

A BASIC PACKING GUIDE: EXTERIOR CONTAINERS

FIBREBOARD BOXES (CARTONS)

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

First, the shipper must determine whether or not a fibreboard container is suitable for the particular commodity to be shipped, bearing in mind the item's vulnerability as well as the potential for encountering handling and transportation hazards. If the determination is "yes, it will be suitable", the shipper should use the fibreboard container subject to the following:

1. The underlying factors in the selection of the fibreboard box are:
 - resistance to compression
 - resistance to puncture
 - strength on the score lines
 - And probably the most important, resistance to moisture absorption.Impregnated and multi-wall boxes are the most practical. Never use corrugated fibreboard boxes with a bursting test strength of less than 275 lbs. per square inch (for exporting).
2. Flaps should be stapled or glued with a water-resistant adhesive applied to the entire area of contact between the flaps. For further protection, all seams can be sealed with a water-resistant tape.
3. Keep weight of contents within load limits specified in the box maker's certificate that appears on the box. The circular form of certification indicated applies only to those fibreboard boxes that are constructed and used in compliance with rule 41 of the Uniform Freight classification for rail shipments and item 222 of the National Motor Freight classification for truck shipments. We would recommend using only those fibreboard boxes made and certified to comply with the aforementioned rules.

DO NOT use fibreboard with a bursting test of less than 275 lbs. per square inch for export shipping containers.

4. Reinforce with two tension straps applied at right angles and criss-crossing at top and bottoms, or with two girth straps of filament tape.

5. When the nature of the contents permits, the load should support the walls of the container. Otherwise, the container selected should have sufficient resistance to compression to prevent collapse when placed in the bottom tier of a pile of similar boxes. NEVER OVERLOAD.
6. Full height partitions should be utilized to separate fragile items within the same fibreboard box and/or to increase the stacking strength of the box.
7. Do not overlook economies and additional security offered by unitizing or palletizing, or by over-packing several fibreboard boxes in consolidation containers.
8. Remember, highly pilferable merchandise is never safe in fibreboard boxes.

NAILED WOOD BOXES

The nailed wood box is one of the most satisfactory containers of overseas shipments for commodities of moderate weight. Among its particular advantages:

- its ability to support superimposed loads
- its ability to contain difficult loads without undue distortion or breaking open
- the protection it affords contents from damage due to puncture, breakage or crushing
- 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 per cent and 18 per cent. Knots should not be over one-third the width of the board and specifically should not interfere with nailing. Bad cross graining should also be avoided.
2. Consult appropriate tables for selection of proper sized of lumber and nails. Boxes with two or four cleats on each end are particularly recommended for overseas shipment.
3. Load properly. Many well-designed boxes fail because the load is not properly fitted within the container. Unless the item to be packed is irregular in shape, do not permit any voids or dead space. If the load must be kept upright, equip the box with lift handles, skids, top peaks or gables, or some similar device to assure the box being stowed and handled in an upright position. AVOID OVERLOADING.
4. Reinforce the boxes with adequate tension metal straps placed one-sixth of the distance from the ends, unless containers 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 edges with a waterproof tape or adhesive, to protect both the contents and the interior packing material.

