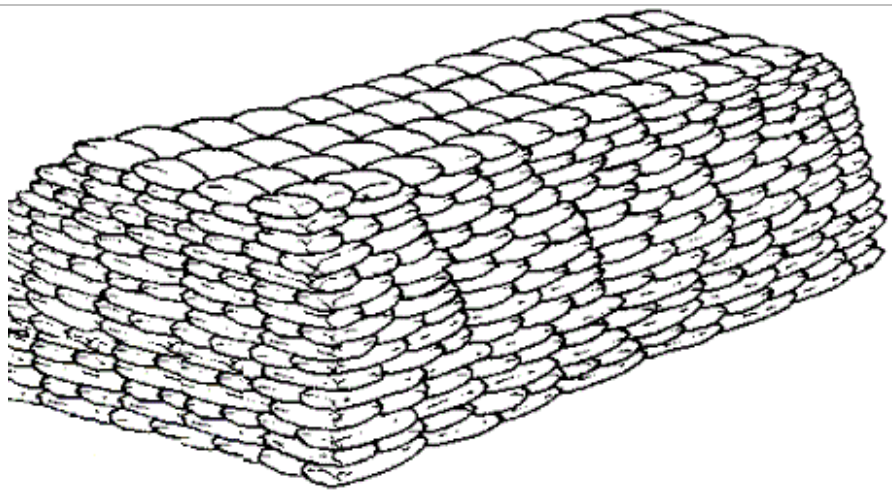


There are multiple varieties of alternatives for stacking loose cartons and irregular shapes. The configuration will depend on the commodity itself, the space requirements of the warehouse, and the speed and skill of the warehouse staff. Some possible configurations might include:

Block Stack	Brick Stack	Pinwheel Stack	Irregular Stacks with Separators
			

Many ground stacking operations also utilize what is called "pyramid stacking." Pyramid stacks are useful for durable, bulky items and in contexts when high volumes of uniform items need to be stored in a relatively small space. Pyramid stacks - sometimes also called "stair stacking" have interlocking layers with reduced diameters the further up the stack goes. The pyramid shape prevents dangerous items from falling, and may make accessing the top layer easier for hand loaders.

Pyramid Stack



No matter what the stacking configuration looks like, stacks should not be stored above an unsafe height.

- A safe height may be context specific; for NFI cartons/bales/sacks of any size that are heavy enough injure workers, stacks should never exceed 2.5 meters, while light voluminous items such as empty plastic jerry cans might be stored higher if required.
- Food bags, blanket bales or sacks of concrete can be stored in pyramid stacks, however pyramid stacks should still only be made as high as is contextually safe.
- No matter the height, warehouse workers should be able to safely withdraw cargo from the top layer without risk of falling or causing the stack to collapse.
- A stack should not surpass a ratio of 3:1 - the height cannot be 3 times the horizontal width of the base.
- Stacks should never be so high that they come into contact with the ceiling, and at least half a meter space should be left between the top of the stack and the ceiling for accessing items as needed.

Stacks should never exceed 6 meters in length, or a maximum floor space of 6 x 6 meters.

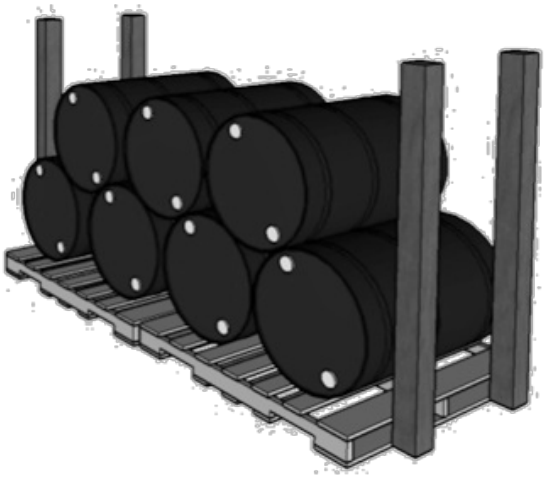
Excessively wide or large stacks can cause multiple problems:

- Spoiled or damaged items in the middle are difficult to spot or deal with.
- Practising FIFO/FEFO may be difficult if cargo in the middle of a large stack is inaccessible.
- Visual counting may be difficult or impossible.
- Excessive weight in a single area of the warehouse may lead to structural risks.

