A BASIC PACKING GUIDE

EXTERIOR CONTAINERS

Fiberboard Boxes (Cartons)

The most common economical container continues to be the fiberboard box. This is understandable as shippers seek efficient, but inexpensive and lighter weight containers. It comes closest to fitting the description of the ideal shipping container, which is light in weight, of low cost, but able to withstand normal transportation hazards and protect the contents against loss or damage. The fiberboard box frequently measures up to most of these requirements in domestic transportation, but fails frequently in overseas movement when proper selection procedures are not followed. It must be recognized that all commodities cannot be suitably packed in fiberboard boxes. Moreover, all fiber-board boxes are not suitable overseas containers. This is particularly true be-cause increases in moisture content of corrugated fiberboard adversely affect its stiffness and compressive strength.

NOTE: Compressive strength may be reduced to approximately one-half normal strength by high humidity (90 percent r.h.+). More serious strength losses may occur with cyclic humidity. Impregnation or coating of the fiberboard will delay but not completely prevent this loss.

Illustrations of Solid and Corrugated Fiber Construction

First, the shipper must determine whether or not a fiberboard container is a suitable one for the particular commodity to be shipped, bearing in mind the item's vulnerability as well as the handling and transportation hazards to be encountered.

The actual selection of the box is the next logical step based on the following points.

1. The underlying factors in the selection of the fiberboard box are resistance to crushing, resistance to puncture, strength of the score lines and probably the most important - resistance to moisture absorption. Impregnated and multi-wall boxes are the most practical. Never use corrugated fiberboard boxes with a bursting test strength of less than 275 pounds per square inch. Corrugated fiberboard in export shipment applications should be constructed using water-resistant adhesives.

2. Flaps should be stapled or glued with a water-resistant adhesive applied to the entire area of contact between flaps. For further protection all seams can be sealed similarly.

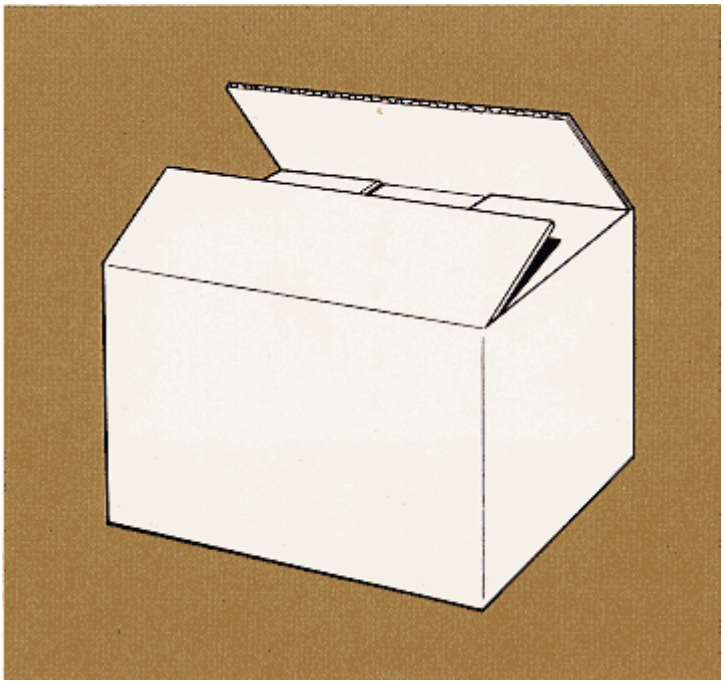
3. Keep weight of contents within load limits specified in the box manufacturer's certificate. NEVER OVERLOAD.

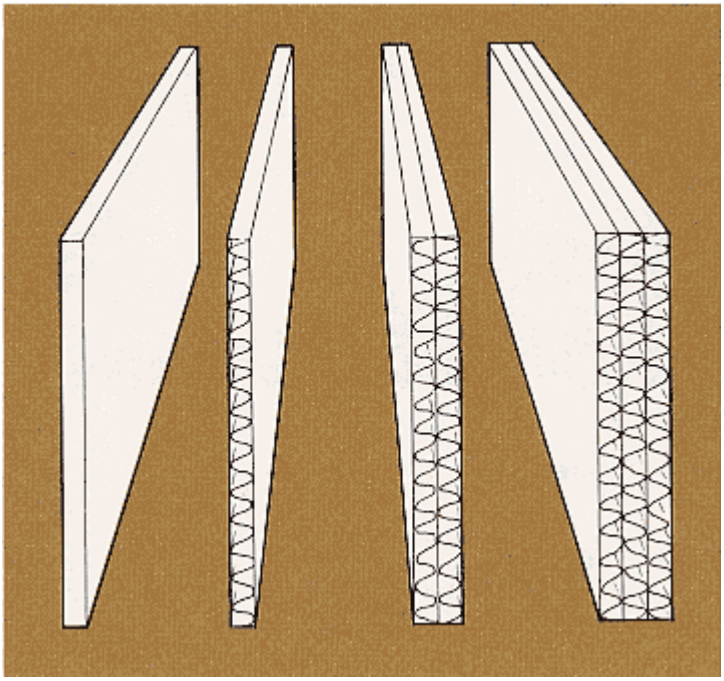
4. Reinforce with two tension straps applied at right angles, and crisscross at top and bottom, or with two girth straps of filament tape.

5. When the nature of the contents permits, the load should support the walls of the box. Otherwise, the box should have sufficient resistance to compression to prevent collapse when placed in the bottom tier of a pile of similar boxes.

