Air Freight Packaging Pointers

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Introduction

Shipments must be properly packed to ensure damage-free transportation with ordinary care in handling. For more information about your responsibilities and our liabilities, please see our Terms and Conditions of Contract.

The proper packaging of goods for transportation requires a good understanding of the product and distribution environment. It also requires knowledge of packaging materials, experience and patience. Understanding and following these packaging pointers can help you ensure damage-free freight movement.

Hazards of Distribution

Below are the most common hazards present in distribution. These are "normal" hazards of distribution and therefore must always be considered when preparing your air freight shipment.

Punctures and Abrasion: Occurs when the package shifts or comes in contact with other packages or material handling equipment during sorting and other shipping operations. They can also be the result of improper or insufficient internal packaging that does not prevent the contents from shifting, resulting in the product being damaged or the package failing to contain the product.

Compression: Occurs when external forces are applied to the sides, faces or corners of a package. Stacking, shock, vibration, material handling equipment and tie-down straps all generate compression forces that may result in package or product damage. Proper packaging offers the necessary level of protection against these forces.

Environmental exposures: High and low atmospheric pressures are not restricted to air transit and can have a dramatic effect on some products or packages. High and low humidity can result in condensation or corrosion, and it can greatly reduce the stiffness and compression resistance of paper-based products. Temperature extremes globally can range from -80° F to +160° F and can dramatically affect the performance characteristics of packaging material. Other common environmental exposures include, but are not limited to, dirt, dust, odors and precipitation. If a product or package would be considered damaged if exposed to these hazards, then the shipper must take extra measures to ensure the package can protect the shipment from these known hazards.

Shipment Handling: Proper cushioning can reduce damage caused by the shock incurred during shipment handling. It is important to note that your shipment will most likely be handled with a forklift at some point during distribution. Proper packaging must be able to protect the contents from the drops and impacts commonly associated with handling operations.

Shock: Occurs during handling and transportation as a result of impacts with forklifts, racks, containers, floors and other shipments. Proper cushioning can reduce damage caused by shock. Most products will require some level of shock protection to prevent damage during normal distribution.

Vibration: Occurs in transport vehicles like trucks, planes or ships and on virtually anything else that moves, such as forklifts or conveyor belts. Proper cushioning can absorb and reduce the negative effects vibration can have on your product.

Pre-Shipment Testing

It is highly recommended that you conduct some type of package performance test to verify your air freight package can withstand the normal rigors of transportation and protect the product. The major advantage of pre-shipment performance testing yourself is the opportunity to evaluate the product protection performance of the packaging and to make any necessary changes to the packaging before you invest money into new packaging materials or methods.

Conducting pre-shipment performance tests in a laboratory setting will help you evaluate the package's ability to protect the product from the normal hazards of distribution. When determining your testing protocol, remember that shock, compression, vibration and atmospheric conditioning can all have very different effects on your packaged product, so your testing should not focus on just one hazard, such as the shock incurred when a package is dropped.

As a member of the International Safe Transit Association (ISTA), UPS Supply Chain Solutions℠ promotes the use of ISTA testing protocols as a way for shippers to evaluate and test their transport packaging designs. ISTA is a non-profit organization that develops testing standards and certifies laboratories to conduct the testing. Visit http://www.ista.org for a list of certified laboratories capable of running ISTA and other transportation tests.

Marking and Labeling Shipments

All air freight packages must be properly labeled per the Terms and Conditions of Contract. Each piece must be legibly and durably marked with the name and address, including correct ZIP code of the shipper and consignee. If a package is reused, all old labels, tags, markings, etc., must be removed, and the container must still retain adequate strength for transportation. Failure to follow these basic requirements can result in the denial of a cargo claim.

Handling labels should be highly visible and, with few exceptions, on all sides of the package. This can reduce the chances that a package is flipped, rolled or tumbled in search of shipping labels. It is recommended that both pictorial markings and text be used for each of the special handling requirements. For a complete list of acceptable markings, please refer to ASTM D5445 Standard Practice for Pictorial Markings for Handling of Goods and/or ISO 780 Pictorial Marking for Handling of Goods. Below are a few examples of handling markings commonly used by our customers.

Do Not Fork

Place on all sides of package where forklift entry is restricted. Depending on package size and space availability in aircraft containers or semitrailers, it is not always possible to honor this request.

Top Heavy

Place on all sides of package. Recommended any time a package height is more than 48" and the center of gravity is higher than 24" or when the package falls over when tipped 22° or less in any direction.

Fragile

Place in the upper left corner of all side panels.

Center of Gravity

Place on all side panels and on the cover or top panel. Forklift access points should allow handlers to keep the center of gravity between the fork blades.

Perishables and Other Thermal-Sensitive Products

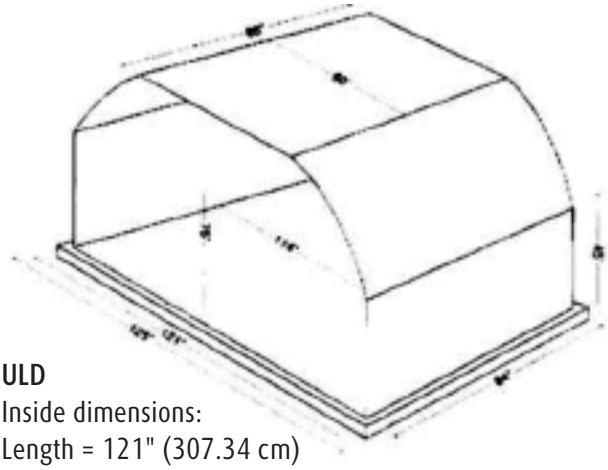
Per our Terms and Conditions of Contract, U.S. and Canadian air freight shipments must be packed to travel without spoilage for 72 hours from the time of pickup. All international shipments must be packed to travel without spoilage for 24 hours beyond an agreed delivery deadline. As stated in the Hazards of Distribution section, ambient temperatures during transportation are not always controllable and can be extreme, so special care must be taken to ensure the package can provide the necessary protection in a variety of environments. Shipments requiring special care or attention between origin and destination are not acceptable.

Expanded Polystyrene (Styrofoam) containers are not acceptable as an outer packaging material. These types of coolers must be overpacked to protect them from the ordinary rigors of transportation. If a corrugated fiberboard box is used as the overpack, we recommend a minimum of doublewall corrugated be used to fabricate the box.

Long or Oversize Air Freight

By our definition, long or oversize air freight is anything that will not fit in our standard air freight container, also known as a unit load device (ULD).

Any shipment with a length or width dimension greater than 84" (213.36 cm) will likely need special packaging to provide protection from flexing and bending during handling and transit. The package needs to be a thick-wall spiral-wound tube, heavy laminate paperboard, multiple-layer corrugated and/or include a rigid reinforcement such as wood to protect it from flex or damage during normal handling. A quick check for sturdiness is to pick the package up at both ends and determine sag at the middle. Then lift at middle and note sag at both ends. If your product or package cannot handle the sag seen during these checks, then reinforcement is required. For shippers sending pipes and similar freight, please refer to the topic of the same name.



ULD
Inside dimensions:
Length = 121" (307.34 cm)
Width = 84" (213.36 cm)
Height at center = 76" (193.04 cm)

Shipments longer than the width of the ULD or transport vehicle door will be handled from the ends during loading and unloading. Often they are also handled from the ends during sorting due to the confined spaces on loading docks or in warehouses.

Because long shipments have to be handled from the ends, it is extremely important that the product be well cushioned on the ends. In addition, the ends must be reinforced and capable of withstanding multiple drops and impacts with material handling equipment during distribution.

Corrugated Fiberboard Boxes (CFB)

These are often improperly referred to as cardboard cartons or boxes. Even though CFBs are the most common type of shipping container, many people do not know the strengths and weaknesses of the package. The greatest compression strength of the box is within 1" of the edges created by two adjacent panels. Corrugated fiberboard can degrade over time, losing as much as 50 percent of its strength after sitting just six months. Humidity and moisture also cause major problems for this paper-based product. A relative humidity of 90 percent can weaken a CFB by as much as 60 percent. Most CFBs do not maintain enough strength and integrity to be reused and should be thought of as single-use packages.

