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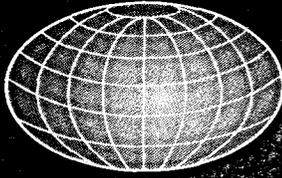
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Export Packaging

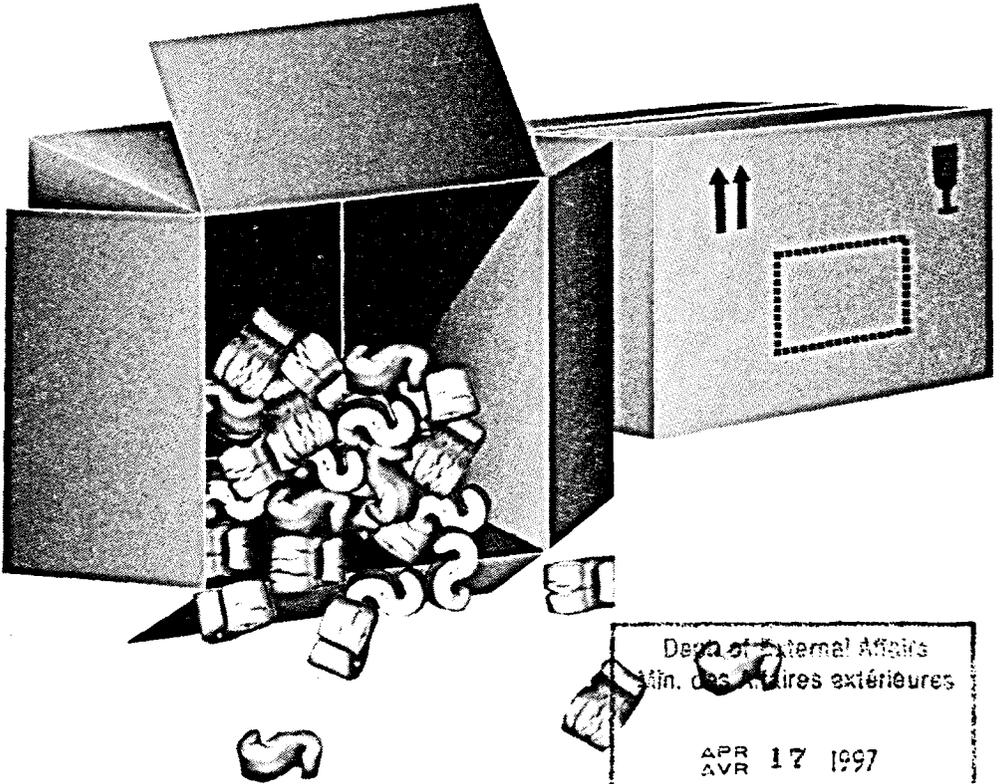


Department of Foreign Affairs and International Trade (DFAIT) has commissioned this guide for Canadian shippers and exporters to facilitate their international cargo movements. Safe, efficient and effective packaging of products will increase Canada's international competitiveness and will promote better customer relations and repeat orders.

DFAIT's focal point on transportation is the Services Industries and Transportation Division (TPS), located at 125 Sussex Drive, Ottawa, Ontario, K1A 0G2.
Tel: (613) 996-0446/996-0245; Fax:(613) 996-1225/996-1267



EXPORT PACKAGING



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Department of Foreign Affairs and International Trade

Designed and written for Foreign Affairs and International Trade Canada,
Services Industries and Transportation Division
by



THE MARIPORT GROUP LTD.

Burlington, Ontario

The opinions expressed in this report are those of the authors and do not necessarily represent the past or current policy of the Government of Canada.

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FOREWORD

In the early years of international trade, packaging of goods was relatively easy.

Personal effects were shipped in a steamer trunk and clothing and cloth items in a jute bale. Trade goods however were shipped in barrels or casks packed in clean straw.



These ubiquitous shipping containers came in many sizes and weights, were easily handled, and were completely reusable. For example, up until the 1960's nickel matte used to be shipped from Canada to smelters in Norway in used oak barrels. The barrel was the common denominator of international trade, and apart from marks to identify the consignee and shipper and contents, every barrel was the same whether it contained whisky or china. Logos, bar coded tracking, point of sale graphics and the like were unknown.