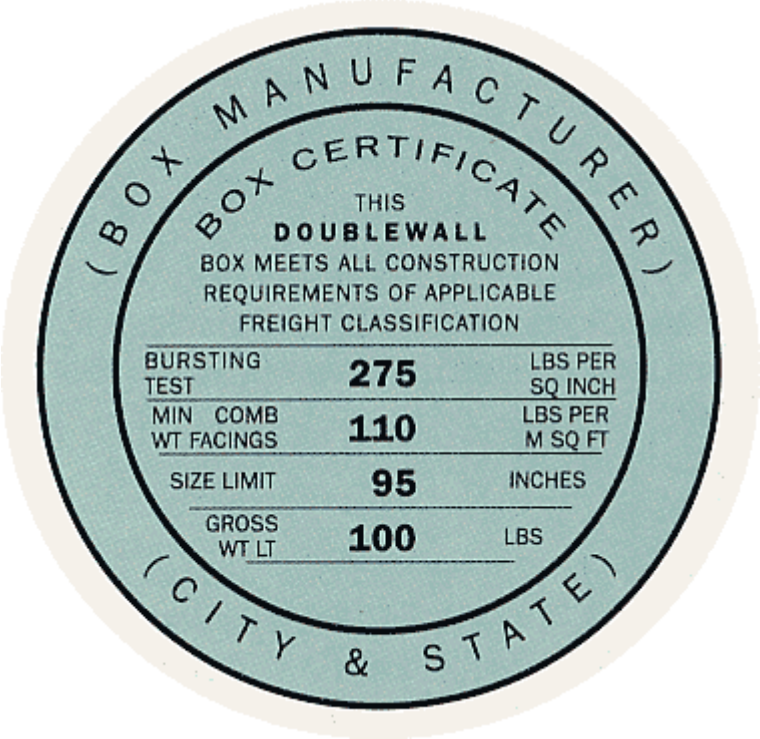
6. Full height partitions should be utilized to separate fragile items within the same fiberboard box and/or increase the stacking strength of the box.

7. Do not overlook economies and additional security offered by unitizing, palletizing or by overpacking several fiberboard boxes into consolidation containers. Highly pilferable merchandise is rarely safe in fiberboard boxes.





1. *Solid Fiberboard*
2. *Single Wall (Double Faced)Corrugated Fiberboard*
3. *Double Wall Corrugated Fiberboard*
4. *Triple Wall Corrugated Fiberboard*



The circular form of certification indicated applies only to those fiberboard boxes that are constructed and used in compliance with Item 222 of the National Motor Freight Classification for truck shipments. Unless performance can be assured by a qualified testing laboratory, we would recommend using only those fiberboard boxes made and certified to comply with the aforementioned rules.
DO NOT use fiberboard with a bursting test of less than 275 lbs. per square inch for export shipping containers.

Nailed Wood Boxes
The nailed wood box is one of the most satisfactory containers for overseas shipment of moderate weight commodities.
Among its particular advantages are: ability to support superimposed loads; ability to contain difficult loads without undue distortion or breaking open; the protection it affords contents from dam-age due to puncture, breakage or crushing; and finally, the fact that it permits interior blocking to hold the contents in place, thus allowing the container to be turned on its side or upside down. The following recommendations should be considered in selecting the nailed wood box:

1. Boxes should be made up of seasoned lumber with moisture content between 12 percent and 19 percent. Knots should not be over one-third the width of the board, and specifically should not interfere with nailing. Severe cross graining should also be avoided.

2. Consult appropriate tables for selection of proper sizes of lumber and nails. Boxes with two or four cleats on each end are particularly recommended for overseas shipment.

3. Many a well-designed box fails because the load is not properly fitted or secured. If necessary, use proper blocking and bracing to adequately secure the load. A properly fitted or secured load should not move when the box is roughly handled. If the load must be kept upright, equip the box with lift handles, skids, top peaks, gables or some similar devices to assure the box being stowed and handled is in an upright position. AVOID OVERLOADING.

4. Reinforce the box with adequate tension metal straps placed one-sixth of the distance from the ends, unless boxes are in excess of 48 inches in length or over 250 pounds. Then, three or more straps should be used, with one for each additional 24 inches. Staples should be used to hold strapping in place when boards are five-eighths of an inch in thickness or greater.

5. DO NOT USE SECOND-HAND BOXES. They are deficient in strength and do not permit detection of pilferage.

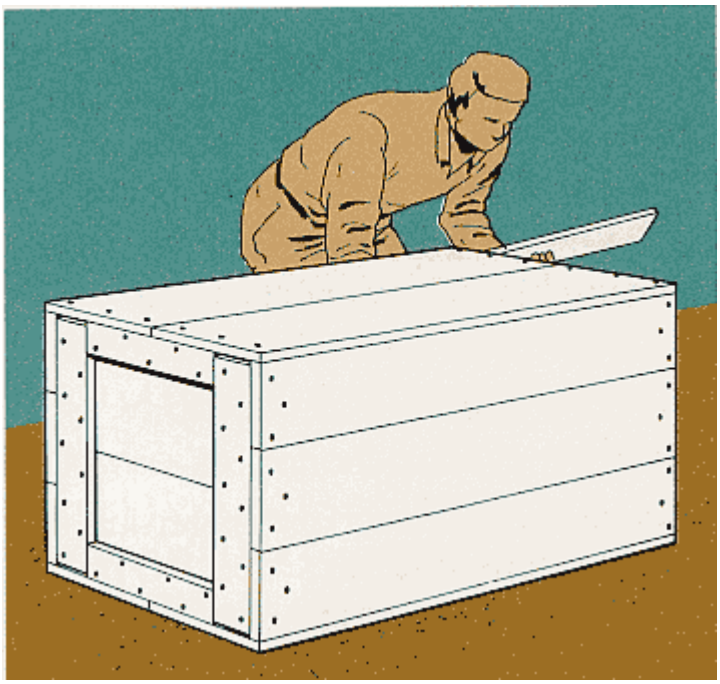
6. Boxes should be equipped with corrugated fasteners or similar devices where contents are substantially valued and susceptible to pilferage.