Stacked items should not be slumping or falling over. Crushed or damaged units at the bottom of stacks should be addressed immediately; crushed items should be moved to the top of the stack, and if possible/necessary, reduce the height of the stack to prevent further damage.

Cylindrical Items

Ground storage of cylindrical items must be done in way to prevent items from rolling or falling. Ideally, items like tires and metal drums should be stored with their flat surfaces facing downward on a pallet or tarp. In some cases, cylindrical items may not be able to be safely stacked on their flat surfaces due to height restrictions, weight concerns, or the overall dimensions of the item – in which case guard barriers can be built outside the pallet or floor storage to keep the items in one place. Any guard barrier should be strong enough to contain the weight of the combined items.

Cylinders Stored Upright	**Cylinders Braced/Stored on Side**
	

Timber/Lumber

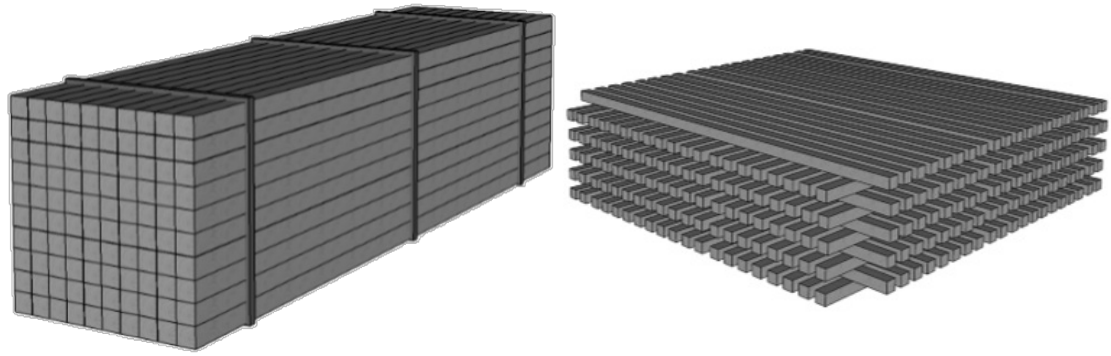
Loose timber and lumber are commonly stored throughout the humanitarian sector. Timber should:

- Ideally be stored outside in a covered space.
- Separated by type/length/requirement.
- Be easy to count.

Thought it may be tempting to stack timber in a pile, dense piles of wood can lead to infestation or rot, and make proper accounting very difficult. To facilitate timber management, solutions might include:

- **Bundles** - Bind lumber/timber items into uniform bundles with identical piece counts. This will speed up counting, and make bulk moving of lumber/timber faster. Bundles are opened one at a time to facilitate pick orders. Bundles should still remain a reasonable size, and not be so large they break their bindings.
- **Layer Stacks** - Stack lumber in uniform, interlocking patterns, much like laying layers for a stack of cartons/bales/sacks. Laying an interlocking pattern requires defining a base layer, and then repeating the same number of units on the next layer, and so on. The interlocking pattern allows for ventilation, something bundling cannot. An interlocking pattern of lumber/timber will always result in a fairly large foot print however, so stacking is only recommended when outside storage isn't an issue.

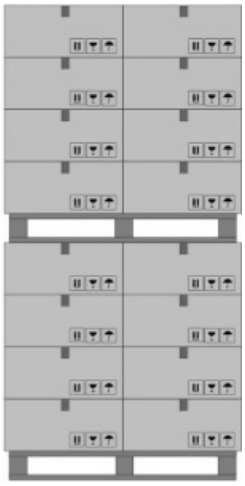
Lumber Stored in Bundle **Lumber Layer Stacked**



Double Stacking Pallets

Double stacked pallets are defined by one or more pallets placed on top of each other without the additional layer of a pallet rack or support structure. Double stacking is fairly common in transport, but should be avoided for any form of medium to long term storage in warehouses. A double stacked pallet can easily fall over and injure warehouse workers if any part of the bottom pallet is compromised, often without warning. A collapsed double stacked pallet can also easily destroy the contents of one or both of the individual pallets. With the inconsistent flows and constant changes of a humanitarian supply model, a double stacked pallet may end up being stored for much longer than originally planned, and managers may forget or simply not realise the dangers of double stacking.