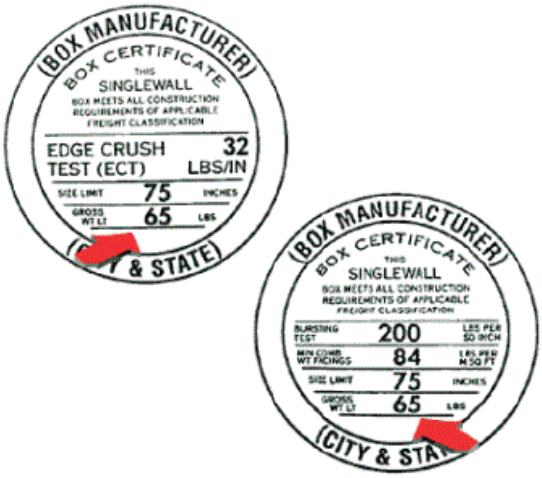
Sealing Corrugated Fiberboard Boxes

Another common problem occurs when the boxes are closed and sealed. Glue, staples, tape or strapping can be used as closures. Tape is the most common closure used by our customers, and improper application is the leading cause for closure failure. Taping a CFB to contain the product and improve the integrity of the package is easy if you follow these steps:

- Use a quality packaging tape specifically designed for box sealing. Non-packaging tapes such as masking tape, duct tape, cellophane and other such tapes should not be used as a substitute for quality box-sealing tape.
- Completely seal all flaps, top and bottom. One strip where the flaps meet is seldom adequate.
- Rub the entire tape surface to ensure contact and adhesion.

Selecting Corrugated Fiberboard Boxes

Boxmakers' certificates (BMC) are typically found on the bottom flaps. The BMC states the maximum size (length + width + height) and the maximum weight the box can hold based on the material used to construct it. These size and weight limits have long been the minimum requirements cited by the trucking industry. In these examples, both BMCs indicate the maximum size cannot exceed 75" and the maximum weight allowed is 65 pounds. Exceeding these limits could result in a damage claim being denied.



Corrugated Fiberboard Boxes (CFB) (cont.)

Box Strength Guidelines

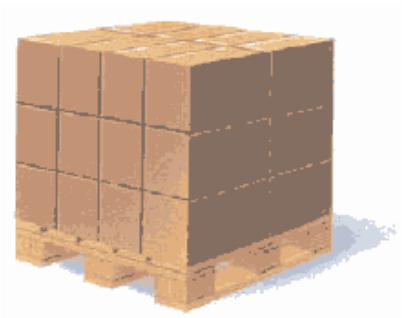
Singlewall Corrugated				Doublewall Corrugated			
Maximum Weight of Contents in Pounds	Size Limit of Box in Inches	Bursting Test in Pounds per Square Inch	Edge Crush Test (ECT) in Pounds per Inch Width	Maximum Weight of Contents in Pounds	Size Limit of Box in Inches	Bursting Test in Pounds per Square Inch	Edge Crush Test (ECT) in Pounds per Inch Width
30	75	200	32	60	85	200	48
40	75	200	40	80	95	275	51
50	85	250	44	100	105	350	61
65	95	275	55	120	110	400	71
80	105	350	NA	140	115	500	82
				150	120	600	NA

New BMC Strength Guidelines

As a result of changes in distribution over the years, such as automated sortation, the old size and weight standards have proven to be inadequate and new guidelines have been proposed. We highly recommend shippers adopt and do not exceed these new guidelines.

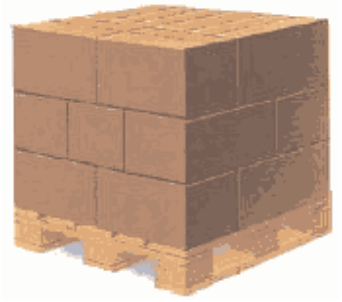
Column Stack

A common misconception is that interlocking cartons on a pallet is a good practice. In all cases but one, this can reduce the carton's top-to-bottom compression strength up to 50 percent. Therefore, column-stacked loads on pallets is the recommended method.



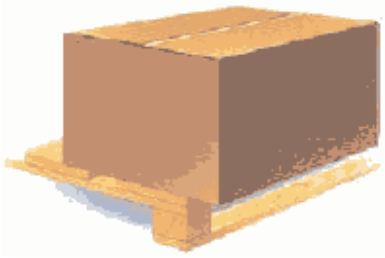
Interlocking Stack

The exception to the interlocking rule would be if the items inside the cartons were rigid, such as pails of paint. Interlocking these type of cartons will result in a more stable load. Stack boxes in columns, corner-to-corner and edge-to-edge for the greatest stacking strength.



Overhanging

Cartons that overhang the pallet edge can have their compression strength reduced by as much as 32 percent. Overhang also exposes the packages to tears, punctures and impacts during normal handling and sorting operations.



Corrugated Fiberboard Boxes (CFB) (cont.)

Misaligned

Misaligning cartons can reduce the boxes' compression strength by as much as 30 percent.

Degrading

Long-term storage can degrade corrugated and other paper-based products. Cartons sitting in a warehouse can lose up to 50 percent of their strength.

High Humidity

Do not store corrugated or other paper-based packaging material in high humidity. A relative humidity of 90 percent could reduce the packages' resistance to compression by 60 percent.

Pyramid-Shaped Loads

Pyramid-shaped pallet loads are one of the biggest packaging problems confronting the transportation industry.

Since pyramid pallet loads don't provide a level surface, the top cartons are exposed to potential damage from other shipments. A level surface will provide maximum strength and stability, and ensures that the load, to the extent practicable, will remain intact.

Pyramid-shaped loads also have the potential for costing more to ship because transportation costs are based on the greater of the actual weight or the dimensional weight. In addition, pyramid-shaped pallet loads are subject to being broken down and/or delayed in transit.

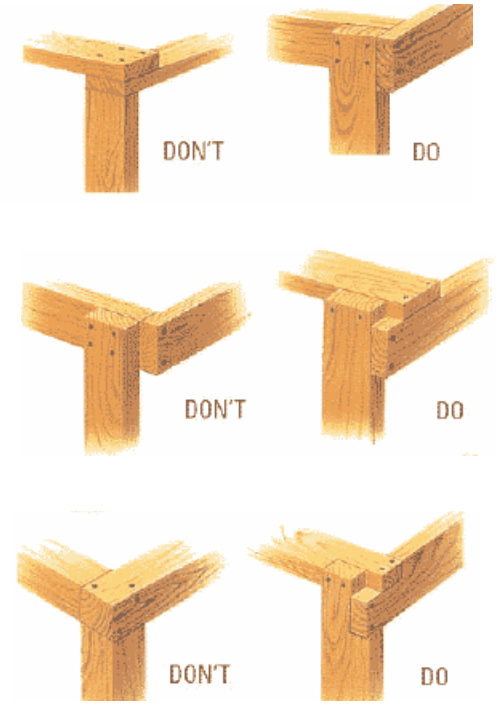
Wood Packages

Crating your shipment can help protect the product and allow for safe, damage-free transit if it is done properly using quality lumber.

- Always use interlocking corners when building crates.
- Do not locate fasteners in the endgrain of wood, especially plywood. A fastener's resistance to pullout can be reduced by 35 percent when located in endgrain rather than in the side or edge grain of a board.
- Use plywood not Oriented Strand Board (OSB), Medium Density Fiberboard (MDF) or Particleboard. Experience has shown these materials do not withstand the normal rigors of transportation as well as plywood.
- Knots cannot be larger than one-third of the surface they appear in. For example, a 3"-wide board should not have a knot that occupies more than 1" of space across the width of the board.
- Fasteners should not be located in knots or other defective areas of the wood.
- Use diagonal braces on each panel to increase the strength and integrity of the crate.

Corners and Diagonal Braces

Diagonal braces have a dramatic effect on the strength of a crate. The graphics below illustrate the relative strength of four different designs. It is not the amount of wood used as much as how the wood is used.



Wood Packages (cont.)

100 Units

120 Units

667 Units

1130 Units

Some international locations require different types of wood packaging to be treated with chemicals or heat before being allowed into their country. Check with your local UPS Supply Chain Solutions office to verify the requirements for your destination country.