While you can still use a jute bale or a barrel for shipment, these are not preferred containers. Today, the options for shipment are innumerable, as are the types of packaging. Regrettably, the opportunity for damage to goods shipped has also expanded, along with the options for mode of shipment and type of packaging.

Damage due to improper packaging constitutes between 10-15% of claims in the view of cargo surveyors. This figure is supported by a survey of rail shipment damage by the Fibre Box Association that identified a total of 12% of damage due to inadequacies related to the carton. Half of this damage was due to "boxes and interiors seeming inadequate for the contents". However poor packaging also contributes to damage resulting from poor stowage of goods in the truck or freight container. Handling and stowage losses constitute a highly significant 43% of causes of loss and this figure has not changed appreciably in the last 15 years.

Percentage of All Damage Attributable to the Package

from a rail shipment damage survey by the Fibre Box Association

Boxes and interiors seem inadequate for contents	6%
Improper closure of box	4%
Defective product, defective inner container	2%
Boxes damaged by rough handling	4%

The packaging situation is so complex, involving decisions relative to many conflicting needs, that many companies have dedicated packaging groups. Alternatively, "third party" professional packagers may be utilized, or package production companies will provide a package and packing design to meet needs of volume shippers.

This booklet is not aimed at such major packaging activities. Rather it is designed to provide basic guidance to the small to medium sized company that is moving into the export trade, and needs an understanding of the basic principles of cost effective packaging.

The booklet complements other DFAIT booklets on **Safe Stowage, Introduction to Packaging Regulations and Export Documentation** with the aim of ensuring that you - the shipper - understand how to get your product to the customer in an undamaged condition, by the best mode, and at the best transportation cost.

To assist you in this goal, the booklet provides guidance on selecting the appropriate service, pricing the shipment, and packing the product to the needs of the transportation mode.

Causes of Loss in International Marine Shipments 1988-91

Data courtesy of CIGNA Insurance Companies

Fortuitous Losses	Sinking, Strandings, Fire, Collisions and Heavy Weather	21%
Water Damage	Fresh Water, Condensation ("Sweat") and Sea Water	15%
Handling and Stowage	Breakage, Leaking & Crushing, Contamination and Infestation	43%
Theft	Pilferage and Non-Delivery	21%

Attention to Packaging is Important

Institute Cargo Clauses - Exclusions

4 In NO case shall this insurance cover

4.3 Loss damage or expense caused by insufficiency or unsuitability of packing or preparation of the subject-matter insured (for the purpose of this Clause 4.3 "packing" shall be deemed to include stowage in a container or liftvan but only when such stowage is carried out prior to attachment of this insurance or by the Assured or their servants).

You may not be insured if you do not package in an appropriate manner.

CHAPTER 1 SHIPPING OPTIONS

There are many ways in which your product may be shipped to the customer. It is your choice whether to use:

- Canada Post
- A courier
- A freight Carrier, or
- A freight Forwarder

The mode you choose will affect both the packaging & packing of your product.

DECIDING ON MODE AND CARRIER*

The first decisions to be made are the selection of the mode of transportation and the choice of individual carrier. Cost and transit time are often the key elements in the selection of a mode and are also important when choosing amongst carriers within a mode. The quoted shipment cost for the small to medium sized exporter can vary tremendously. For this reason it is essential to undertake your own survey of different carriers and modes to determine which company offers the highest quality, most knowledgeable, and cost effective service.

Do not assume that the person at the end of the phone line knows as much as they should about the carrier they represent, or the full range of services provided by the company. It can also be useful to speak to different people within the same carrier company, especially if they have more than one office within your area. One nationwide air freight forwarder recently quoted four different rates to ship the same product door to door overseas on the same day. At a major parcel carrier, telephone agents were unaware of packaging test services provided by the company. Do not be reluctant to ask questions and seek a knowledgeable representative.

Finding the most effective blend of speed of transit, carrier quality and cost will be very important to establishing and then keeping export sales.

Keep in mind however that the actual choice of carrier and mode will depend on several factors, the most important of which are:

- Your location & the consignee's location
- Volumes involved
- Product characteristics (eg fragile, special handling needs)
- Total transit time
- Cost of service
- Quality of service
- Customer requirements (eg contract delivery date)

* "Carrier" is used in this booklet as a generic term for the company or organization that handles the movement of your product from Canada to the export marketplace.

