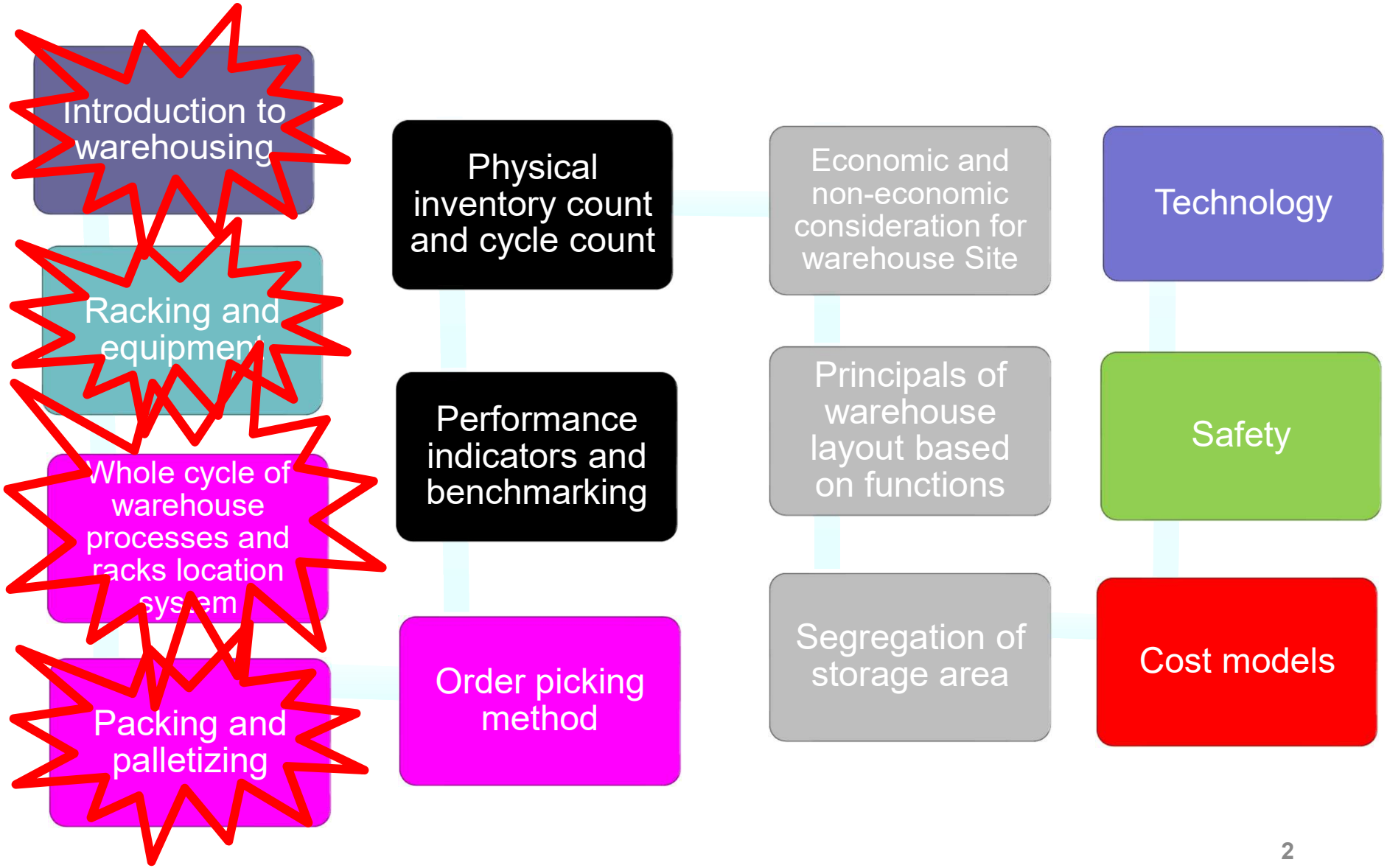
Problem 04

Pack it right, pack it tight!