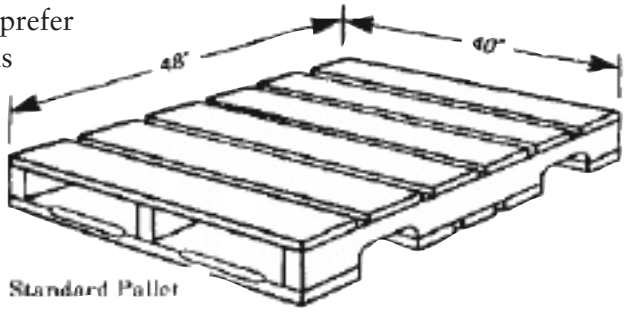
Air Freight Pallets

Two common materials used to fabricate pallets are wood and plastic. Pallets assist in the consolidation and handling of packages by allowing mechanical handling equipment to move shipments, thereby decreasing the amount of time it takes to move packages. Pallets also allow us to move shipments without directly contacting the packages, thereby reducing the packages' exposure to damage. Forklifts are used to load, unload and sort almost all air freight shipments, so a high-quality pallet can greatly reduce damages associated with manual handling.

- Pallets should be large enough to accommodate the shipments without overhang. Anything overhanging the pallet edges will be subject to impacts that can result in punctures, abrasions and compression damage.
- Pallets with broken or missing parts must not be used.
- Any fasteners that protrude must be removed or resecured so they are flush or below the surface before loading packages on the pallet.
- Spacing between the deckboards should be as narrow as possible to ensure the corners of corrugated boxes are supported and not aligned over the gaps and to prevent forklift damage from below.
- Know the rated capacity of your pallet and never exceed it.
- Pallets or other forkable bases are required on any shipment with a floor-bearing load of more than 100 pounds per square foot.
- Bottom deckboards should always be used. They increase the strength and integrity of the pallet and can help stabilize the load during handling operations.

Some international locations require different types of wood packaging to be treated with chemicals or heat before being allowed into their country. Check with your local UPS Supply Chain Solutions office to verify the requirements for your destination country.

In the U.S., one of the most common freight pallets measures 48" by 40". There are many different styles and sizes available, all of which can be designed to carry heavy or light loads. Because of the limited space in our aircraft containers and trailers we often have to rotate the pallet to fit into the available space, so we prefer four-way entry pallets like the one seen here. This means we can approach the pallet from the front, back or either side and move it more easily. It also limits the pallet's exposure to damage that can occur when we have to chisel under an edge of a pallet because no entry points are available on the sides or ends.

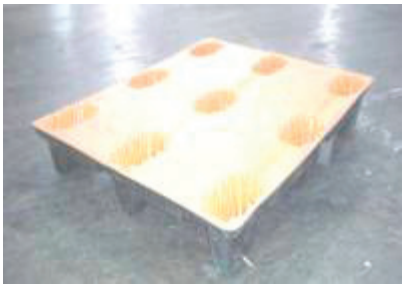


Standard Pallet

Air Freight Pallets (cont.)

Plastic Pallets

Plastic pallets are an alternative to wooden pallets. They are typically the most expensive type of pallet, but they are very durable and capable of being reused many times without failure. Another benefit of plastic pallets is that they usually have a solid deck which helps protect the bottom of the shipment from forklift damage and supports the load. On the negative side, the deck surface of plastic pallets tends to be slippery, and it is more difficult to fasten blocking to the deck or prevent product movement.



Corrugated Pallets

Corrugated pallets are an alternative to wood and plastic pallets and are becoming more popular as different countries further restrict non-manufactured wood packaging materials. Corrugated pallets weigh less than a typical wooden pallet and are easily recycled. However, based on our experiences, corrugated pallets do not stand up to the rigors of transportation very well and therefore are not recommended. If corrugated pallets are used, we highly recommend that the fiberboard and adhesives used to assemble the pallets be water resistant.

Dunnage

Empty spaces in packages can greatly reduce stacking strength, resulting in the package being crushed during normal handling, sorting and loading operations. Remember, stacking does occur and in many cases we cannot guarantee stacking will not occur. Empty spaces can sometimes allow the contents to move freely causing damage to the product and package. We recommend your product be properly blocked and braced with dunnage to prevent movement inside the package. We also highly recommend all voids be filled when shipping product in corrugated fiberboard boxes.

Dunnage can be as simple as rolled-up newspaper and blocks of wood or as complex as custom-designed corrugated wraps or molded foam. The main function of dunnage is to block or brace the product and prevent it from shifting during transit. In some cases dunnage may also offer some cushioning protection, but that is not its main function. Selecting the appropriate dunnage material will depend on a variety of factors including, but not limited to, the strength of the outer box, the internal cushioning material, the size of the voids and the fragility of the product or products being packaged. Remember, in-transit boxes can be stacked up to 8' high in trailers, and sometimes more than 100 pounds per square foot of downward force can be applied, even in short stacks.

Wrong

The package at right contains steel pins placed randomly into a box. The parts are not bundled together and the voids are left unfilled. Ideally the pins should be wrapped, taped or bagged to create a bundle. The box should then be filled halfway with dunnage and the bundled parts placed in the center. The rest of the package should then be filled with dunnage and all the box flaps sealed shut.

Correct

The package at right shows the product repacked correctly prior to the top flaps being sealed shut.

Dunnage (cont.)

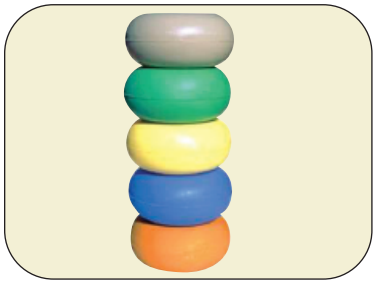
This product has not been adequately blocked or braced with dunnage material. The product shifted inside the package and penetrated the outer walls, exposing the product to further damage. Not only is this package (and its contents) in jeopardy of damage, it also poses a risk to other shipments, to our employees and to the equipment used to handle the shipments during distribution.

Small and dense products tend to settle in this loose-fill product during distribution. It is recommended that loose fill be used only to fill voids when packaging large, light-weight products. A minimum of several inches of loose fill should surround all sides of the product.

Cushioning

Because shock and vibration forces naturally occur during transportation and distribution operations, most products will require some type of cushioning. The cushioning material you select must be able to protect the product from these shock and vibration forces from the time of pickup until final delivery. Cushioning should be resilient and capable of absorbing and rebounding after multiple shock inputs. Wadded-up paper may be sufficient for separating items and filling voids, but for most practical purposes, it is not a good cushioning material. Contact a foam supplier or package fabricator to discuss the proper type and amount of cushioning required to protect your product from the known hazards of distribution.






Cargo Security

The best approach to reduce theft in transit is to start with new, well constructed packaging. Do not place the description of the goods, either text or graphics, on the exterior of the box. If this is not possible, then consider overpacking into a larger outer container, Freightglove cargo bag, or stretch wrap the loads with black or opaque film. Further steps include the use of security tape and seals.

Cargo Bags

These completely enclose the shipment, protecting it not only from pilferage but also from rain, sleet and snow. Quality cargo bags will be tough and tear-resistant and can accommodate some type of security seal.

Strapping Seals

These one-time use seals are crimped over intersecting straps. If the straps are cut to gain access to the package or load, the crimp cannot be reused on new strapping and there will be a visual indication that the package or load was tampered with or opened.

Tamper Evident Tape

These tapes come in a number of styles and colors and can be very effective. As the tape is removed, a portion of the tape is left behind, creating a visual flag that tampering has occurred.

Stretch Wrap

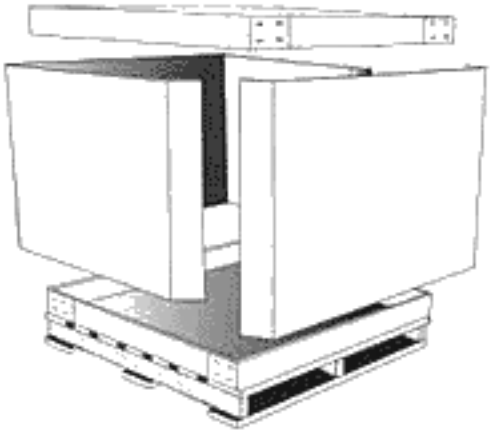
Opaque stretch wrap is available in a number of colors and can effectively hide the contents of a shipment. Although a common material used to prevent pilferage, it can also hide evidence of pilfering from the load if the wrap was lifted and then pulled back in place. Always use banding to secure the bundled load to the pallet.

UPS Supply Chain Solutions offers different levels of service for customers requiring higher levels of security from pickup to delivery. The level of security selected during transit should be as high or higher than your own internal security procedures. Certain restrictions apply, so contact your UPS Supply Chain Solutions sales representative to discuss your requirements.