LUMBER & NAIL TABLES FOR NAILED WOOD BOXES

		BELOW MEASUREMENTS IN INCHES											
		LOAD SUPPORTS CONTAINER WALLS						LOAD GIVES LITTLE OR NO CONTAINER SUPPORT					
		SOFTWOOD			HARDWOOD			SOFTWOOD			HARDWOOD		
Weight of Contents (Pounds)	Number of End Cleats	Thickness sides, top & bottom	Thickness ends	Thickness and width of cleats	Thickness sides, top & bottom	Thickness ends	Thickness and width of cleats	Thickness sides, top & bottom	Thickness ends	Thickness and width of cleats	Thickness sides, top & bottom	Thickness ends	Thickness and width of cleats
Over - Less													
0 - 50	2	3/8	5/8	5/8 x 1 3/4	3/8	5/8	5/8 x 1 3/4	1/2	3/4	3/4 x 2 1/4	1/2	5/8	5/8 x 1 3/4
0 - 50	4	3/8	5/8	5/8 x 1 3/4	3/8	5/8	5/8 x 1 3/4	1/2	5/8	5/8 x 2 1/4	1/2	5/8	5/8 x 1 3/4
50 - 100	2	1/2	3/4	3/4 x 2 1/4	3/8	5/8	5/8 x 1 3/4	1/2	3/4	3/4 x 2 1/4	1/2	5/8	5/8 x 1 3/4
50 - 100	4	1/2	3/4	3/4 x 2 1/4	3/8	5/8	5/8 x 1 3/4	1/2	5/8	5/8 x 2 1/4	1/2	5/8	5/8 x 1 3/4
100 - 250	2	5/8	3/4	3/4 x 2 1/4	1/2	3/4	3/4 x 2 1/4	5/8	3/4	3/4 x 2 5/8	1/2	3/4	3/4 x 2 1/4
100 - 250	4	5/8	5/8	5/8 x 2 1/4	1/2	5/8	5/8 x 2 1/4	5/8	3/4	3/4 x 2 1/4	1/2	5/8	5/8 x 2 1/4
250 - 400	2	3/4	13/16	3/4 x 2 5/8	5/8	3/4	3/4 x 2 1/4	3/4	1 1/16	1 1/16 x 3 1/4	5/8	13/16	13/16 x 2 3/4
250 - 400	4	3/4	13/16	3/4 x 2 5/8	5/8	3/4	3/4 x 2 1/4	3/4	3/4	1 1/16 x 3 1/4	5/8	3/4	3/4 x 2 3/4
400 - 600	4	13/16	13/16	13/16 x 2 5/8	5/8	3/4	3/4 x 2 1/4		13/16	1 1/16 x 3 1/4	3/4	13/16	13/16 x 2 3/4
600 - 800	4	13/16	1 1/16	1 1/16 x 3 1/4	13/16	1 1/16	1 1/16 x 3 1/4	13/16	1 1/16	1 1/16 x 3 1/4	3/4	13/16	13/16 x 2 3/4
800 - 1000	4	1 1/16	1 5/16	1 5/16 x 4 1/8	1 1/16	1 5/16	1 5/16 x 4 1/8	1 1/16	1 5/16	1 5/16 x 4 1/8	7/8	1 1/16	1 1/16 x 3 3/8

NAILS: Cement coated nails are preferred for their increased holding power. The size of the nail depends on the thickness of the wood (see above). Use 6d for 5/8", 7d for 3/4", 8d for 13/16", 9d for 1 1/16" & 12d for 1-5/16". Do not use nails into wood less than 5/8". Spacing of nails (fastening sides, tops & bottom to the ends) varies with the size of the nail. Space 6d 2", 7d 2-1/4", 8d 2-1/2", 9d 2-3/4", and 12d 3-1/2". (If nailing into end grain, reduce spacing by 1/4".)

WOOD: Fir, pines, poplar, cottonwood, cedar, hemlock and larch are included in the softwood category. Hardwoods include ash, elm, cherry, oak, hard maple and hickory.

3-WAY CORNER: THE STRONGEST, MOST RIGID CORNER CONSTRUCTION FOR A CRATE

There are two general types of crates: the open or skeleton crate and the fully sheathed crate. Both types are dependent upon properly constructed frameworks and 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 the contents 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 over-pack to consolidate fibreboard boxes or to provide 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 lower holds, hence must bear great superimposed weights. Insure top strength by frequent top joists under sheathing (never more than 30" apart). DON'T depend on end grain nailing ALONE to hold these joists. Provide joist support positioned directly under the joists' ends.
3. Reinforce floor at load bearing points when between skids or sill members.
4. Design for vertical sheathing; sides and ends.
5. On skid type crates, terminate end sheathing at flooring to permit entry of forklifts. Terminate side sheathing ½" short of skid bottoms to prevent tearing away of sheathing when crate is dragged sideways.
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 always be chamfered, sling points provided and marked to facilitate loading aboard ship.
8. Reduce cube and interior bracing problems by providing maximum disassembly of the carried item. Spares and disassembled parts should be adequately secured to the crate interior. In so doing, aim at a low center of gravity.
9. Supplement weak end grain nailing of interior bracing by back-up cleats.
10. Line crate interiors (except bottom) with a high-grade waterproof barrier material. Ventilate crates containing machinery or other items susceptible to damage from condensation with baffled vents or louver plates covering ventilation hole clusters at ends or sides. Also, space floor boards 3/8" apart. Consider use of crate top coating where open freight car or open storage may be encountered.
11. Corners of all crates should be reinforced with lengths of 1" flat nailed strapping applies so as to tie together all their faces at each corner.