E215 – Warehouse and Storage

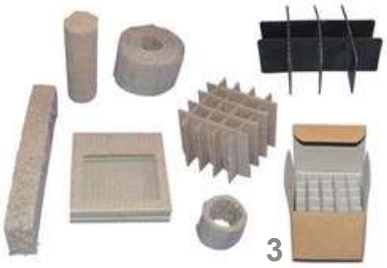
SCHOOL OF ENGINEERING

E215 Warehousing and Storage Topic Flow

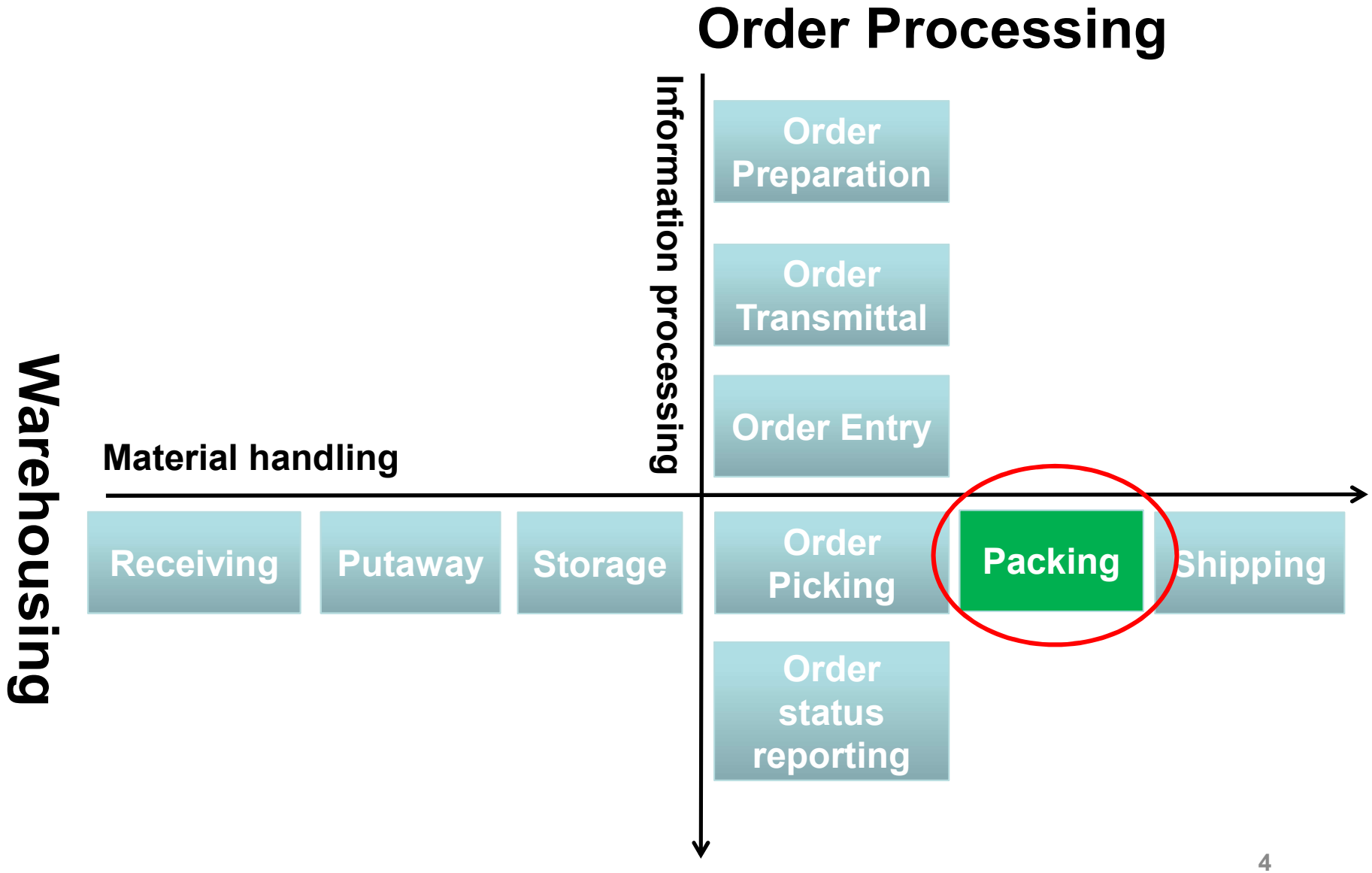


Learning Objectives

- Describe the outer and inner packages.
- Elaborate the principle of good packaging.
- Perform proper labelling and select suitable void fill.
- Demonstrate good practices of packing process.
- Differentiate and recognize types of pallets available in the industry
- Define standardized pallets dimensions
- Identify the material used to secure cargo and prevent damages to cargo
- Demonstrate cargo palletisation



Recap: Processes in a Warehouse



Outer Packages

- Smallest unit of transportation
- Protect, secure, and identify the merchandise they contain
- There are various outer packages available in the market.
  - Crate
    - Storage/transport of large and heavy items
    - Usually made of woods, some are made of steel, aluminium, and plastic