PRICING - CASE STUDIES

In early 1994 a number of alternatives were explored routing selected shipments of different weights, to a range of destinations. The illustrative routings were from an origin within 50km of Pearson International Airport to a destination within 50km of (Manchester) United Kingdom, (Tokyo) Japan and (Denver) U.S.A.. Shipments priced were 10kg, 25kg, & 250kg. There is no price variation with content. The carrier is only concerned with weight and volume. The charts on the following pages show how much variation there was in pricing of single items to the same destination, between different carriers. The rate quotes received also demonstrated that the least cost mode of carriage was not the same for all weights and destinations. The carriers were:

- Canada Post
- Courier services
- Air carriers offering freight service
- Air freight forwarders
- Surface freight forwarders

While Canada Post and couriers provide service within a single fee, other carriers have a series of add-ons, of which you should be aware. These add-ons can materially affect the overall shipping cost, and may include some or all of the following:

- Pick-up
- Domestic freight
- International freight (Air, Ocean, Truck, Rail)
- Domestic handling
- Customs brokerage at destination
- Local delivery

Not all carriers provide a complete service in all areas. Where a carrier omits foreign customs or local delivery charges, independent arrangements must be made, often at considerable expense.

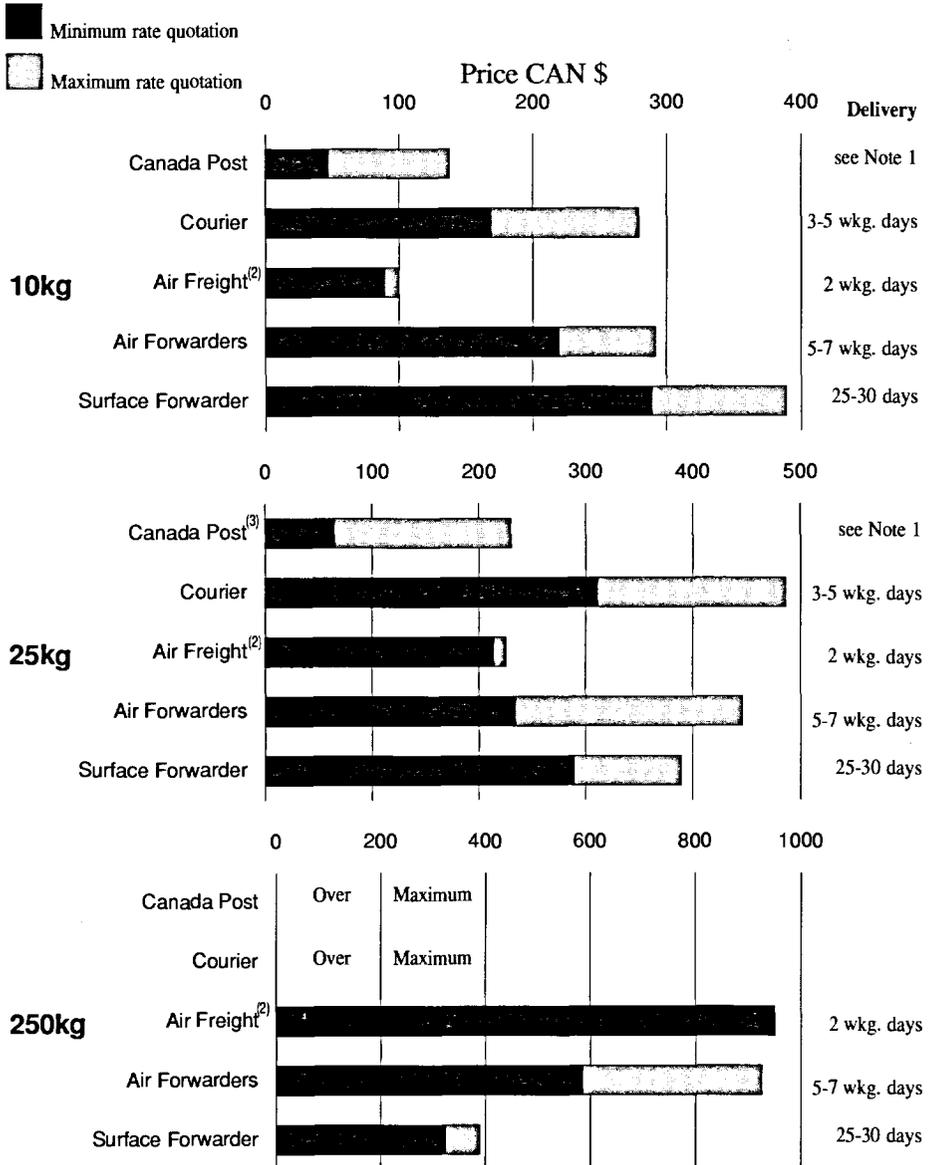
Example - what is *really* least expensive

Carton of books approximately 10 kilos shipped Toronto to Manchester. Selection based on air freight cost, without inclusion of additional costs.