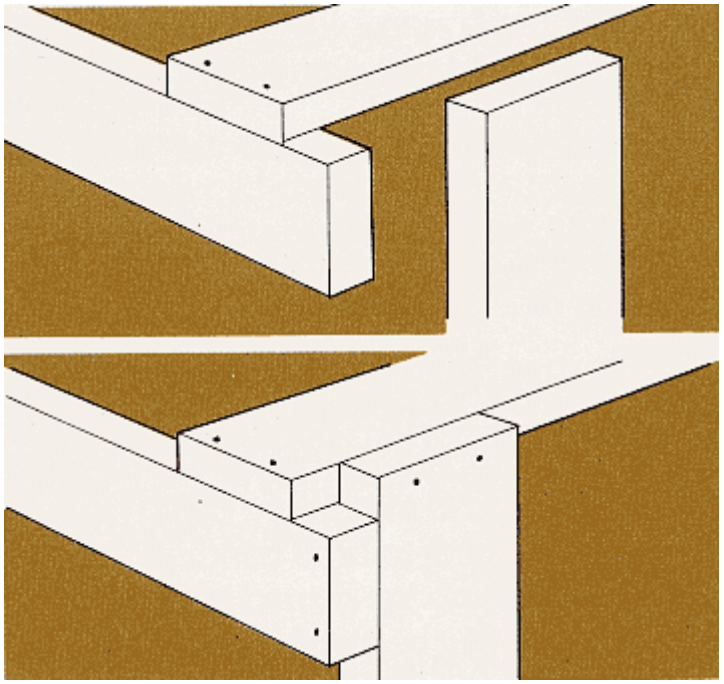
7. Boxes should be lined with a waterproof barrier material sealed at the edge with a waterproof tape or adhesive to protect both the contents and the interior packing material.