Double Stacked Pallet



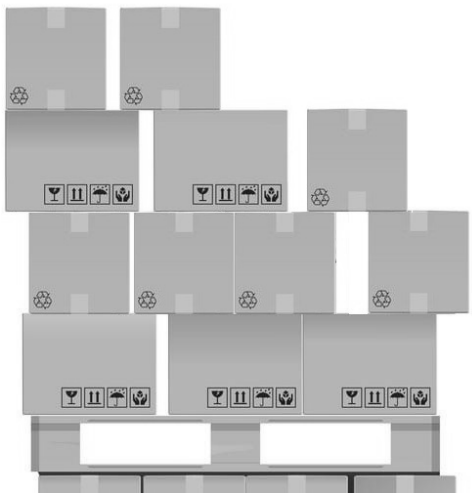
Elevated Storage

Pallet Racking

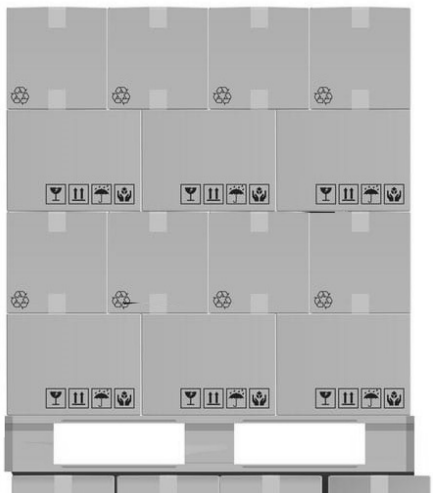
Cargo stored on pallet racking has advantages and disadvantages. Though use of pallet racking affords the efficient use of vertical space and rapid movement of large volumes of cargo, users of pallet racking sacrifice the ability to manage cargo at the unit level, instead having to work mostly with palletised cargo.

When managing cargo using pallet racking, pallets should be properly stacked and loaded. Ideally, only like items and/or items with the same SKU will be stored on the same pallet, and pallets containing the same SKUs will be stored next to each other on the same racks. Cartons and cargo on pallets should be uniform and even, with weight evenly distributed across the pallet to avoid accidents while moving using a forklift. Cartons or items on a pallet should also not stick out over the edge of the pallets to maximise the use of space on the rack.

Improper Palletisation



Proper Palletisation



Ideally, pallets should also be well wrapped to prevent slumping or falling during movement and long-term storage. Pallet wrapping is cheap and widely used, and can be done by hand without the need for special equipment. Some products and warehouses also choose to utilised binding – synthetic or organic ropes or straps - that keep palletised cargo together. Properly wrapped or bound pallets will dramatically increase the longevity of the pallet.

Pallet with Plastic Wrapping



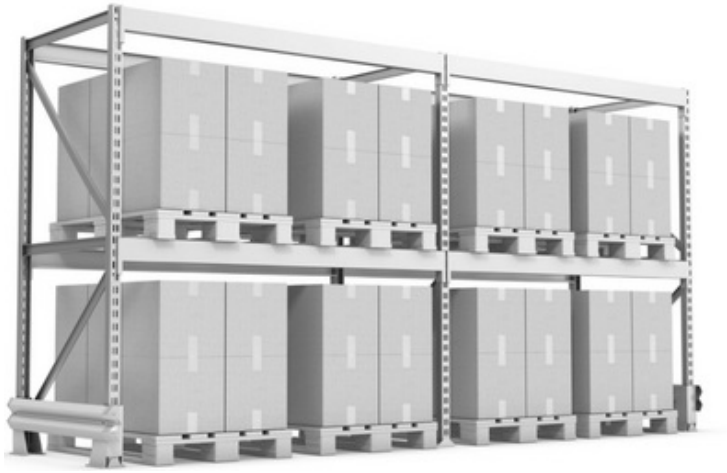
Pallet with Plastic Binding



Other general guidance points for utilising pallet racking systems:

- Pallets stored on racks for long periods of time may start to slump or display distress. Pallets appearing compromised must be pulled down, rebuilt/re-stacked and re-wrapped.
- Racks should be numbered for easy reference, including the row number and the level of the racking.
- Items most frequently accessed should be stored in the lower level of pallet racks. More infrequently accessed items should be stored on higher racks.
- Extremely heavy, bulky or expensive items requiring rack storage should be stored on the ground floor of pallet racks to avoid injury while loading or damage to goods.
- Pallets should be clearly labelled denoting consignment information, and should be legible from the ground and at any angle.
- If stock cards are used, they should be kept at ground level in a safely accessible area.
- The rows between racks should be separated far enough to allow for manoeuvring of handling equipment.
- Pallets should be adequate width to sit on the cross beams without risk of falling through.
- Pallets stored next to each other on pallet racks should not come into physical contact.
- Pallets should be evenly balanced across the beam; no pallet should be leaning over the edge of the frame, nor sticking out too far.
- Pallets should not exceed the weight limit of the racking.
- Loading and offloading of racks should only be conducted by a trained professional.

Pallet Rack Safely in Use



Shelving

Warehoused items stored on shelving offers the quickest and most organised access to the lowest inventory unit. Where as ground stacking or pallet racking are meant for large scale storage of high volumes of items, shelving should be treated as a sorting point for individual items, much like items stored on the shelf a local store.

Shelving is ideal for items that are dispensed at low volumes, such as certain pharmaceuticals or communications equipment, or for high value or sensitive items. Shelved items tend be very detailed, and many individual SKUs can be stored on a single shelf. For this reason, proper accounting is essential.

- Shelved items should have stock cards clearly visible and accessible. If shelved items are taken from a larger consignment in the warehouse, both the warehouse stock and the stock on shelving should probably be tracked on separate stock cards.
- Shelves should not be overloaded, and all items should be clearly identifiable and separated.
- Shelves should be clearly numbered for ease of reference.

As shelving tends to contain loose items or items at the unit level, there are a few tricks warehouse and stock managers can use.

- Fragile items such as glass vials can be stored on the bottom shelf to reduce the risk of accidental breakage if handling units are dropped or fall over.
- Liquids, powders and solids should be clearly separated. Liquids should be stored on bottom shelves, both because of their weight and because a ruptured package might leak on all items below it.
- Some like-items may still need to be separated. As an example - the same quantities and dosage of a single pharmaceutical may have different expiration and/or batch/lot numbers, or different items belong to different donor grants. Each item will need its own stock card and clearly defined space.

Shelf with Loose Items in Use



General Storage Guidelines

Below are general guidelines for the most commonly stored types of items in a humanitarian context.

Medical Items	• Boxes should not receive direct sunlight. • Temperature in the warehouse should be controlled and recorded daily, and fridge temperature should be controlled and recorded where cold chain items are stored. • Drugs should ideally be stored by type of drug: infusions, injectables, oral drugs, diagnostic tests, etc. • Always store medical supplies separately from chemicals or food (pesticides, fertilisers, cement, fuel included), and dangerous goods. This also applies when loading onto vehicles. • If stored on pallets, all cartons should be clearly labelled with their contents. • Always record batch numbers (found on the outer cartons and on each container of the drugs, allocated by the manufacturer) and expiry dates of medical supplies upon receipt and record batch references at all stock movements, including on all stock/bin cards and all warehouse ledgers. • It is good practice to track medical supplies on stock cards raised by batch number. Alternatively, you can record the batch number of the drugs as they moved in and out of stock. • Expired drugs are not fit for human consumption and should be destroyed safely. Contact your local Food and Drug Administration to enquire about the regulations around the destruction of medical supplies. • Expired or damaged drugs must be quarantined until they can be safely destroyed. Keep a record of drugs placed in quarantine on the relevant bin and stock cards. • It is advisable that all medical items be rotated following the FEFO (first expired, first out) principle. • Some national authorities require special licenses for the storage of drugs and medical supplies. Check with local authorities to find out what is required in the area of operation. • More information on specific guidelines for storage medical items can be found in the health supply chain section of this guide.