Assure yourself that handling facilities are available for your crate at destination and at intermediate points. Provide consignee with opening instructions to reduce accidental damage in unpacking.

WIREBOUND BOXES AND CRATES

Wirebound boxes and crates have shown themselves useful for a large variety of products not affected by minor distortions of the container. It is an ideal container for over-packs of solid or corrugated fibreboard boxes (cartons). If the wirebound container is not completely filled or if the contents may be affected by possible distortion of the container, properly applied interior blocking or bracing should be used. The ends of wirebound containers should be reinforced to adequately resist the 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 thickness, straight grained and sound, free from knots, decay, mildew or open splits. Sound knots not more than 1 ½" 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 ½" on crates and 2" on boxes. A minimum of two staples per slat is recommended.
3. Mitered cleats provide greater resistance to rough handling than tongued and grooved cleats.
4. Observe care in effecting closures to avoid wire fatigue. Use special closure tools.
5. Consult appropriate tables and your box supplier for specifications for export type containers.
6. Where contents are susceptible to pilferage or exceed 150 lbs., apply one tension strap around top, bottom, and ends. If over 250 lbs., apply two additional straps 3" from each end around top, bottom and sides; also consider applying straps over intermediate cleats.
7. Line box interior with good grade of waterproof barrier material, properly sealed.

CLEATED PLYWOOD BOXES

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

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 rotten, split or otherwise defective cleats.
3. Apply intermediate cleats to all panels in excess of 24".
4. Apply strapping only over edge and/or intermediate cleats for maximum support. Strapping which spans unframed areas is easily broken and can handlers. Employ stapling to hold banding in place on the cleats.
5. Don't overlook lining with adequate waterproof or vapor-proof barrier material, where contents are susceptible to water 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 damages to 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 or dangerous substances, be sure the drums meet D.O.T. specifications and are properly labeled for carriage of the intended cargo.

FIBRE DRUMS

Fibre drums are gaining importance for use in export. Before using, however, it should be determined that open storage en route is not contemplated. Considerations for fibre drums include:

1. High-density materials should not be packed into fibre drums.
2. Fibre drums should be filled to the top in order to add rigidity to the package. If contents are such that weight limits will be exceeded if filled to the top, smaller drums should be used. Avoid empty spaces at top of drum.
3. It is advisable to settle or de-aerate materials, particularly light fluffy powders, during filling operations. Use of a vibrator or mechanical settler is recommended. Bag-lined drums can be de-aerated 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. Fibre drums are not designed to roll on sidewalls. Avoid cutting and chafing of sidewalls.
7. If possible, palletize fibre drums to facilitate mechanical handling in warehouses or on docks.
8. Never use a drum that has sidewall damage (cuts, dents) as stacking strength is lost.

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. Stack (dry) barrels should be stored on ends. Never store or ship slack barrels on their side.
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 shift. Make sure barrel wood and liner material will not contaminate contents.
4. Keep voids in slack barrels to a minimum. Use headliners (strips of coiled elm fastened inside chime) to give barrelheads added strength.
5. Where tight barrels are employed, hoops should be fastened with not less than three hoop fasteners (dogs) per hoop. Provide for inspection at interim transit points to check for leakage where practicable. 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 plies of textile material such as burlap 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 of the sack to control sifting. Gluing can also close them. 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. This type of container, more than any other, must be adapted to the requirements of the commodity they contain. This requires careful research and intelligent selection. It is recommended that the loaded bag does not exceed 50 lbs. Consideration must be given to the value of the product as well as to its hygroscopic properties and chemical and physical characteristics.

UNIT LOADS

Many products or commodities can be economically palletized or unitized to facilitate handling, stowage and protection of cargo. Palletizing is the assembly of one or more packages on pallet base and securing the load to the pallet. Unitizing is the assembly of one or more items into a compact load secured together and provided with skids and cleats for ease of handling. Often, palletizing and unitizing can significantly reduce packing costs. In addition, pallet and unit loads offer the following advantages:

- Handling of palletized or unitized loads requires use of mechanical handling equipment, reducing the manual handling damage hazard.
- Eliminates the multiple handling of individual items, further reducing possible damage for manual handling.
- Reduces opportunity for pilferage and theft and permits early detection of tampering.