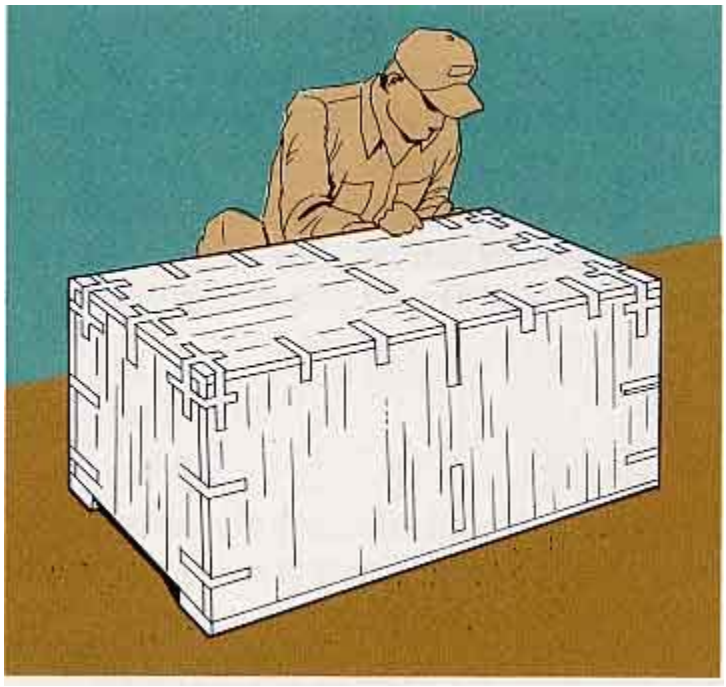
<insert img here>

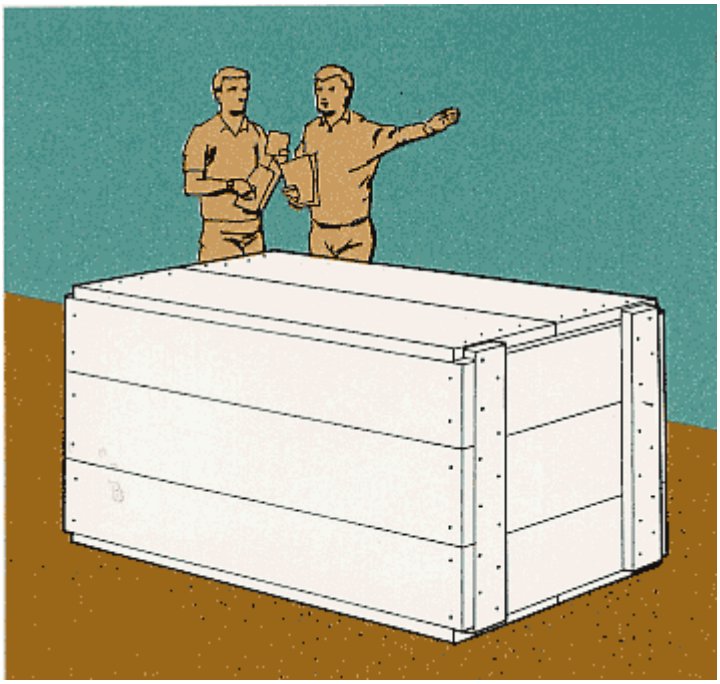
Crates

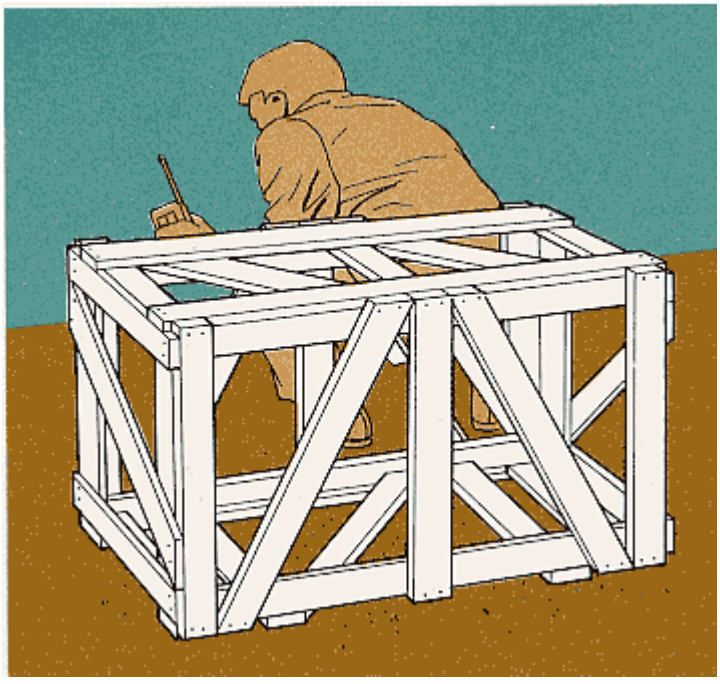
There are two general types of crates - the open or skeletal crate and the fully sheathed crate. Both types are dependent upon properly constructed frameworks. While the drawings below illustrate the comparative strength of frame members of open crates under vertical compression, the same principles apply to sheathed crates, as they also require diagonal bracing to make them rigid. Keep in mind that sheathing is provided to protect against exposure to the elements. The open crate can be used where contents are virtually indestructible, and packing is required only to facilitate handling and stowage. It also serves well as an overpack to consolidate fiberboard boxes or to pro-vide unit pack stiffness to resist crushing. Three-way corner construction should be reinforced with diagonals.











RELATIVE STRENGTH UNDER DIAGONAL COMPRESSION

Consider these points in sheathed crate construction.
1. Provide a SUBSTANTIAL framework, i.e., corner posts or vertical end struts, edge or frame members, intermediate struts and diagonal braces.

2. Large crates are usually stowed in the lower holds, hence they must bear great superimposed weights. Ensure top strength by frequent top joists under sheathing (never more than 30 inches apart). DON'T depend on end grain nailing ALONE to hold these joists. Supplement with back-up cleats.

3. Reinforce floor at load-bearing points.

4. Design sides and ends for vertical sheathing.

5. On skid type crates terminate end sheathing at flooring to permit entry of forklifts. Terminate side sheathing '/a inch short of skid bottoms to prevent tearing away of sheathing when crate is dragged sideways. The use of rubbing strips facilitates handling by forklift trucks.

6. On sill type crates provide lengthwise rubbing strips at base to facilitate handling and prevent tearing adrift of sheathing when the crate is dragged.

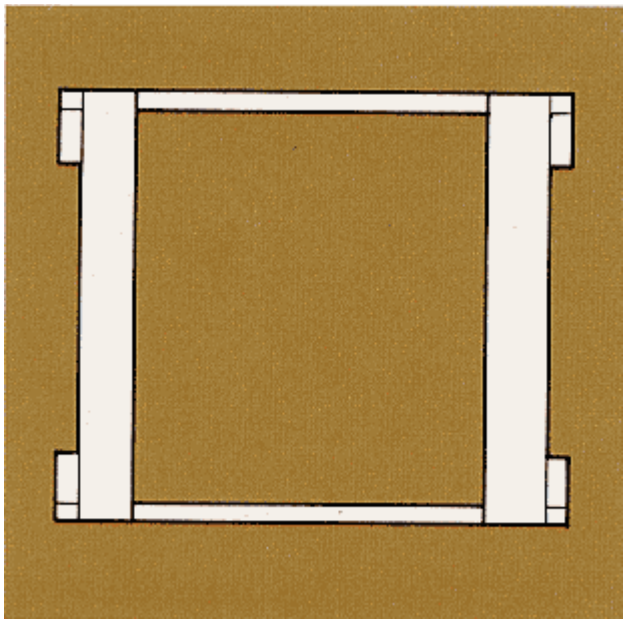
7. Where skids are used, be sure they are of sufficient dimensions and an adequate number provided. Skid ends should al-ways be cambered, sling points provided and marked to facilitate vessel loading/ discharge.

8. Reduce cube and interior bracing problems by providing maximum disassembly of the carried item. Spares and disassembled parts should be adequately secured to crate interior. In doing so aim at a low center of gravity.