Food Items	• Food needs to be protected from sun, rain, humidity and extreme temperatures. • Covered and protected storage space is always preferable. • If uncovered and unprotected storage cannot be avoided, make sure outside storage is only temporary (maximum 10 to 15 days). • Always store food separately from chemicals (including pesticides, fertilisers, cement, and fuel), dangerous goods and drugs. This also applies to when transporting items as well. • If you are treating a warehouse that contains food against pests, make sure the chemical used is food-safe (consult your regional logistics support if you are unsure). • Ensure the storage areas are cleaned daily, and that all cleanings are recorded (daily sweep, weekly clean and wipe-down, monthly deep clean). • Pay particular attention to infestation signs • Immediately separate and quarantine infested stocks from the rest. All infestations must be reported immediately to country managers. • Expired food items must be quarantined and stored separately until they can be destroyed. • Expired food must be disposed of immediately. Check with local health authorities to determine whether it can be used as animal feed or for the appropriate disposal method (incineration or burial). Be mindful that the destruction of food may sometimes cause strong cultural reactions. • Pay particular attention to the reception process to confirm weight received: weigh five to ten per cent of the consignment and extrapolate weight of the full consignment to estimate total weight of the consignment against documented weight or use a truck weighbridge to compare the actual weight to the documented weight on the GRN/delivery note/waybill. Record any discrepancy on the GRN. • Always record batch numbers and expiry dates of food items upon receipt and stock movement, including on all stock/bin cards and all warehouse ledgers. • It is advisable that all food items be rotated following the FEFO (first expired, first out) principle.
Construction Materials	• Small parts such as screws, nails, turns and bolts are usually measured and accounted by weight rather than units. • For poles, sticks, metal bars and other long and/or bulky items, build “reference” storage areas, with items separated by quantity. For example, store wooden poles in bins with 100 pieces in each. This will help managing stocks per FIFO principles and avoid the deterioration of stock. • For sand, gravel and other loose materials, build tank storage per cubic metre to help track stock levels. A good option is to build one cubic metre “bins” and cover them to preserve the quality of the material. • The maximum height of a stack of cement should not exceed 15 bags, to prevent lumping from pressure. • Cement must always be kept dry and away from the walls of the warehouse. Ideally cover cement stacks with tarpaulin to protect the bags.

Chemical Products	• Chemicals can never be stored with food or drugs supplies. • Many chemical products are defined as dangerous goods – dangerous goods should be identified and labelled/handled appropriately. • When conducting routine warehouse checks, check the packaging of chemicals thoroughly for wet cartons, chewed plastic, broken seals and spilt liquids. • Most chemicals are perishable. Maintain an alert system to warn of pre-expired chemicals. • The disposal of chemicals is extremely sensitive. Always refer to local laws and regulations. • Fuel and chlorine are the most commonly stored chemicals in humanitarian contexts – make sure they are managed accordingly.

Adapted from the British Red Cross Warehousing Guidelines, WFP Food Storekeepers Guideline, and the DELIVER Drug Storage Manual.

Temperature Controlled Items

The need for temperature-controlled storage has been increasing in the humanitarian operations over the past few decades, and agencies are becoming more aware of the challenges surrounding temperature sensitive cargo. Temperature control ranges are generally defined in the following ranges:

Temperature Range	Common Name
Surrounding naturally occurring temperature	"Ambient Temperature"
Above +40°	"Excessive Heat"
+30° to +40°C	"Warm"
+15°C to +25°C	“Controlled ambient” or “Temperature-Controlled”
+8°C to +15°C	“Cool”
+2°C to +8°C	“Cold” or “Chilled” or “Refrigerated”
-25°C to -15°C	“Deep freeze” or “Frozen”
Different ranges between -80°C to -40°C	"Ultra-low”

Field level humanitarian working conditions also frequently preclude any type of temperature-controlled storage capacity, so the need for temperature-controlled conditions must be factored into operational plans when selecting and establishing storage. Any form of temperature-controlled space will require basic equipment – air-conditioners, refrigerators, freezers – and some form of power, most commonly electricity.