Basic Quote	Air Freight	C\$ 84	2 wkg days	Deliver to & pick up at airport
	Canada Post	C\$132	7 -10wkg days	Door to door
	Courier 1	C\$152	5wkg days	Door to door
	Courier 2	C\$179	3wkg days	Door to door

The additional costs for air freight were: Export and import brokers, time and expenses for trip to Pearson International airport, time and expenses for trip to Manchester airport. Total cost, excluding duties, for air freight was \$406.

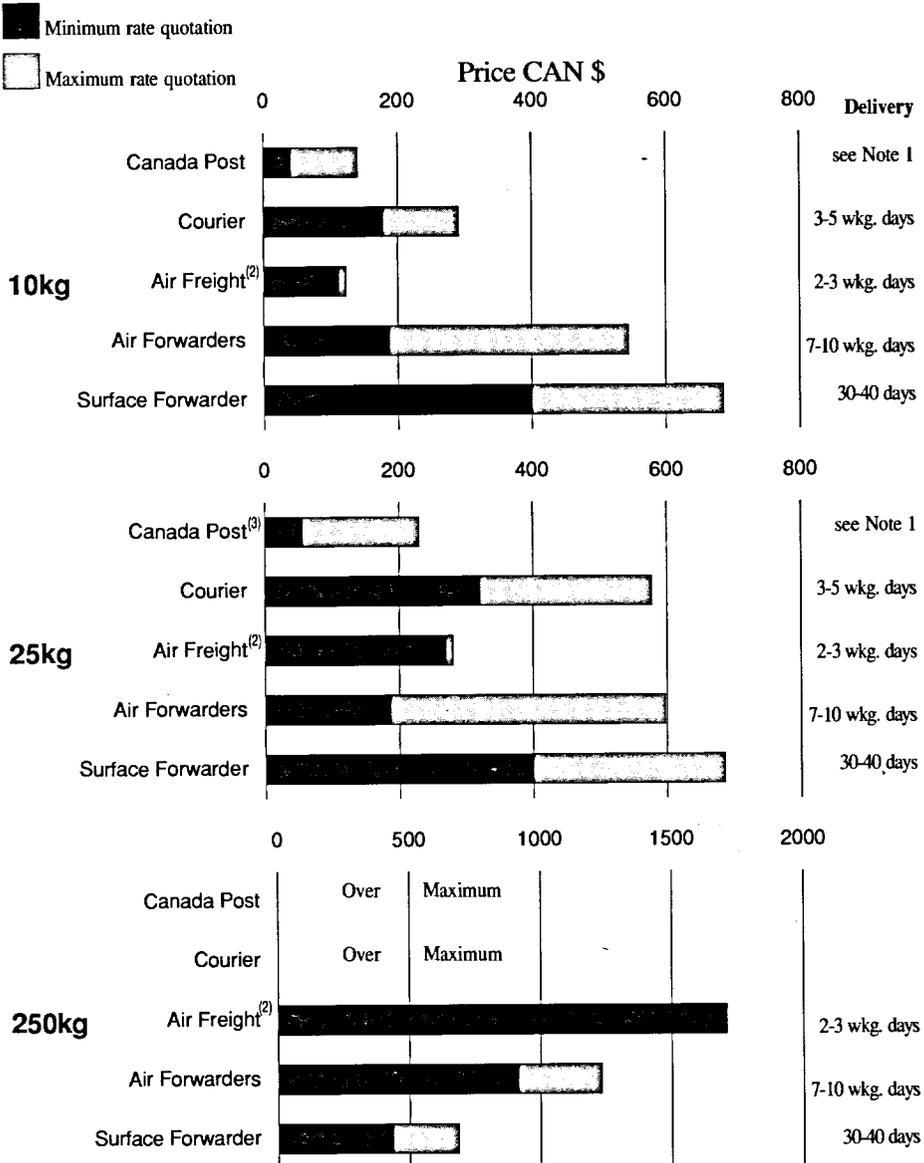
Pricing Comparison (early 1994) Toronto to Manchester (UK)



Note

- (1) Min. rate by surface, up to 45 days delivery; max. rate by air, 7-10 days delivery.
- (2) Shipper must arrange all brokerage and destination delivery. Rate only includes domestic pick-up and freight.
- (3) Price for 20kg which is maximum for international destinations.