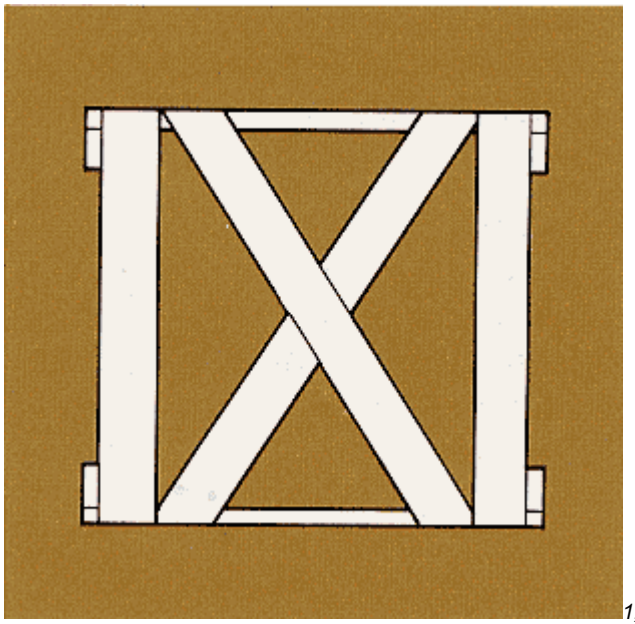
9. Line crate interior (except bottom) with a good grade waterproof barrier material. Ventilate crates containing machinery or other items susceptible to damage from condensation with baffled vents or louvre plates at ends or sides. Also, space floor boards 3/8 inch apart.

10. Corners of all crates should be rein-forced with lengths of 1 inch flat nailed strapping applied so as to tie together all faces at each corner.

11. Assure yourself that handling facilities are available for your crate at destination and at intermediate points. Provide consignee with opening instructions to re-duce accidental damage during unpacking.



100 Units



1,130 Units

Wirebound Crates and Boxes

Wirebound boxes and crates have shown themselves useful for a large variety of products not affected by minor distortions of the unit and as overpacks for solid or corrugated fiberboard boxes (cartons). If the wirebound container is not completely filled, properly applied interior blocking and bracing is recommended. The ends of wirebound containers should be reinforced to adequately resist forces that may be applied during handling thus preventing damage to contents. Shippers should AVOID OVERLOADING and should not use boxes too large for their contents. Other considerations are:

1. Veneer and cleats should be full thick-ness, straight grained and sound, free from knots, decay, mildew or open splits. Knots not more than 1.5 inches in diameter and less than one-third the width of the piece of veneer are allowable. Wire should be free from rust and scale.

2. Ideal staple spacing is 2.5 inches on crates; 2 inches on boxes. A minimum of two staples per slat is recommended.

3. Observe care in effecting closures to avoid wire fatigue. Use special closure tools,

4. Consult appropriate tables and your box supplier for export specifications.

5. Where contents are susceptible to pilferage or exceed 150 pounds, apply one tension strap lengthwise around top, bottom and ends. If over 250 pounds, apply two girthwise straps within 3 inches of each end. Also, consider applying straps over intermediate cleats.

6. Line box interior with a good grade waterproof barrier material and properly seal.

Cleated Plywood Boxes

Properly assembled and used, cleated plywood panel boxes have many uses in foreign trade. Their lightness and comparative strength particularly recommend them for air cargo shipments. Shippers may abuse these containers by using second-hand units, overloading, applying strapping improperly, allowing long un-supported panels or failing to properly nail the box closed. Thin panels invite damage to contents through punctures. Follow these points:

1. Consult appropriate tables to avoid overloading, to determine proper nail spacing and to find

correct dimensions of plywood and cleats. NEVER USE SECOND-HAND BOXES.

2. Reject rotted, split or otherwise defective cleats.

3. Apply intermediate cleats to all panels in excess of 24 inches.

4. Apply strapping only over edge and/or intermediate cleats for maximum support. Strapping that spans unframed areas is easily broken and may injure cargo handlers. Use stapling to hold banding in place on cleats.

5. Don't overlook lining with adequate waterproof or vaporproof barrier material, where contents are susceptible to wetting damage.

Steel Drums
New steel drums are generally excellent for export. Second-hand drums, unless thoroughly reconditioned and tested, may give trouble because of fatigue caused by dents at the chime and previous damage to the closures. Also consider the following:

1. Closures must be made as prescribed by the manufacturer. Back up friction type covers of drums, as well as cans or pails, with soldering or spot welding at three or more points.

2. Be sure adequate seals are used on locking levers and sealing rings of open end drums. Failure of seals may result in accidental opening of covers.

3. Consider use of tamperproof seals at filling and dispensing holes.

4. Make frequent spot checks of automatic filling machinery by weighing filled drums. Shortages may occur at the source.

5. Do not re-use single or one trip containers.

6. For hazardous materials/dangerous goods, be sure the drums meet DOT/ IMO/ICAO or appropriate standard-making group specifications, and are properly labeled for carriage of the intended cargo.

Fiber Drums
Fiber drums are gaining importance in the export picture. Before using them deter-mine that open storage enroute is not contemplated. Considerations for fiber drums include:

1. High density materials should not be packed into fiber drums.

2. Fiber drums should be filled to the top in order to add rigidity to the package. Use smaller drums if contents are such that weight limits will be exceeded if filled to the top. Avoid empty spaces at the top of the drum.

3. It is advisable to settle or deaerate materials particularly light fluffy powders- during the filling operations. Use of a vibrator or mechanical settler is recommended. Bag-lined drums can be deaerated simply by manually compressing the filled bag.

4. Keep size of drum compatible with weight of contents to avoid overloading.

5. Closures are important. Be sure sealing rings and locking levers are properly in place and will not be accidentally jarred or pulled loose.

6. Handle with mechanical equipment or roll on bottom chimes. Fiber drums are not designed to roll on sidewalk Avoid cutting, denting and chafing of sidewalls as stacking strength will be lost.