NFIs - Fortunately, the vast majority of non-medical related NFI items can be stored in the ambient range, and many durable goods can be stored in high temperature conditions for long periods of time with minimal effect.

Basic Pharmaceuticals - The majority of basic pharmaceuticals can be stored for months at a time in the climate-controlled range (15° to 25°C), and can be stored in ambient temperature for relatively short periods of days or weeks. Exposure to temperatures above 25°C won’t immediately damage most basic pharmaceuticals, but can experience reduced shelf life and efficacy if exposed to excessive heat for long periods of time. Prolonged exposure to

temperatures below 15°C can also damage basic pharmaceuticals, and warehouse managers should be mindful of both ends of the ranges. Some pharmaceuticals require special temperature ranges – these should either be indicated on the packaging and/or communicated prior to the arrival of the cargo at the facility.

A climate-controlled space can be easily achieved with a regular split air conditioner unit with an automatic temperature sensor built in, and basic insulation. As long as the air conditioner can be set to maintain a specific temperature and have access to electricity, the climate-controlled range is achievable. Climate controlled storage spaces are more effective when built into smaller rooms, with proper insulation and limited access to prevent heat loss. Thermometers should be kept in climate-controlled spaces at all times for quick reference, and agencies may wish to invest in remote sensors that don't require the storage area door being opened, or data loggers that continually record temperatures. Where power isn't available 24 hours a day, climate-controlled storage should be built to remain below 25°C for at least 70% of any 24-hour period.

Cold-Chain - Cold-chain storage includes anything in the "frozen," "refrigerated," or "cool" categories. Cold-chain management requires equipment specifically planned and used for the required temperature ranges. This might include keep cool boxes, specially calibrated refrigerators, and refrigerated trucks/containers. Cold-chain also requires special monitoring and training. For more information on cold chain management, please refer to the cold-chain section of this guide.

Dangerous Items

Warehouses are frequently a holding and consolidation point for extremely dangerous items, and humanitarian storage facilities are no exception. Humanitarian agencies may be handling and storing highly volatile or reactive compounds without understanding them. Field level warehouses may not have the proper storage set up for dangerous items, and workers may not be fully educated on the proper handling of dangerous items.

Reactive Substances - A reactive substance is any substance that interacts with other nearby objects, altering one or both in noticeable and possibly dangerous ways. In the context of warehousing, two seemingly inert or relatively stable compounds may be safe when stored by themselves, but when stored next to each other or in a facility may cause adverse or violent reactions.

Reactive substances can cause quick and noticeable reactions, or slow and hard to immediately recognise reactions. Both can be damaging to inventory, physical structures and pose hazards to humans. A notable example of a substance frequently used by humanitarian agencies is HTH Calcium Hypochlorite (Granulated Chlorine) used in health responses.

- HTH emits fumes, even in its solid form, that corrode metal. HTH stored in an enclosed space can degrade other NFIs near by (metal shovels, medical consumables), and even degrade metal racks and warehouse structures.
- HTH combined with water - forming liquid chlorine - can cause a flammable reaction when combined with liquid fuels such as gasoline or diesel.

Other notable reactive compounds used by humanitarian agencies might include lead acid batteries, cleaning agents, and synthetic fertilisers.

Reactive substances should be properly labelled on their exterior packaging, and warehouse workers should be aware of the nature of the reactive substance while handling them. Reactive substances must be stored in well ventilated spaces inside storage facilities. Any

known reactive substance should be well inspected to ensure packing isn't compromised, and there is no evidence of leakage. Warehouse managers should work with program staff to ensure reactive substances are stored for as short a time as possible, minimising hazards to the warehouse workers.

Fuel – Storage and management of fuel can be extremely hazardous. Liquid or compressed gas fuels by their nature are highly combustible and should be treated separately than other storage items.