Overpacking

When shipping multiple pieces on pallets, consider overpacking them. This can be done using a standard container such as the Air Transport Associations (ATA) sizes or by using custom sizes designed for your specific packages. The advantages of overpacking include reduced pilferage, reduced damage and ease of handling. These are ideal for large shipments of small packages and high-value shipments or retail-type packages that would be considered damaged if soiled, scuffed, torn or punctured.

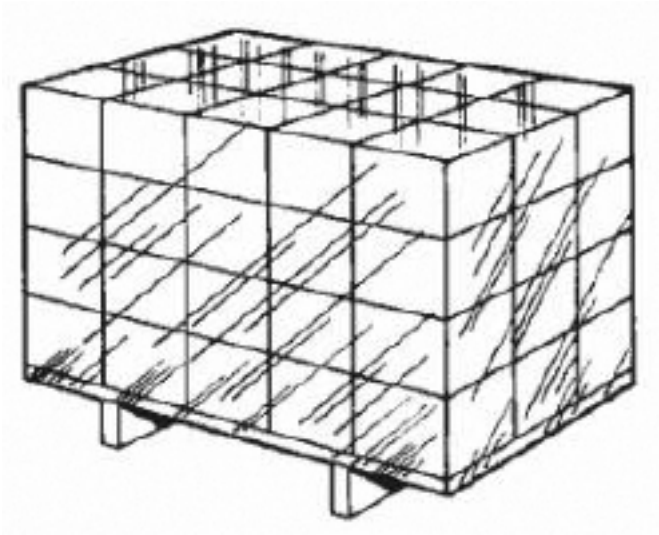
Plastic top/bottom with corrugated sides



Corrugated top/bottom/sides with wooden base

Stretch Wrapping

Stretch wrapping is a common and effective method of keeping all pieces of a shipment together, increasing the chances of damage-free, on-time delivery. However, 70 percent of all wrapped shipments are incorrectly wrapped. The stretch wrap should first be applied around the pallet and continued around the load and upward. **Do not wrap only the cartons or load.**



Stretch wrap is designed to stabilize the load, not secure it to the pallet, so strapping should be used in conjunction with stretch wrap to secure the load.

Please refer to the section titled Applying Stretch Wrap for step-by-step instructions.

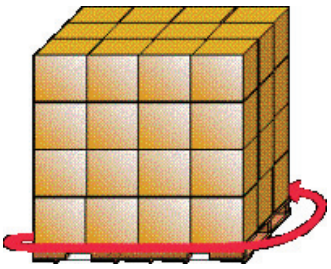
Applying Stretch Wrap

Stretch wrap is often applied incorrectly and, as a result, is incapable of keeping the packages tightly bundled during normal distribution, resulting in loss or damage. The method illustrated below works for most pallet loads.

Applying Stretch Wrap for Damage-Free Shipping

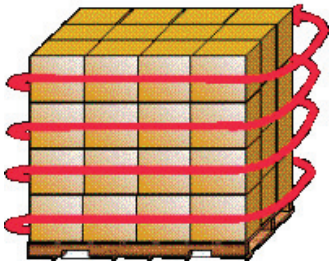
Step 1

Tie the stretch wrap to the pallet and wrap the lower layer and pallet three to four times. The stretch wrap must extend to the ground.



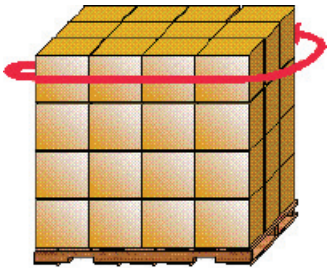
Step 2

Spiral up the pallet load overlapping the previous wrap by approximately 40 to 60 percent.



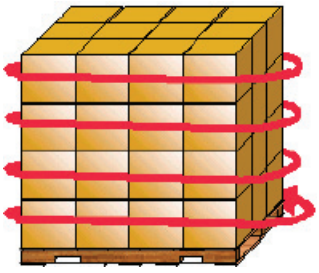
Step 3

Wrap top layer three to four times with half of the stretch wrap width extending above the top layer.



Step 4

Spiral down overlapping the previous wrap approximately 40 to 60 percent and tie it off at the pallet.



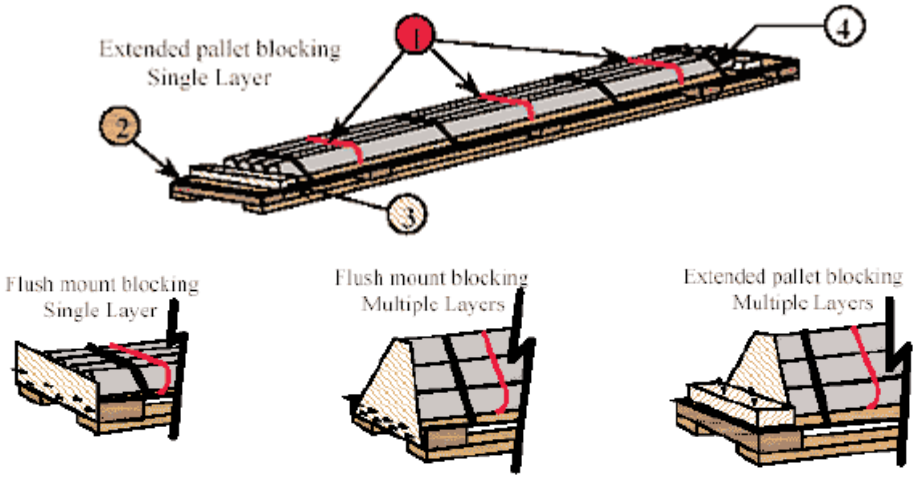
Pipes and Similar Freight

Pipe shipments require special packaging before UPS Supply Chain Solutions can accept them for distribution. The method illustrated below works for most pallet loads. Click here for a printable 8.5"x11" version: Packaging Pipes and Other Similar Loads.

Packaging Pipes and Other Similar Loads

These types of shipments will require special packaging to prevent the product from puncturing or damaging the aircraft, equipment or other shipments during flight, loading, unloading and sorting operations. Any shipment where the product(s) can telescope away from the rest of the load will require end protection. Examples include, but are not limited to, pipes, rods, tubing, antenna components, angle iron, steel or other heavy objects.

1. **Bundle**: Two or more articles bound together to form a single package or pack. Multiple bundles may also be combined to further unitize a load and ensure containment throughout distribution. This can be done with strapping or filament tape. Bundling increases the integrity of the load and can reduce loss and damage in the event the load becomes separated from the pallet during transportation and handling.
2. **Pallet**: A low portable platform of wood, plastic, metal, fiberboard or combinations thereof, that is elevated enough to allow for forklift access and aid in handling. The platform must elevate the entire load at least 6" from the ground. Long shipments will require a platform to run the entire length to allow for end blocking.
3. **Blocking**: Materials used in packing and loading to maintain shipments in a fixed position during transit by bracing them against the shipment. The most common material used for blocking is wood. The blocking is fastened to the pallet to prevent the load from shifting and keep the individual pieces from telescoping out from the end of the shipment.
4. **Securing**: Use strapping material to secure the bundled load to the pallet. The strapping is designed to hold the shipment to the pallet and prevent it from coming out of the blocking.



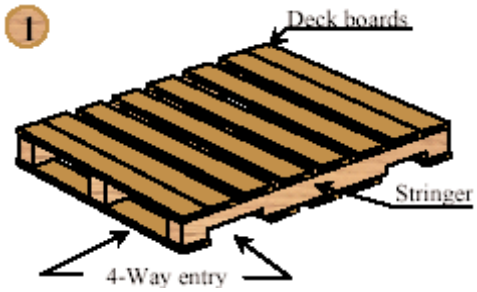
Drum and Pail Shipments

Drum and pail shipments require special packaging before UPS Supply Chain Solutions can accept them for distribution. We do not have drum clamps or specialized drum-handling equipment, and loaded drums often exceed our floor-bearing loads; therefore we require all drums and pails to be palletized. The method illustrated below works for most pallet loads. Click here for a printable 8.5"x11" version: Securing Drums to Pallets.