- Speeds loading and unloading of trailers, boxcars, intermodal containers, barges, ships and aircraft.
- Facilitates application of waterproofing protection to the load; the overwrap applied accompanies the load for the entire journey.
- Reduces incidence of lost or strayed items.
- Facilitates checking and inventory of shipment.

PALLETIZING CARGO

There are four “standard” pallets that accommodate the different modal/intermodal containers most frequently used in international commerce. The sizes, in inches, of these pallets are:

- 45 x 54 (114 x 137 cm)
- 45 x45 (114 x 114 cm)
- 45 x 33.75 (114 x 83 cm)
- 40.91 x 49.09 (104 x 122 cm) or 40 x 48 (102 x 122 cm).

Select the pallet that:

1. Best utilizes the space on the intermodal transportation to be used.
 2. Best utilizes the uniform unit package dimensions of the item to be shipped.
 3. Limits the weight of the palletized load to 2200 pounds (1000 kg).
- ✓ Assemble the individual unit packages on the pallet base without an overhang. The load pattern should minimize voids and be interlocking.
 - ✓ Insert spacers between the rows or layers of irregularly shaped items. Adhesives can be used between cartons in a uniform load.
 - ✓ Secure the load tightly and firmly by using horizontal and vertical strapping. Plastic shrink-wrap can be used to stabilize and protect palletized loads.
 - ✓ Provide stacking protection to the top of the pallet by using a lumber, plywood or fibreboard cap. Loads that are susceptible to compression must also be supported with vertical framing.
 - ✓ Palletized loads susceptible to water damage can be protected by shrink-wrap or stretch wrap, overwrapping with barrier material, or consolidated shipping in a weather-tight container.

UNITIZING CARGO

- ✓ Assemble individual items into one unit by bolting, nailing, or strapping together.
- ✓ Provide unit loads with skids to facilitate handling by forklift.
- ✓ Provide vertical cleats on sides of load to facilitate handling by cargo sling.
- ✓ Provide water damage protection by using plastic shrink-wrap or stretch wrap on individual items before assembly into unit load.
- ✓ Apply shrink-wrap or stretch wrap to entire load.
- ✓ Use waterproof paper or plastic film over-wraps.

The American National Standards Institute in New York publishes a guide to aid manufacturers, consumers and the general public on unit-load and transport package sizes that efficiently fit ISO freight containers, rail cars and USA truck trailers. Unit load stacking patterns and package sizes are presented.

SUGGESTIONS FOR VALUABLE SHIPMENTS

1. In planning the shipment of valuable merchandise, seek a level of security comparable to the security you know you require for your own premises.
2. Select a tariff designed for the movement of valuable merchandise and abide by its recommendations.
3. Make advance booking with a carrier for shipment so consignees may be on alert for arrival.
4. Tender shipment to carrier not more than three (3) hours prior to the scheduled departure of the flight for which advance arrangements have been made.
5. Notify the consignee to accept delivery of the shipment at destination within three (3) hours after scheduled arrival time of flight.
6. Avoid shipping when consignment will arrive at destination on weekends or holidays. (Some carriers will refuse shipments tendered between 1 p.m. Friday and 8 a.m. Monday). When delays in acceptance of valuable merchandise are anticipated, e.g. when weekend or holiday arrivals are unavoidable, arrange for special handling such as transportation via an armored vehicle or placement in a suitable repository such as provided by Purolator at Kennedy Airport. (Some carrier tariffs provide for special handling charges that are assessed against the shipment when consignee fails to pick up the shipment within three (3) hours of scheduled arrival time of flight).
7. Adhere to minimum package dimensions. Most tariffs provide for minimum package size of one (1) cubic foot.
8. Use only new, well-constructed packaging for your product.
9. Clear and complete delivery and handling instructions should appear on at least three (3) surfaces of the exterior-shipping package.
10. Eliminate all product identification on the exterior of shipping package.
11. Avoid shipping on a routine schedule; report suspected theft quickly.