Types of Outer Packages

Outer Packages	Features
Crate 	• Storage/transport of large and heavy items • Usually made of woods, some are made of steel, aluminium, and plastic
Barrels 	• Storage/transport of liquid • Seldom used for transportation, mainly for decorative purposes • Usually made of wood and strengthen with metal or wooden hoops

Types of Outer Packages

Outer Packages	Features
Drums 	• Storage/transport of liquid and hazardous material • More commonly used than barrels • Usually made of steel, plastic, or paperboard (called fibre drums)
Cartons 	• Also called Box • Made of paperboard / cardboard • Lightweight • Recyclable • Storage/transport of dry and light weight goods

Types of Outer Packages

Outer Packages	Features
Sack & Bag 	• Made of paper (+ additional chemical to enhance its strength) or plastic • Usually used for powder or granular products (i.e. grain, cement, powder fertilizer) 
Bale 	• Usually made of nylon, sometimes with tension bands provided to hold the bale together • Usually used for bulky items that can be compressed (i.e. wool, cotton) 

Characteristics of Good Outer Packages

- Stack and nest easily
  - Save storage/transportation cost
  - Reduce potential damage

- Collapse when empty
  - Save space when it is not in used
  - Save transportation cost when the empty containers need to be transported to another place

- Handle comfortably
- Provide easy means for tracking and tracing
  - Use Outer Package Labels

Characteristics of Good Outer Packages

- Reusable and returnable
  - Minimize the impact of logistics to the environment
  - E.g. Plastic and metal containers, as well as strong corrugated cartons
- Minimize the total life cycle cost
  - Initial production cost, handling, space, and maintenance cost.
  - Protection of products
  - Security issue

Undesirable Characteristics of Outer Packages

- Mis-sized
- Weak
- Expensive
- Will result in:
  - Excess cost
  - Inefficiency
  - Product damage

Packages and Labels

- Packages in the warehouse typically consist of outer and inner packages.
- Outer package is the smallest unit of handling in transportation unless it is palletized or containerized.
- Outer packages are labelled for identification and tracking purposes.
- Labels are made of metal, paper, cloth, or polymer. Paper is the most common one.
- It is used for product identification, warning, advertising, etc.

Packages and Labels

- In the warehouse, labels are used mainly for product identification. During transportation, labels are used mainly for both product and customer identification (i.e. customer name and address).
- Label should not be placed at the top or bottom of outer packages, but put at the side.
- Size and quantity of label should be minimized without reducing its information – for environmental considerations.

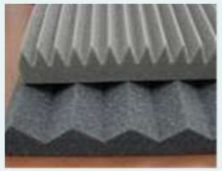
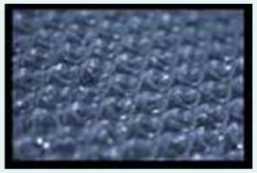
Void Fills

- Void fill are materials used to fill the space between products and packaging.
- In palletized cargo, it also can be used to fill the space between cartons.
- When void fill is used, choose the lightest possible and also environmentally friendly.

Types of Void Fills

Void Fills	Features
Loose fill materials 	• Also called “packing peanuts” • Made of styrofoam, paper, etc • Inexpensive per application but not very effective in cushioning • Some are bio-degradable
Industrial paper 	• Made of kraft paper, newsprint, and tissue paper. • Not as messy as loose fill materials • Available in sheet or roll form • Inexpensive per application • Environmentally friendly

Types of Void Fills

Void Fills	Features
Flexible foams and bubble materials 	• Made of flexible foam and plastic • Outstanding cushioning and surface protection capability • Expensive per application • Not for general purpose void fill  
Inflatable Air Pillow 	• Made of plastic • Inexpensive per application • Better cushioning capability compared to loose fill • Some are bio-degradable  

Types of Void Fills

Void Fills]	Features
Expandable Foam 	• Also called “foam-in-place” • Made of styrofoam • Expensive per application • Mould around the product being packaged 
Paperboard and corrugated partition 	• Made of paper cardboard • Can be sized correctly to be effective • Keep the product in a upright position • Professional presentation • Act as barrier between each packed unit • Increased stacking strength

How to Select Suitable Void Fills

- Surface Protection
  - Glass, metal, scratch-sensitive plastic: use foam and bubble.
- Dust Free
  - Pharmaceutical or health care product: do not use loose fill which is prone to flaking.
- Cushioning
  - Electronic products and others that need to be held tightly in place: use expandable foam