7. If possible, palletize fiber drums to facilitate mechanical handling in warehouses or on docks.

Barrels, Casks or Kegs

The wooden barrel has been a workhorse of overseas trade, dating back to ancient times. Selection of the wrong barrel for your product can result in leakage, contamination, breakage and many other headaches. The following are basic recommendations:

1. Tight (liquid) barrels should be stored bung up. Request stowage on bilges. Slack (dry) barrels should be stored on ends. Never store or ship slack barrels on their sides.

2. Provide reinforcing head cleats running from chime to chime at right angles to headpieces. Cleat thickness should never be greater than chime depth.

3. Use tongue and groove staves with a suitable liner where contents, such as dry chemicals and powders, may sift. Make sure barrel wood and liner material will not contaminate contents.

4. Keep voids in slack barrels to a mini-mum. Use headliners (strips of coiled elm fastened inside chime) to give barrel heads added strength.

5. Where tight barrels are employed, hoops should be fastened with not less than three fasteners (dogs) per hoop. Provide for inspection at interim transit points, where practicable, to check for leakage. If contents are carried in brine, re-brining at interim points may save contents of leaking units.

Multi-Wall Shipping Sacks

Multi-wall shipping sacks or bags are being used more and more for packaging of powdered, granular and lump materials, particularly dry chemicals. These sacks are flexible containers generally made up from two walls or plies of heavy-duty kraft paper to a maximum of six. Often, they are made in combination with special coatings, laminations, impregnations or even textile material such as bur-lap to give them additional strength and added protection to their contents. Because of the flexibility of these containers, special attention must be given to the use of flexible waterproof or moistureproof barriers in their construction.

There are several types of bags used, the most common being the pasted bottom or sewn bottom open-mouth, and the pasted valve or sewn valve. The pasted bottom and sewn bottom open mouth type bags are closed after filling, by sewing through all plies with a strip of tape incorporated into the sewn end in such a way that it folds over the end to control sifting. They can also be closed by gluing. The valve type bags are closed by manually folding over an external paper sleeve or by the check valve action of an inner paper sleeve when the bags are full. The internal pressure of the contents causes this, and care must be taken that the bags are sufficiently filled to exert this pressure. It must be recognized that slight leakage will nevertheless occur, particularly when the bags are handled.

The use of these bags for overseas shipments should be limited. These bags must be adapted to the requirements of the commodity it contains. This requires careful research and intelligent selection. It is recommended that the loaded bag not exceed 50 pounds. Thought must be given to the value of the product as well as to its hygroscopic properties and chemical and physical characteristics. Utmost consideration must be given to in-transit hazards, such as atmospheric conditions or expo-sure to the elements, number of transfers and handlings and warehouse facilities. Of major importance is the question as to whether the contents of the sack will be subjected to contamination if the bags are ruptured or if foreign matter can filter in through stitching holes.

A good practice for the shippers is to include a supply of open mouth refill or overslip sacks with each shipment.

The number of refill sacks should not be less than 1 percent of the number of sacks in the shipment and preferably 3 percent. The refill sacks should be imprinted with instructions for their use as well as identification of the commodity that they will carry. Overslip sacks should be slightly larger than the original sack and constructed of the same number and kind of plies.

Palletizing of a number of sacks, adequately shrink-wrapped and/or banded to the pallet, has been particularly effective in reducing damage and pilferage, and forces use of mechanical handling equipment.

Bales

A well-made bale may be expected to outturn reasonably well in most export trades. Bear in mind, however, that all bales are subject to pilferage, hook holes and water damage. They are, therefore, not recommended for highly valued commodities. To minimize losses, follow these recommendations:

1. Use a primary wrap of fiberboard material where contents may be subject to damage from strapping pressure.

2. Use an inner wrap of creped or pleated waterproof paper. This type of paper is necessary to provide moisture protection and to give with bale distortions without tearing.

3. Provide heavy outer wrap of burlap or similar cloth able to withstand heavy abrasions in transit.

4. Provide "ears" at corners of small bales to facilitate handling without hooks. Bale weights under 100 pounds are less apt to be handled with hooks.

5. A minimum of four flat tension bands should be used. Apply tightly at the maximum bale compression to avoid slipping of end bands.

6. Stencil all shipping and cautionary marks on bale. Do not use tags as these can easily be torn off during normal handling.

Flexible Intermediate Bulk Containers (FIBCs)

These containers, a combination of pack-aging materials and a lifting system, can be used in the transportation of most granular and powder commodities. They should have a capacity not in excess of three cubic meters and/or a gross weight of 3,000 kg and be fitted with integral or detachable devices for lifting/suspension.

FIBCs are manufactured from a fabric or woven polymer, polypropylene, polyethylene, polyester or polyamide; the latter two for use in multi-trip containers where they are expected to encounter arduous conditions. The fabric is made up into a cuboid or cylindrical container stitched with man-made fiber or twine. Some heavy-duty units have welded seams.

Some flexible containers have disposable polyethylene liners that are used to prevent product seepage and improve water-tightness. These liners can also preclude cleaning and extend the life of re-usable containers.