Securing Drums to Pallets

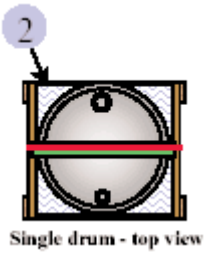
1 Pallets

- Must be sturdy and strong enough to support the load. Hardwood lumber is recommended.
- No broken boards or protruding fasteners allowed.
- Minimize gaps between the deck boards.
- 4-way forklift entry preferred.



2 Corrugated Sheet

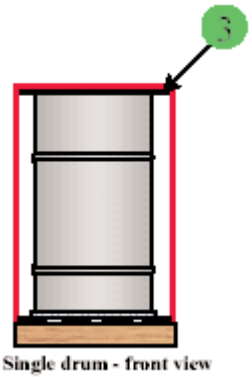
- Must be between drum and pallet decking.
- No piece should be smaller than the base of one drum.
- Reduces wear and punctures caused by decking fasteners.



Single drum - top view

3 Interface Material

- Should be something the strapping can dig into, such as wood or heavy paperboard.
- Prevents steel-on-steel contact and slipping.
- Spreads the force exerted by the strapping.

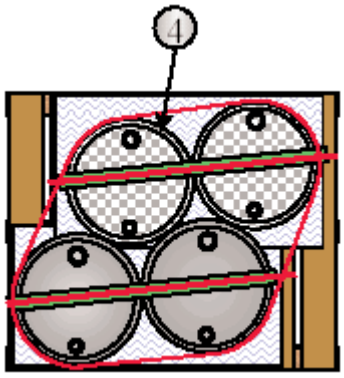


Single drum - front view

Drum and Pail Shipments (cont.)

4 Loading the Drums

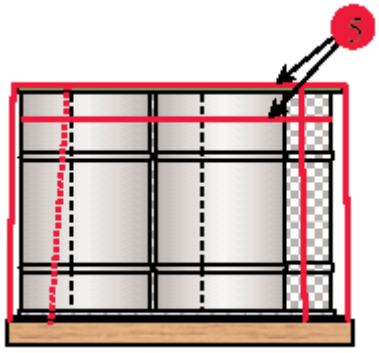
- Keep load as close to center as possible.
- Do not allow overhang.
- Multiple drums must be bundled tightly together using the least amount of pallet surface area as possible.



Multiple drums-top view

5 Strapping

- Steel strapping is preferred because it stretches very little.
- Strap multiple drums together first. This creates one unit that is easier to secure.
- Use an interface material under the strapping and drum to distribute the load and prevent slipping. This is not required under the strap used to bundle multiple drums together.
- Keep strapping as close to the drum sides as possible. This limits the load shifting and protects the strapping from damage. This may require running the strapping between deck boards instead of out to the edge of the pallet.



Multiple drums-front view

Securing Pails to Pallets

Securing pails to pallets allows us to handle them efficiently with forklifts and gives us the ability to easily block and secure them during transit. It also helps us maintain the proper orientation, reducing the chances of spills.

Spools and Reels

Spool and reel shipments require special packaging before UPS Supply Chain Solutions can accept them for distribution. The method illustrated below works for most pallet loads. Click here for a printable 8.5"x11" version: Securing Spools and Reels.

Securing Spools and Reels

Definition: A cylinder with an edge or rim at each end and an axial hole for a pin or spindle, on which to wind a flexible material such as wire, cable or rope.

Handling issues: These items can roll and shift during transportation due to their shape. They are hard to lift and move without damaging the edge or rim. Some products packaged on spools and reels can only be handled in the vertical orientation without the product being damaged. In addition, when spools or reels are stood on edge their weight is concentrated in a very small area that often exceeds the floor-bearing weight capacity of our aircraft. It is for these reasons that spools and reels must be secured to a forkable platform for transportation.

1 Blocking

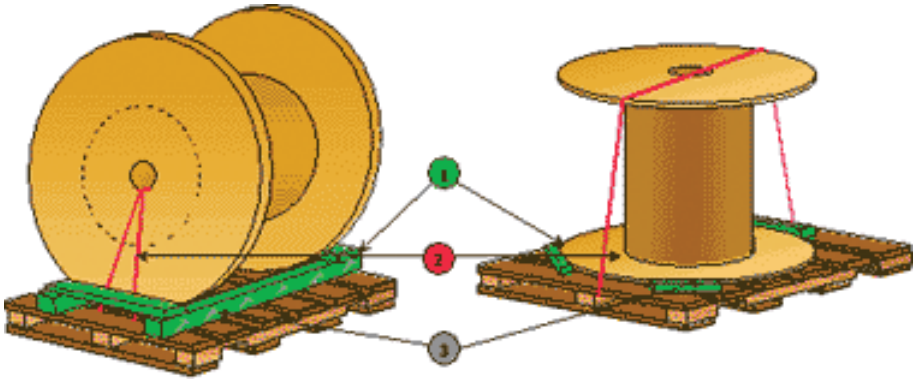
Materials used to keep objects in a fixed position during transportation and handling. The most common blocking material is wood. The blocking should be placed tightly against the object being secured to prevent any and all movement.

2 Strapping

A flexible strip material used as a medium to fasten, hold or reinforce. Steel strapping is preferred over plastic strapping on loads over 500 pounds because it does not stretch. Locate strapping where it is not exposed to damage during handling. The primary purpose of strapping is to keep the spools or reels from bouncing out of the blocking. The blocking is what prevents the load from shifting.

3 Fasteners

Any device used to secure one part against another. Nails, screws and staples are the most common types used with wood. Blocking requires a minimum of two fasteners in each end to prevent pivoting and maintain adequate strength.



Palletizing Boxes

Palletized corrugated boxes often become damaged during normal distribution because the shipper fails to properly stack, bundle or secure the load before tending it to UPS Supply Chain Solutions. The method illustrated below works for most pallet loads. Click here for a printable 8.5"x11" version: Building Pallet Loads of Boxes.

Building Pallet Loads of Boxes

1 Pallets

- Should be large enough to prevent overhang.
- Must be sturdy enough to support the load.
- No broken boards or protruding nail heads.
- The less space between deck boards the better.
- 4-Way entry preferred. This improves handling and reduces damage to the shipment.

2 Stacking

- Align boxes in columns, corner to corner, for the greatest stacking strength.
- Do not align corners over spaces between deck boards.
- Boxes should not extend past the pallet edges.
- Avoid interlocking or rotating layer patterns.
- Do not pyramid the boxes; keep the top layer flat to prevent damage from top loads.
- Use a slip sheet under load when possible. This helps distribute the weight evenly and protects the bottom layer.

3 Top/Bottom Load Protector

- Can be corrugated, wood or heavy paperboard.
- Reduces damage to top/bottom layers.
- Prevents pieces from getting lost or separated from the load.
- Helps distribute the weight of top-loaded freight.
- Can be held in position with tape, stretch film, banding or adhesive.

4 Corner/Edge Boards

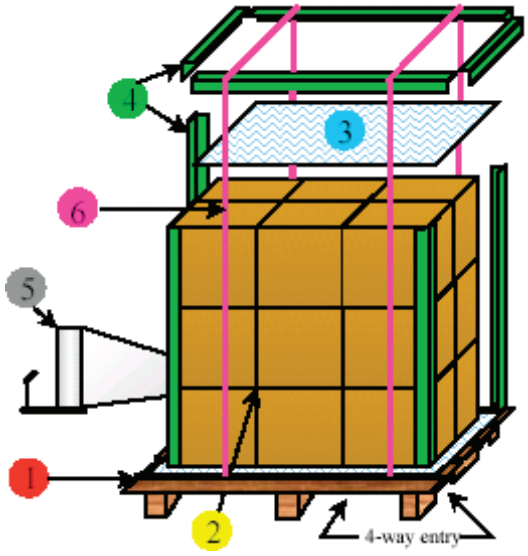
- Should be full length of the load.
- Use on all corners of the load.
- Increases the vertical stacking strength.
- Helps stabilize the load.
- Prevents damage to box edges that make up the load corners.

5 Stretch film

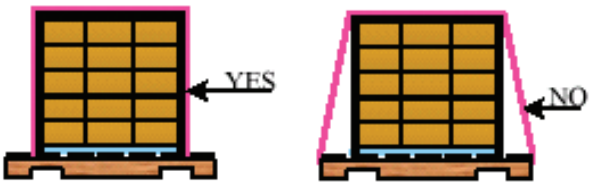
- Must be tight to prevent load shifting.
- Capture the pallet when wrapping bottom layer.
- Can be twisted like rope for greater strength.