How to Select Suitable Void Fills

- Lightweight
  - The heavier the void fill, the more expensive the transportation cost.
  - Air pillow is the lightest, follow by styrofoam. Paper based void fill is the heaviest.
- Cost
  - Expandable and flexible foam are the most expensive
  - Cheapest is styrofoam loose fill

Packing in the Warehouse

- Usually products come to the warehouse already packed in suitable packages from the manufacturing plants
- Packing in the warehouse is usually for:
  - Customization of order size
  - Damaged outer packages from the plants
  - Returned product from customers (usually the outer packages would have been removed)

Good Practice in Packing

- Packing involves the preparation of the goods for shipment.
- Goods are placed in outer packages (cartons, crate, etc) before palletized.
- Plans should be developed to maximise the volume and weight utilization of the packaging.
- Void fill should be used to minimize product shifting and damage in-transit.

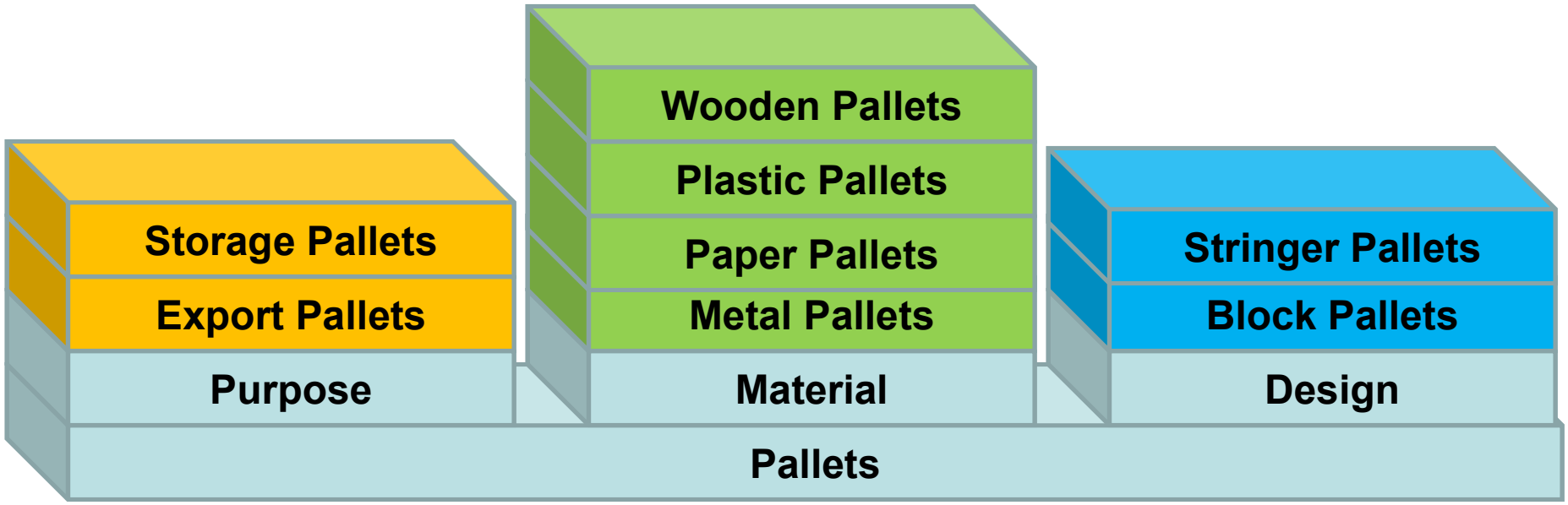
Good Practice in Packing

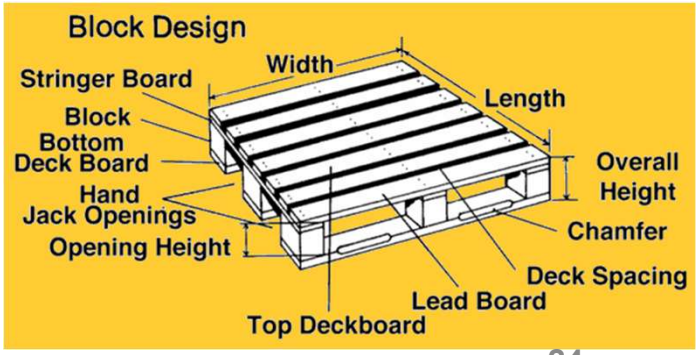
- Visual inspection should be conducted to ensure that no damaged cargo is packed for shipment
- Ideally the picker should not be the one who packs (for counter checking purpose):
  - ✓ Picker – uses pick list
  - ✓ Packer – uses packing list
- Weight checking should be employed to identify picking or packing errors before loading into containers.
- Outer packages should be dusted and cleaned before palletising
- Environmental friendly void fill is preferred.
- Returnable or recyclable
- Once packing is completed, confirmed in the WMS.