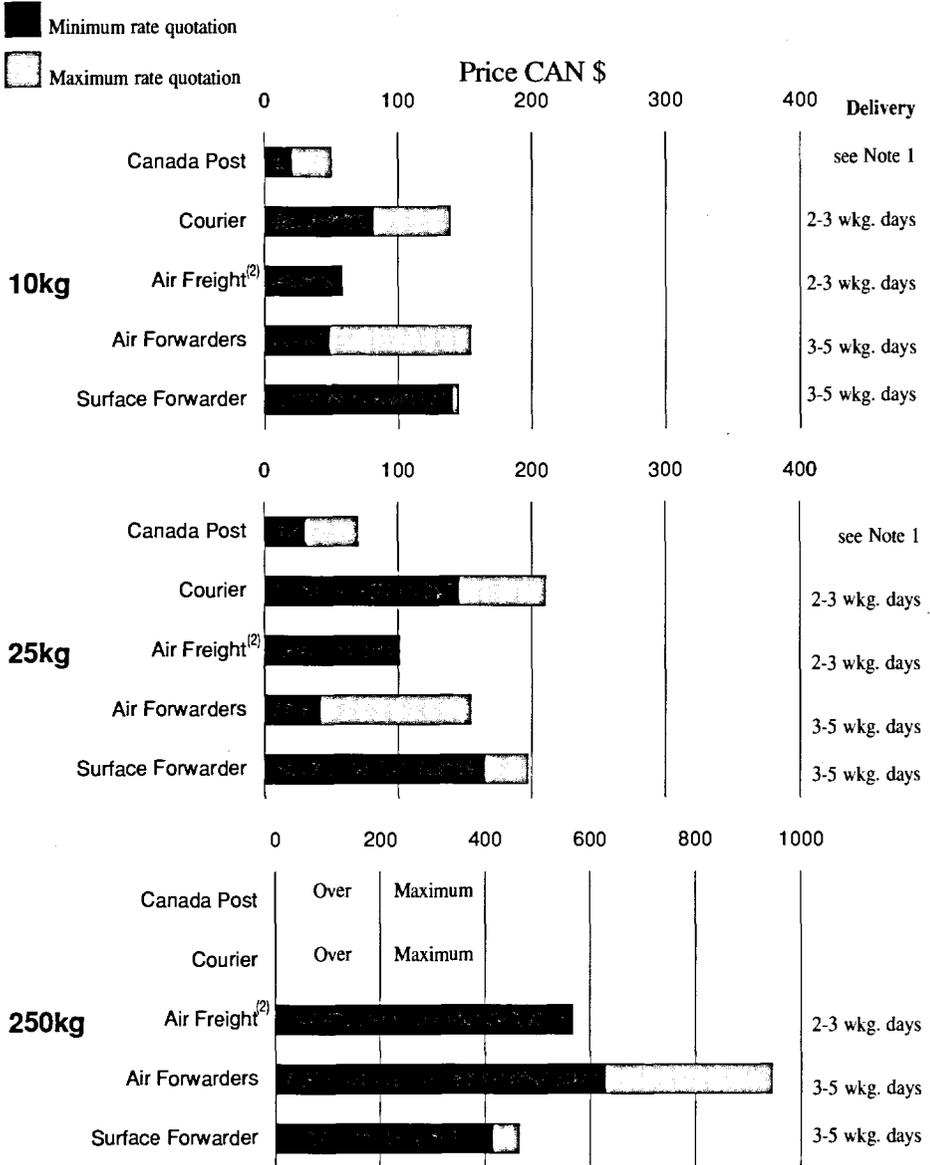
Pricing Comparison (early 1994) Toronto to Tokyo (Japan)



Note

- (1) Min. rate by surface, up to 60 days delivery; max. rate by air, 10-14 days delivery.
- (2) Shipper must arrange all brokerage and destination delivery. Rate only includes domestic pick-up and freight.
- (3) Price for 20kg which is maximum for international destinations.