6 Banding

- Used with stretch wrap to secure loads.
- Use corner boards under banding to prevent damage.
- Draw banding tight to the load.
- Keep as close to the load as possible to avoid exposure to damage or breakage. This may require running it between deck boards rather than to the edge of the pallet. (See Item "A")



Item "A"



Bagged Shipments

Bagged shipments often become damaged during normal distribution because the shipper fails to properly stack, bundle or secure the load before tending it. To address this problem, we created a poster for the use of our customers and Service Centers that illustrates one of the preferred ways to prepare such shipments. Click here for a printable 8.5"x11" version: Building Pallet Loads of Unboxed Bags.

Building Pallet Loads of Unboxed Bags

1 Pallets

- Must be large enough to prevent overhang.
- Must be sturdy enough to support the load.
- No broken boards or protruding fastener heads.
- Solid deck surface is preferred.
- 4-Way entry preferred. This improves handling and reduces damage to the shipment.

2 Top/Bottom Load Protector

- Can be corrugated, wood or heavy paperboard.
- Reduces damage to top/bottom layers.
- Prevents pieces from getting lost or separated from the load.
- Helps distribute the weight of top-loaded freight.
- Prevents bags from sagging between deck boards and reduces punctures caused by decking fasteners.
- Should be captured under the stretch film.

3 Stacking

- Do not allow overhang.
- Be sure bottom load protector is in place.
- Product inside of bag should be evenly distributed to create a flat surface for the next layer.
- Keep bag sides and ends butted up tight to each other to create a stable foundation.
- Rotate the pattern of each layer to be opposite of the previous layer. This will help stabilize the load. (See Item "A")

4 Stretch film

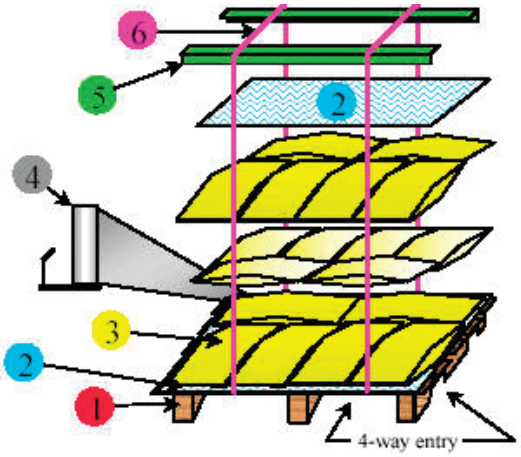
- Used to unitize or bundle loads.
- Must be tight to prevent load shifting.
- Overlap previous wrap by 50 percent.
- Capture the pallet when wrapping bottom layer to limit load-shifting.
- Can be twisted like rope for greater strength.

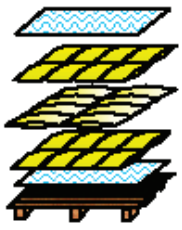
5 Corner/Edge Boards

- Should be full length of the load.
- Helps stabilize the load.
- Prevents banding damage to the bags.

6 Banding

- Used to secure the bundled loads to the pallet.
- Use corner boards under banding to prevent damage to bags.
- Draw banding tight to the load.
- Keep banding as close to the load as possible to avoid exposure to damage or breakage. This may require running it between the deck boards rather than out to the edge of the pallet.





Item A

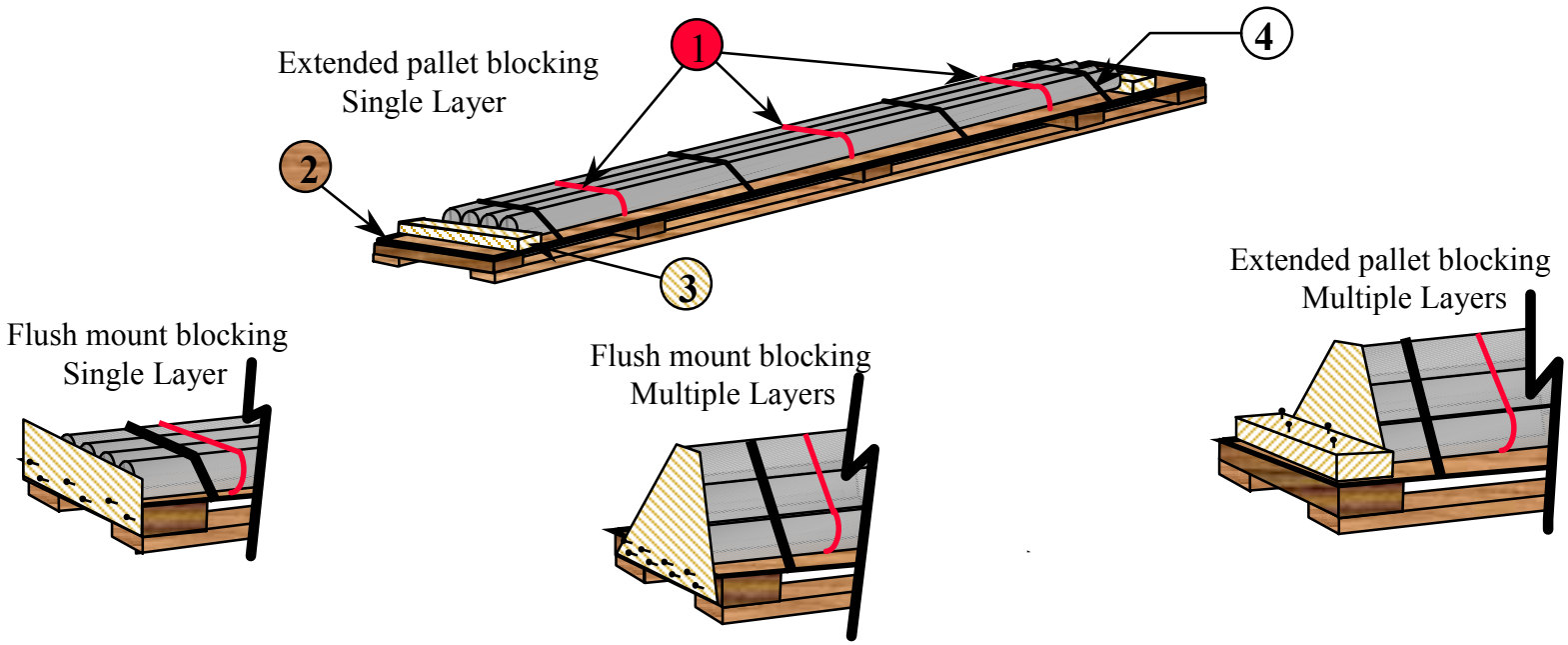
Air Freight Packaging Pointers

Appendix

Packaging Pipes and Similar Loads

These types of shipments will require special packaging to prevent the product from puncturing or damaging the aircraft, equipment or other shipments during flight, loading, unloading, and sorting operations. Any shipment where the product(s) can telescope away from the rest of the load will require end protection. Examples include but are not limited to pipes, rods, tubing, antenna components, angle iron, steel or other heavy objects.

1. **Bundle:** Two or more articles bound together to form a single package or pack. Multiple bundles may also be combined to further unitize a load and ensure containment throughout distribution. This can be done with strapping or filament tape. Bundling increases the integrity of the load and can reduce loss and damage in the event the load becomes separated from the pallet during transportation and handling.
2. **Pallet:** A low portable platform of wood, plastic, metal, fiberboard or combinations thereof, that is elevated enough to allow for forklift access and aid in handling. The platform must elevate the entire load at least 6" from the ground. Long shipments will require a platform to run the entire length to allow for end blocking.
3. **Blocking:** Materials used in packing and loading to maintain shipments in a fixed position during transit by bracing them against the shipment. The most common material used for blocking is wood. The blocking is fastened to the pallet to prevent the load from shifting and keep the individual pieces from telescoping out from the end of the shipment.
4. **Securing:** Use strapping material to secure the bundled load to the pallet. The strapping is designed to hold the shipment to the pallet and prevent it from coming out of the blocking.