What are Pallets?

- Pallets are portable platforms for storing or moving goods that are stacked on them.
- There are different kinds of pallets available in the market.
- Categorization is mainly based on:
  - Purpose
  - Material
  - Design

Type of Pallets



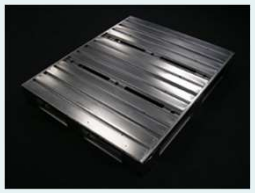


Storage vs. Export Pallets

- **Storage Pallets**
  - More expensive
  - Durable
  - Durable and can be used on racking frames like drive in racks
- **Export Pallets**
  - Cheaper
  - Less durable
  - Some may not be strong enough for long term use on racking frames

Some warehouses will transfer goods from export to storage pallets.

Type of Pallets

Type of Pallets	Features
Metal Pallets come in various configurations and metals. 	• Very strong (for heavy shipment) • Expensive, though it has lower repair, maintenance, and administrative expenses • Very durable (15 years) • Extremely heavy goods • Lower the probability of product damage and breakage due to no-nails • Clean and pest-free • Less fire and safety hazard 
Wooden Pallets  	• Cheap • The traditionally used pallet • Problem with pest, hence fumigation or heat treatment requirement (ISPM 15) • Not durable • Damage to cargo from protruding nails • Easily damaged by water

Type of Pallets

Type of Pallets	Features
Plastic Pallets 	• More costly than wood and paper pallets • No need fumigation for export • Satisfy Good Storage Practice for food and pharmaceutical as it is pest free. • Lightweight and often more durable then wood • Able to handle wet environment well. 
Paper Pallets  	• Cheap (but generally still more costly than wood) • Eco friendly, renewable and recyclable resource • Very light (1/3 wood pallet weight) • Less damage to cargo as there are no nails • Clean when new, and fumigation is not needed for export • As strong as wood due to use of honeycomb structure in paper, corrugated paper or compressed paper

Pallet Designs

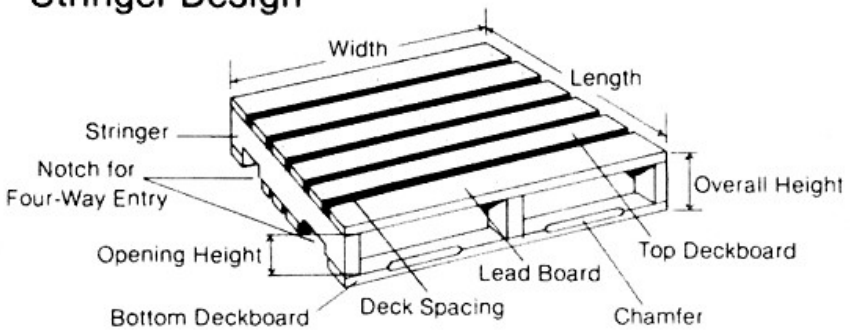
Stringer design:

- Two way pallets
- Lifted from two directions by pallet jacks
- Traditionally made of hardwood (e.g. oak, maple)
- More common in North America (e.g. USA, Mexico)

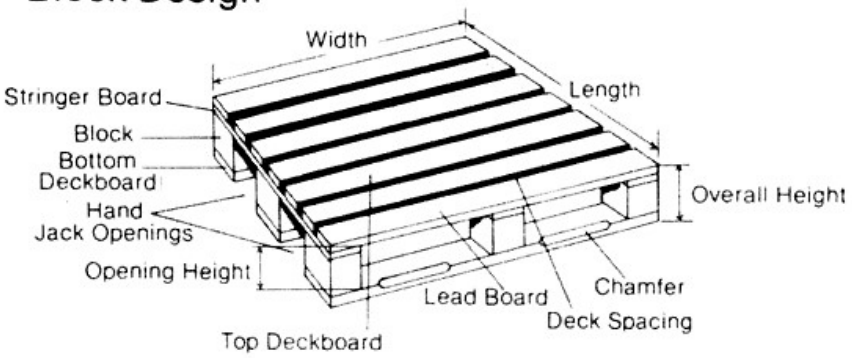
Block design:

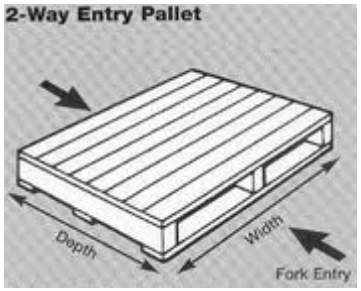
- Four way pallets
- Lifted from any side by pallet jacks
- Traditionally made of softwood (e.g. pine, spruce)
- Common in Europe, and gaining popularity globally

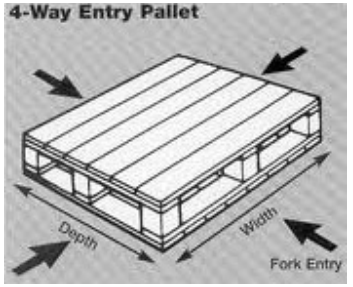
Stringer Design



Block Design







ISO 6780 Pallet Sizes

Dimension (mm)	Region mostly used in
1219 x 1016	North America
1000 x 1200	Europe, Asia
1165 x 1165	Australia
1067 x 1067	North America, Europe, Asia
1100 x 1100	Asia
800 x 1200	Europe - fit many doorways

ISO standardizes 6 pallets dimensions however there are many non-ISO pallet sizes in use in the industry.

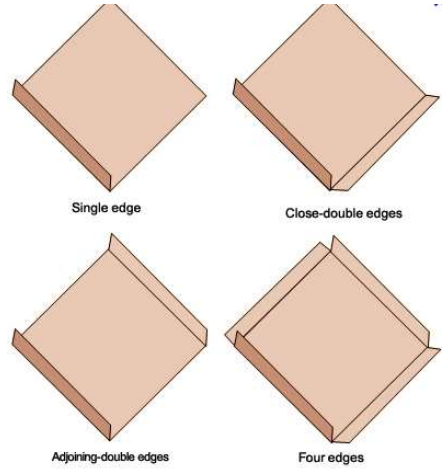
Palletizing

- Cartons are stacked on top of pallets
- Pallet is transferred using forklift, pallet jacks, etc
- Additional materials (e.g. stretch film) are used to enable the pallet + cartons to be transported together as one unit, and also to prevent damages on the cargo

Slip Sheet

Made of plastic, corrugated paper, or solid kraft paper board.

Used to replace pallets



Advantage

- Cheaper, lighter and thinner
- Mostly are recyclable
- Less costly

Disadvantage

- Less rigid, thus less support for products
- Require push-pull attachment on MHE
- Generally result in slower handling

Securing Cargo

- Stretch wrap or film
  - Roll of thin and stretchable plastic film used to secure cargo to pallets
  - Can done manually or using machine
- Strapping
  - Securing a length of thin strong plastic around cargo and pallets
  - Can be done manually or using machine (called banding machine)

Stretch wrap/film

Manual

Machine

Plastic strapping

Strapper sealer

Strapping tensioner

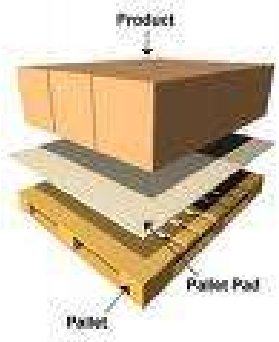
Clip

Machine

Preventing Damages

- Corner post, angle bar, or pallet corner
  - A strong carton or plastic can be placed on each corner of the palletized cargo to prevent damages due to collision with other cargo
  - Usually made of strong paper

- Pallet Pad or Sheet
  - Protect cargo from dirt, nails, and splinters, which are common in wooden pallets
  - Usually made of paper



- Top Sheet
  - Protect cargo from dirt and rain during transportation
  - Usually made of plastic

Suggested Solution

- Design the cardboard partition for inner packing.
- Choose the right dimension carton box to maximize the volume and weight utilization for shipping.
- Ensure warehouse staff adhere to best packing practices.

Palletizing – Step by Step

- Stack the cartons neatly. Try not to let the cartons protrude out from the pallet
- Angle bars can be placed to prevent damages due to collision with other cargo
- Place the top sheet and secure it with tape
- Place the angle bars and secure it with tape
- Stretch wrap such that the entire cargo, and strap them to pallet such that it move like one unit, without wobbling
- The pallets for export to be fumigated first before being used

Learning Objectives

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