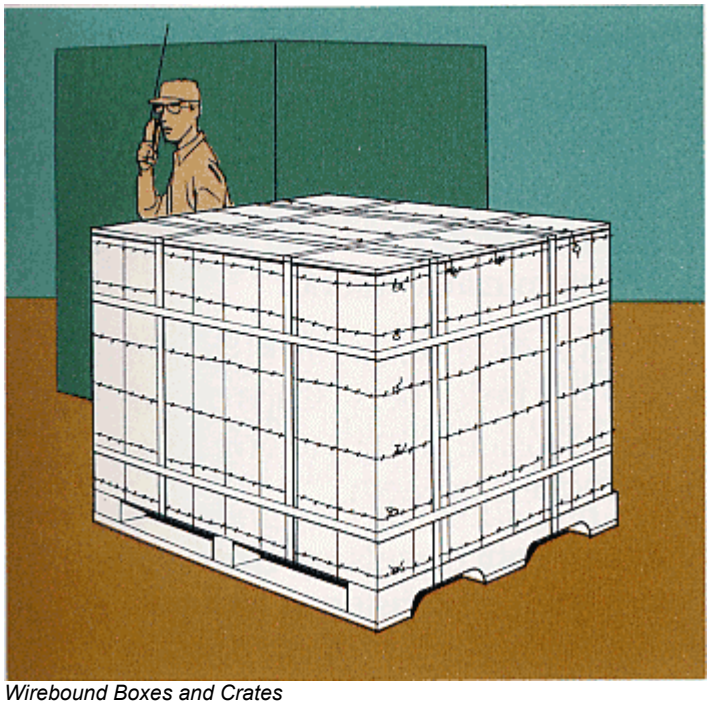
The means of filling are fitted to the top usually in the form of a flexible spout; some types have open tops. Similarly, a discharge fitting such as another spout is located at the bottom of the container. Pro-visions are made to protect the discharge arrangement from dust often by a thimble spout or use of a protective flap.

FIBCs should be inspected prior to each use, checked for abrasions, cuts, contusions, ultraviolet degradation and/or chemical attack evidenced by weakening, softening or discoloration of the material and damage to coatings. These could lead to possible contamination of contents with unacceptable levels of coating fragments or increased chance of moisture contact.

Additional safe handling points include:

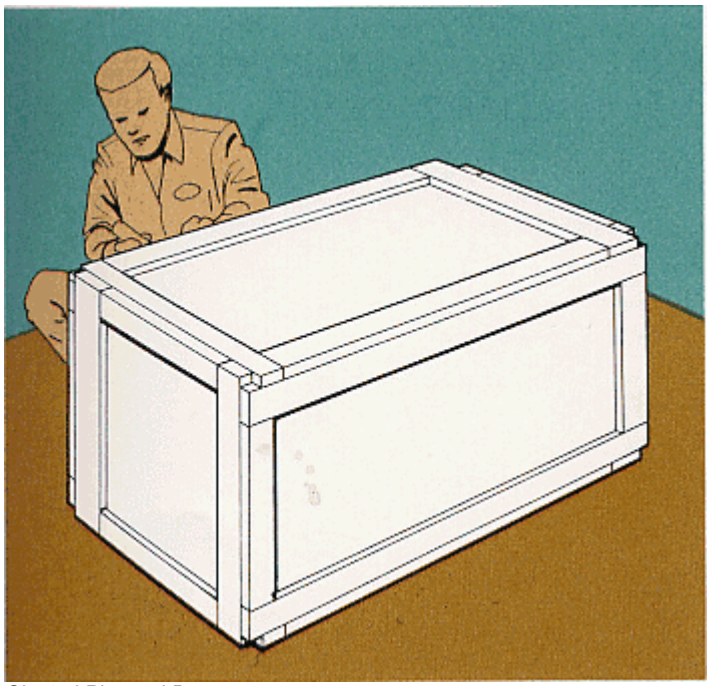
- check for test certificate that indicates the FIBC is an approved type
- ensure the filled FIBC is stable
- close the top inlet correctly
- protect containers from rain and/or pro-longed sunlight
- ensure stability when stacking FIBCs
- secure the containers adequately for transportation