Fuel should be stored in a separate storage area outside the main facility, and at least 10 meters (preferably more) away from the main structure. Any fuel storage area should be well ventilated, and be accessible only by designated persons. Fuel storage areas should have the appropriate fire suppression equipment nearby, and staff should be instructed not to smoke or perform external work in the immediate vicinity of the storage area. **Never** store fuel in a completely enclosed storage facility such as a shipping container, or a facility that can reach excessive heats. For more fuel guidelines, please see the Fuel Management section of this guide.

Sharp or other dangerous items – Some objects may be inert, but still dangerous, such as syringes, nails or farm equipment. Wherever possible, cartons/overpacking containing sharp objects should be well marked, and if necessary cartons should be double packed. Cartons/packaging containing sharp or dangerous items should be inspected for holes or damage. Warehouse workers should use gloves and other protective gear as needed when handling sharp objects.

Other dangerous goods common to humanitarian operations might include compressed gas cylinders. Even if a compressed gas cylinder is storing non-flammable compounds, contents under pressure can cause violent eruptions that can harm or kill handlers. Compressed gas cylinders should never be stored in excessive heat, and should be laid on the ground or securely fastened to a wall. If possible, avoid storing compressed gas altogether, or for as short as possible.

For more information on proper warehousing and storage of dangerous goods, please reference the dangerous goods section of this guide. Take extra note of the table of dangerous goods that should not be stored in the same warehouse, or next to each other in the same warehouse.

Regulated Items

Some items may not be dangerous to handle, but are considered "regulated," either due to their value or for legal reasons. Some governments may deem some medications, communications equipment, or other special items as regulated items, resulting in a requirement for special handing. Controlled storage spaces might also be used for bonded or pre-cleared cargo.

Regulated items should be safely separated from the rest of the storage facility. Regulated storage space should be access controlled, with only appropriate personnel having keys or authority to enter. Depending on the specific regulation, regulated items may require special labelling, and more frequent inspection, and may even require inspection from outside companies or government offices.

Mechanical Equipment

The proper storage of mechanical equipment can be frequently overlooked in storage settings. Mechanical equipment, including generators, vehicles and pumping equipment, will still require routine inspection and maintenance. Equipment with engines will still have plastic and rubber components - including sealants, filters, valves and tubing – which will degrade over time and render the equipment useless. Equipment with liquids - such as motor oils, gear lubricants, or fuel – can evaporate, harden or even slowly corrode machine parts. Large external rubber surfaces – such as tires, water bladders or inflatable boats – are especially prone to damage in long term storage or excessive heat.

If organisations choose to keep equipment in storage, there are several steps to keep equipment running well:

- Vehicles should be “exercised” once every month – meaning the engines turned on and if possible driven a short distance. If possible, generators should be turned on and run for a few minutes to cycle fluids inside.
- Large rubber surfaces, such as boats or water bladders, should be unfurled and inspected every six months to inspect for breakage or damage to seams.
- Once a year, a mechanic or technician should be brought it to do an inspection of all the equipment. All tubing and filters should be repaired or replaced if necessary.

The longer equipment is stored for, the more likely it is to not be usable when the time comes. This is especially problematic in pre-positioning facilities, but should be observed in field warehouses as well. Where required, storage of special mechanical equipment should be kept for as short a time as possible.

Warehousing Tools and Resources

Templates and Tools

TEMPLATE - Binder Labels

TEMPLATE - Box Label

TEMPLATE - Donation-Loan Acknowledgment Letter

TEMPLATE - Equipment Maintenance Log

TEMPLATE - Goods Received

TEMPLATE - Loss Report

TEMPLATE - Material Loan Certificate

TEMPLATE - Physical Inventory Form

TEMPLATE - Release Order

TEMPLATE - Stock Card

TEMPLATE - Stock ID Label

TEMPLATE - Stock Report

TEMPLATE - Temperature And Humidity Monitoring Card

TEMPLATE - Temporary Allocation

TEMPLATE - Warehouse Equipment Maintenance Schedule

TEMPLATE - Warehouse Inspection Checklist

Guide - Pallet Specifications