Pricing Comparison (early 1994) Toronto to Denver (USA)



Note

- (1) Min. rate by surface, up to 12-16 days delivery; max. rate by air, 5-7 days delivery.
- (2) Only one of the carriers contacted could provide a service, the rate does not include brokerage and destination delivery, it does include domestic pick-up and freight.

PACKAGE SIZE LIMITS

Couriers surveyed had a maximum weight limit of 32 kilos (70 lbs) to 56 kilos (125 lbs) for individual packages, but this will vary by destination. Canada Post weight limits are somewhat less at 20kg for overseas packages and 30kg for US destinations. Freight forwarders and air carriers are not limited in weight until an individual item reaches several tonnes.

Note also that postal and courier services will have package volume limits determined by the addition of the longest dimension plus the girth (or the measurement around the shortest dimension). For example, a common size restriction is that length x width x height must be less than 330cm, with no one side larger than 270cm. To certain overseas destinations maximum package sizes may be smaller.

Shipments by courier or freight forwarder will be priced on either a weight or measurement basis and charged against the maximum of the two figures. Thus an item weighing 5 kilos in a small box will be charged by weight. However, if it was packaged in a large box it may be charged at a higher rate based on the volume used.

Don't over-package, you may end up paying extra.

INSURANCE

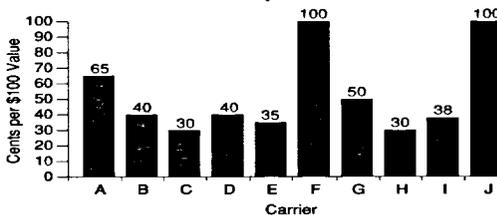
Carrier provided insurance will rarely cover the full value of your shipment. You must ensure adequate coverage.

Carriers in early 1994 quoted from 30 cents to \$1.00 per 100 dollar value. There was considerable variation in price between carriers, and some variation in price between different Ontario offices of the same carrier. Some carriers insure the first \$100 value free. Others may offer a good rate but have a minimum premium level. Be sure to ask about claim procedures; some may be exasperating, especially if damage occurs out of Canada and the carrier does not have its own claims department. Insurance limits also vary by country, so check carefully if the shipment is valuable.

Independent insurers may quote for less, particularly for individual high value shipments. Using independent insurers for regular shipments is also possible, but minimum annual premium may apply, and there may be more paperwork.

Export Insurance Costs for a 10kg Soapstone Carving

Early 1994



FOREIGN DISTRIBUTORS

For the small to medium size exporter, the cost of shipping the product to the customer can be excessively high. For occasional shipments there may be no alternative, however where a significant number of similar items may need to be shipped to a unique market, a distributor may well be a valuable and cost saving component in the shipment process.

By using a distributor (sometimes called a fulfilment agent) you should be able to significantly reduce basic distribution costs by shipping in large volumes. Also packaging costs can be reduced, for example a 10kg package shipped to near Manchester, in England, the minimum cost for door to door service was about \$115, or 11.50/kg. For 250 kg shipped door to door to the same destination, the cost would be about \$300, or \$1.20/kg. Thus if you could expect to sell 25 of the units at 10kg within the UK market in a reasonably short time period, consolidation into a larger shipment and use of a distributor may be cost effective. Shipping by container load, say 1500 of the 10kg packages could reduce costs even further to about 20¢/kg.

Distributors could:

- Receive bulk shipments, maintain inventory control, undertake distribution to customers and issue periodic activity reports.
- Receive and consolidate individual consignments for forwarding.
- Act as a regional branch office.
- Assist with regional advertising and promotion.
- Negotiate favourable local rates, or piggy back business onto volume rates already negotiated.

It pays to carefully consider the relative merits of frequent small shipments vs less frequent large shipments via foreign distributors.

Distributors can also influence packaging decisions

Packaging costs may also be reduced. For example the 10kg package shipped as a single consignment would require a high burst strength carton (say 275 lb) with extensive internal packing for protection. Each carton would require export marking and labelling.

If large quantities are shipped by pallet, internal packing may be reduced to corrugated board, and the carton could be reduced to a less costly domestic 170 lb burst strength.

CHAPTER 2 - UNDERSTANDING THE HANDLING AND SHIPMENT PROCESS

PROTECTING YOUR PRODUCT FROM TRANSPORT HAZARDS

While you may be able to design, or have designed, a unique export package for your product, consider its fragilities - how can it be damaged?