Securing Drums to Pallets

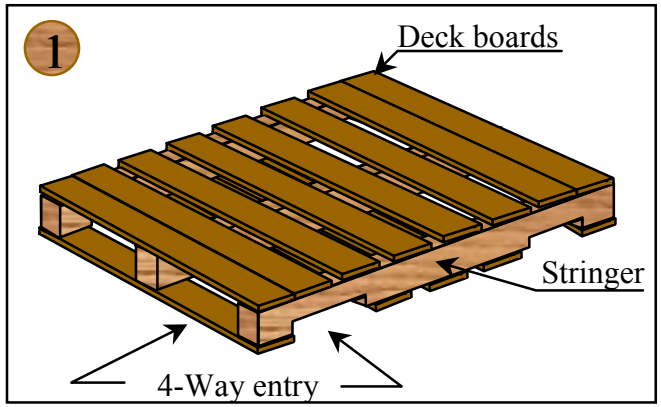
1 Pallets

- Must be sturdy and strong enough to support the load. Hardwood lumber is recommended.
- No broken boards or protruding fasteners allowed.
- Minimize gaps between the deck boards.
- 4-way forklift entry preferred.

Warning-liquid filled drums can be very heavy and care must be taken not to exceed the pallet weight capacity.

2 Corrugated Sheet

- Must be between drum and pallet decking.
- No piece should be smaller than the base of one drum.
- Reduces wear and punctures caused by decking fasteners.



3 Interface Material

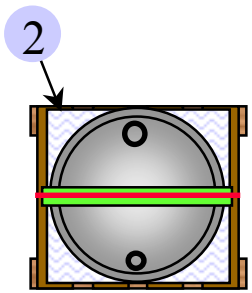
- Should be something the strapping can dig into such as wood or heavy paperboard.
- Prevents steel-on-steel contact and slipping.
- Spreads the force exerted by the strapping.

4 Loading the Drums

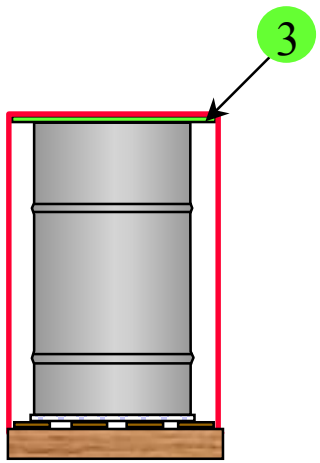
- Do not allow overhang.
- Keep load as close to center as possible.
-Multiple drums must be bundled tightly together using the least amount of pallet surface area as possible.

5 Strapping

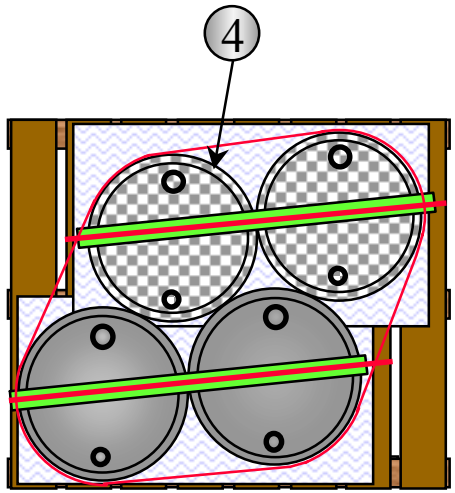
- Steel strapping is preferred because it stretches very little.
- Strap multiple drums together first. This creates one unit which is easier to secure.
- Use an interface material under the strapping and drum to distribute the load and prevent slipping. This is not required under the strap used to bundle multiple drums together.
- Keep strapping as close to the drum sides as possible. This limits the load shifting and protects the strapping from damage. This may require running the strapping between deck boards instead of out to the edge of the pallet.



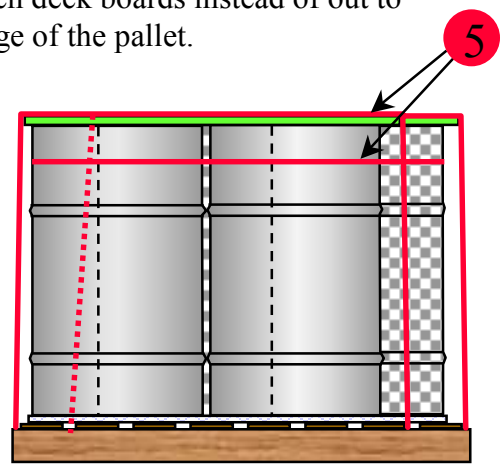
Single drum - top view



Single drum - front view



Multiple drums-top view



Multiple drums-front view

Securing Spools and Reels

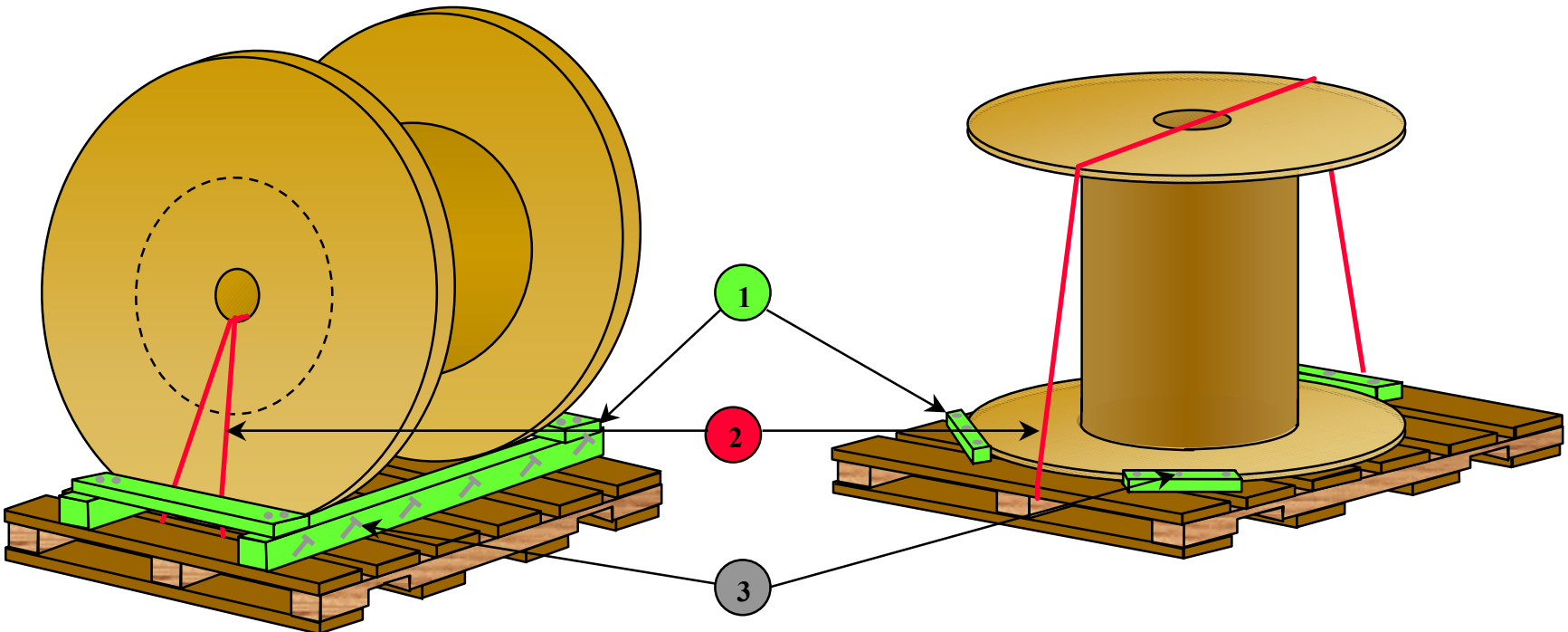
Definition: A cylinder with an edge or rim at each end and an axial hole for a pin or spindle, on which to wind a flexible material such as wire, cable or rope.

Handling issues: These items can roll and shift during transportation due to their shape. They are hard to lift and move without damaging the edge or rim. Some products packaged on spools and reels can only be handled in the vertical orientation without the product being damaged. In addition, when spools or reels are stood on edge their weight is concentrated in a very small area which often exceeds the floor bearing weight capacity of our aircraft. It is for these reasons spools and reels must be secured to a forkable platform for transportation.

1. **Blocking:** Materials used to keep objects in a fixed position during transportation and handling. The most common blocking material is wood. The blocking should be placed tightly against the object being secured to prevent any and all movement.

2. **Strapping:** A flexible strip material used as a medium to fasten, hold or reinforce. Steel strapping is preferred over plastic strapping on loads over 500 pounds because it does not stretch. Locate strapping where it is not exposed to damage during handling. The primary purpose of strapping is to keep the spools or reels from bouncing out of the blocking. The blocking is what prevents the load from shifting.