Steel Drums



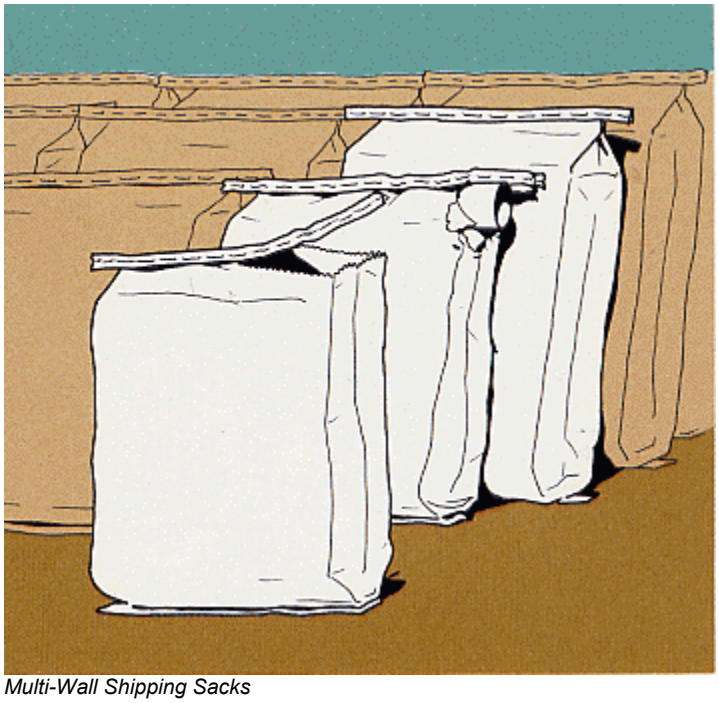
Wirebound Boxes and Crates

Fiber Drums

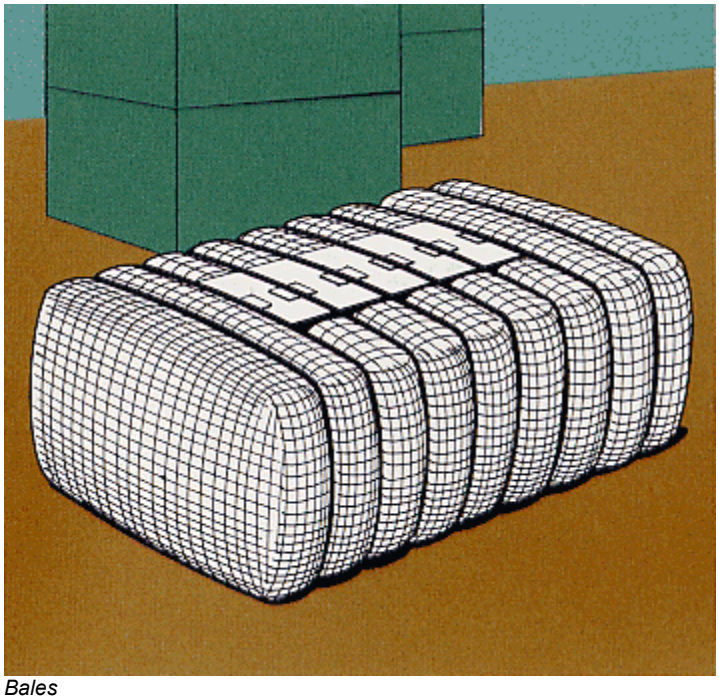


Cleated Plywood Boxes

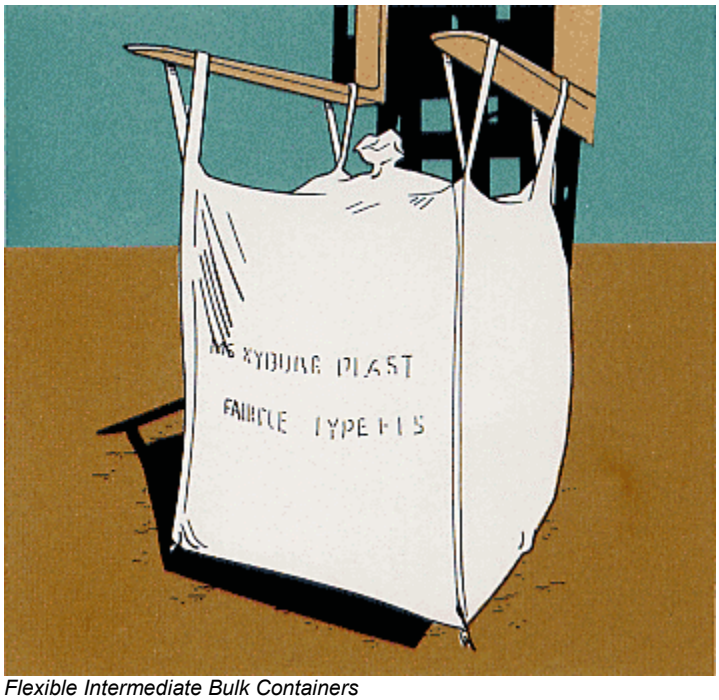
Barrels, Casks or Kegs



Multi-Wall Shipping Sacks



Bales



Flexible Intermediate Bulk Containers

Cushioning

Certain types of cargo must be suspended or protected against shock and vibration by a cushion that gradually increases resistance against item movement.

Selection of the correct cushioning material depends on the item's fragility, measured in "Gs" or the maximum deceleration it can withstand without damage, overall dimensions, weight, shape, surface finish and built-in shock resistance. Other considerations include anticipated drop

heights based on handling and transportation environment. Many cushioning material suppliers provide performance data with their products.

Cushioning Materials and Characteristics

Cushioning Characteristics (1)

Type Material	*Abrasion Resistance*	*Resilience*	*Compression*	*Absorption*	*Water Resistance*	*Dusting(2)*	*Damping Quality(3)*
Expandable Polystyrene (EPS)	Good	Medium	High	Low	High	Low	Low
Cellulosic	Good	Medium	High	(4)	(4)	High	Excellent
Wood Excelsior	Poor	Medium	High	High	(4)	High	Good
Hair Felt	(5)	Medium	Low	(5)	(5)	Low	Poor
Solid/ Corrugated Fiberboard	Poor	Medium	Low	Low	High	High	Poor
Wax Shredded Paper	Poor	Low	High	High	Low	High	Excellent
Cellular, Plasticized, Polyvinyl Chloride	(4)	High	Low	Nil	High	Low	Good
Polyurethane (Fab or Molded)	Good	(8)	(8)	(8)	Low	Low	(8)
Polyurethane Foam (6)	Good	(6)	(6)	(6)	Low	Nil	(6)
Polyethylene Foam (7)	Fair	High	High	High	High	Low	Good
Latex Foam Sponge Rubber	Good	High	Low	High	Low	Low	Fair
Paper Honeycomb	Energy dissipating medium only						

(1) These ratings are general in nature. Any characteristics can be varied in a customized mode.
(2) Dusting describes the extent of material breakdown in small or dustlike particles in transit.
(3) Damping quality reflects the ability of the material to progressively diminish vibrations or oscillation.
(4) This material is manufactured under different specifications that vary the degree of named characteristics but generally is susceptible to moisture.
(5) Used mainly as padding for large and heavy items. Often glued in place.
(6) This is a foam-in-place material that can vary in make-up to meet requirements.
(7) This material is available with anti-static and/or fire retardant additives.
(8) This material can be manufactured to varying specifications to meet shipment needs.