From the standpoint of physical distribution, packaging must contain and protect the product from point of manufacture to point of consumption or use. Handling along the transportation chain can require a very wide range of characteristics and performance from the package. During an export move, all or some of the following hazards can be expected:

- Shock (from dropping, side impacts, etc.)
- Compression (from top loads)
- Vibration
- Changes in atmospheric pressure (in aircraft holds)
- Atmospheric pollution (sulphates in industrial environment, chlorides in marine environment)
- Moisture, water (rain, high humidity, condensation)
- Oxidation
- Extreme temperature (hot or cold)
- Electro-static discharge.

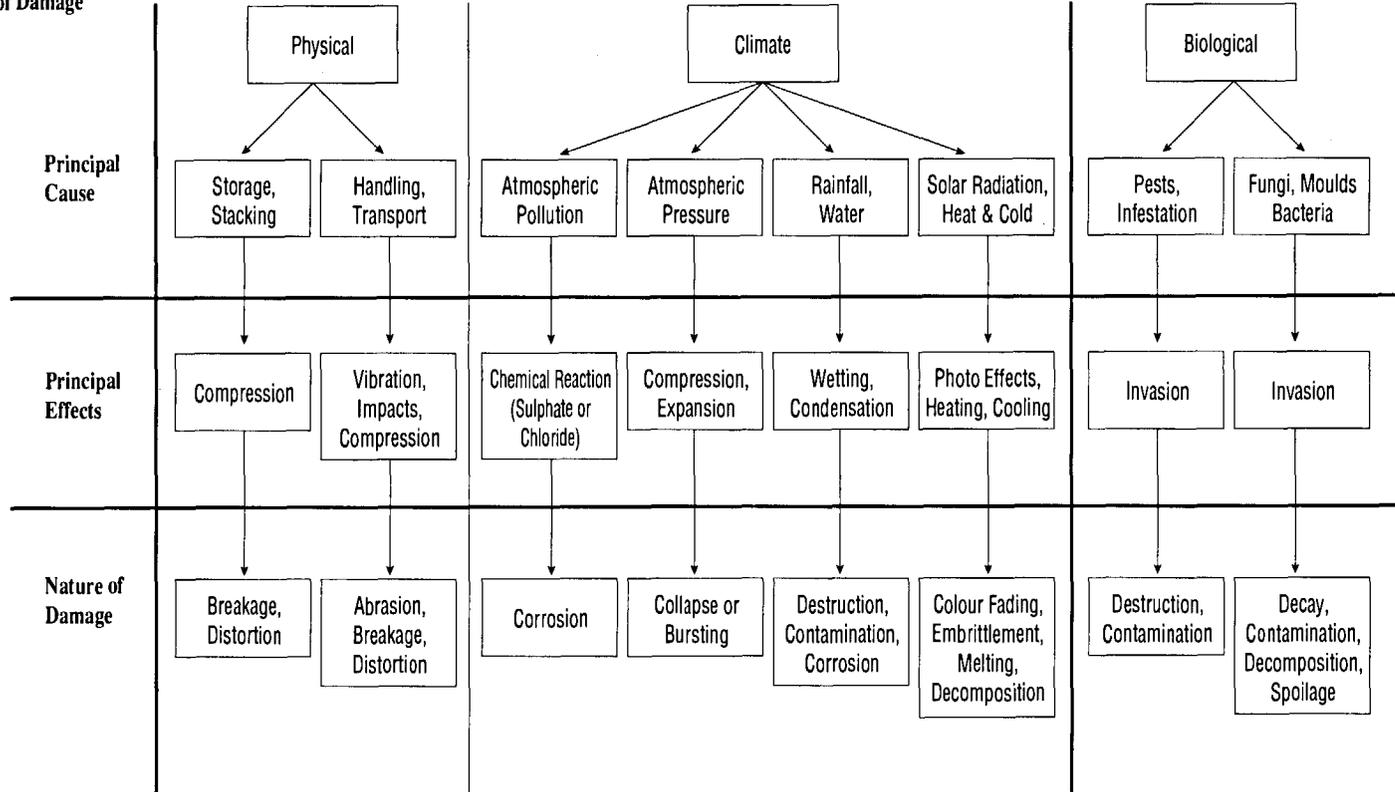
Other hazards may include biological hazards such as infestation (birds, animals, insects) and bacterial spoilage (fungi, moulds, bacteria). Theft, pilferage and vandalism can also occur. Also consider how long it will be between packing the product and receipt by the customer.