3. **Fasteners:** Any device used to secure one part against another. Nails, screws and staples are the most common types used with wood. Blocking requires a minimum of two fasteners in each end to prevent pivoting and maintain adequate strength.



Building Pallet Loads of Boxes

1 Pallets

-Should be large enough to prevent overhang.

-Must be sturdy enough to support the load.

-No broken boards or protruding nail heads.

-The less space between deck boards the better.

-4-Way entry preferred. This improves handling and reduces damage to the shipment.

2 Stacking

-Align boxes in columns, corner to corner, for the greatest stacking strength.

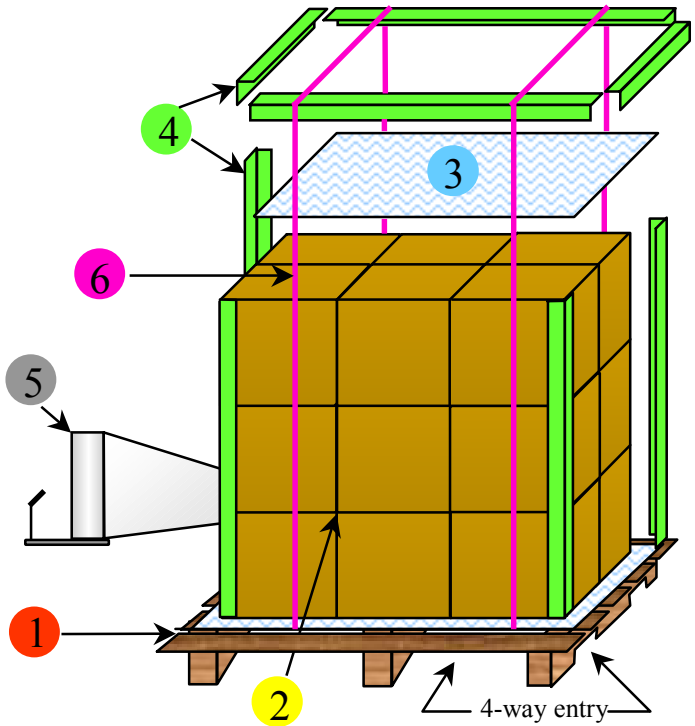
-Do not align corners over spaces between deck boards.

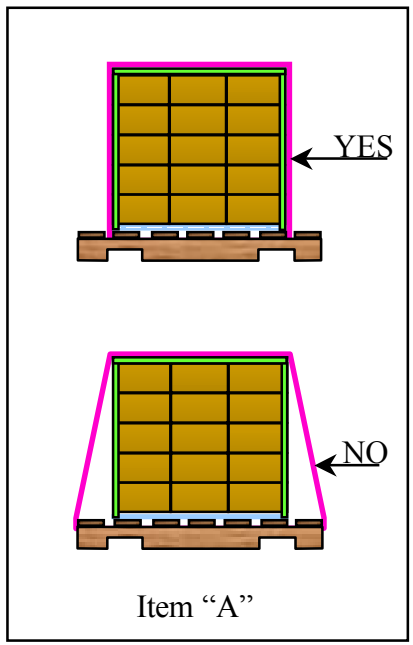
-Boxes should not extend past the pallet edges.

-Avoid interlocking or rotating layer patterns.

-Do not pyramid the boxes, keep the top layer flat to prevent damage from top loads.

-Use a slip sheet under load when possible. This helps distribute the weight evenly and protects the bottom layer.





3 Top/Bottom Load Protector

-Can be corrugated, wood or heavy paperboard.

-Reduces damage to top/bottom layers.

-Prevents pieces from getting lost or separated from the load.

-Helps distribute the weight of top loaded freight.

-Can be held in position with tape, stretch film, banding or adhesive.

4 Corner/Edge Boards

-Should be full length of the load.

-Use on all corners of the load.

-Increases the vertical stacking strength.

-Helps stabilize the load.

-Prevents damage to box edges that make up the load corners.

5 Stretch film

-Must be tight to prevent load shifting.

-Capture the pallet when wrapping bottom layer.

-Can be twisted like rope for greater strength.

6 Banding

-Used with stretch wrap to secure loads.

-Use corner boards under banding to prevent damage.

-Draw banding tight to the load.

-Keep as close to the load as possible to avoid exposure to damage or breakage. This may require running it between deck boards rather than to the edge of the pallet. (See Item “A”)

Building Pallet Loads of Unboxed Bags

1 Pallets

-Must be large enough to prevent overhang.

-Must be sturdy enough to support the load.

-No broken boards or protruding fastener heads.

-Solid deck surface preferred.

-Load protectors must be used.

-4-Way entry preferred.

2 Top/Bottom Load Protector

-Can be corrugated, wood or heavy paperboard.

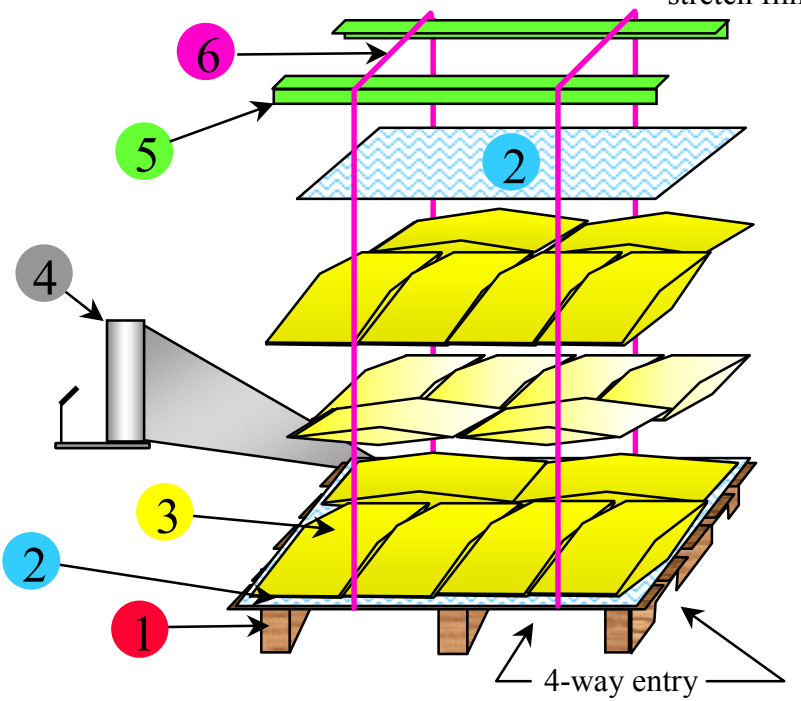
-Reduces damage to top/bottom layers.

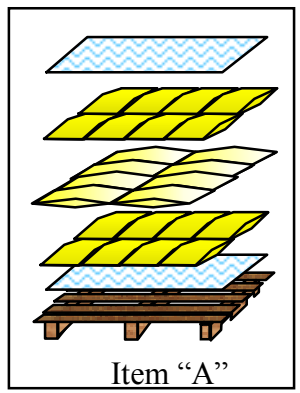
-Prevents pieces from getting lost or separated from the load.

-Helps distribute the weight of top loaded freight.

-Prevents bags from sagging between deck boards and reduces punctures caused by decking fasteners.

-Should be captured under the stretch film.





3 Stacking

-DO NOT ALLOW OVERHANG.

-Be sure bottom load protector is in place.

-Product inside of bag should be evenly distributed to create a flat surface for the next layer.

-Keep bag sides and ends butted up tight to each other to create a stable foundation.

-Rotate the pattern of each layer to be opposite of the previous layer. This will help stabilize the load. (See Item “A”)

4 Stretch film

-Used to unitize or bundle loads.

-Must be tight to prevent load shifting.

-Overlap previous wrap by 50%.

-Capture the pallet when wrapping the bottom layer to limit load shifting.

-Can be twisted like rope for greater strength.

5 Corner/Edge Boards

-Should be full length of the load.

-Helps stabilize the load.

-Prevents banding damage to the bags.

6 Banding

-Used to secure the bundled load to the pallet.

-Use corner/edge boards under banding to prevent damage to bags.

-Draw banding down tight to the load.

-Keep banding as close to the load as possible to avoid exposure to damage and breakage. This may require running it between the deck boards rather than out to the edge of the pallet.