Keep in mind that a very fragile item may need costly packaging, or carriage, to ensure safe arrival. If this is the case, consider redesign of critical elements, or have the consignee arrange packaging and shipping.

Loading and unloading hazards arise not only at pick-up and delivery, but also at any intermediate trans-shipment points. Export destinations usually entail greater loading and unloading hazards due to frequency of transshipment. For example, don't assume that a courier will fly your product to the closest airport to your customer; your package may be flown to an American central distribution hub in Cincinnati, then onto Brussels for European Continent sorting, then trucked to a distribution hub in Munich, then delivered to your customer or distributor by small van. The main hazards here are drops and impacts.

Schematic of Package Transport Hazards

Main Categories of Damage



The preferred size of individual packages is between 15 to 30 kg. Anything lighter can be thrown, anything heavier and not on pallets risks being dropped.

Each mode of shipping has its own unique hazards which are summarized below.

Postal Service

A parcel sent by post must be able to stand repeated random drops or repeated impacts during the sorting, handling and transportation process.

Rail

In rail shipment, three main hazards exist for packages. When rail cars are assembled in yards, the shunting operations may produce impacts with other goods. Snatching also occurs which results from starting and stopping loosely coupled wagons. Vibration depends on the speed, type of car, and condition of the track. In the case of mechanical products, such vibration can cause loosening of screws and fastenings and settlement of loose packing materials, with resultant damage.

Road

The main hazards in road transport are vibration and bouncing of the load. This is affected by both the road conditions and the speed and suspension conditions of the truck. Exports to developing countries are particularly exposed to these hazards because road conditions are often poor. Load crushing by ropes, shifting of the load, and impacts from other goods are also important hazards.

In developed countries some trucking companies specialize in providing better quality truck suspension. Such improved suspension is generally available in North America, and truckers offering Air Ride or Super Air Ride suspension should be preferred over those not offering such a service. However, it may not be possible to reduce packaging to take advantage of the service, as other carriage conditions may increase the likelihood of damage to your product.

Marine

The principal hazard in transport by ship is excessive top loading within the container. Provided the cargo is correctly stowed, there should be no risk of impacts arising from cargo shifting. However keep in mind that containers will, both on sea and on land, be subject to vibration, tipping, rolling and shock loads. See **Safe Stowage** for an explanation of Marine Hazards.

Air

Minimizing package weight to save on air freight costs may expose the product to unacceptable damage risks, not so much in the air as during ground transportation to and from airports. Most cargo is delivered to both carrier and consignee by truck. Often air cargo is stored in warehouses or on transfer docks before forwarding, increasing exposure to theft, pilferage and handling damage. Always insist upon prompt pick-up and delivery of your shipment. Packaging can only be reduced if you are able to pack the air freight container, and your customer unpacks it.

Turbulent air can subject cargo to rapid alternating vertical movements with heavier pressure one moment, and almost weightless conditions the next. As altitude increases, atmospheric pressure decreases, subjecting liquid cargoes to leakage hazards and increased internal pressure. Very low temperature can also be experienced in the cargo hold.

The biggest hazard, regardless of the method of shipment, is the way in which the carton is handled at intermediate stages. When packaging items for shipment in individual cartons, the worst must be expected.

It is only when you, the shipper, can pack the goods either onto a pallet, or into the truck or freight container, and your customer does the unpacking, that you can safely reduce the packing and packaging material specifications.

CHAPTER 3 - PACKAGING AND PACKING MATERIALS

INTRODUCTION

There are many terms and phrases involved in packaging of products and their shipment. The basic terms that will be employed are as follows:

Packaging: The process of ensuring that your product can be safely shipped to its destination. This includes carton selection, packing materials and their choice relative to the method of shipment.

Packing: Packing is the material used within the shipping carton to ensure that the product(s) is/are cushioned against impact with each other, and with the carton itself. Sometimes referred to as cushioning material.

Stowage: This is the act of placing your carton in the shipping vehicle. The vehicle may be a truck, rail car, an ocean freight container, an air container or, for large crates, the hold of a ship.

There are also certain types of **packaging** with which you will be concerned. These are:

Primary: Closest to the product, eg. toothpaste tube, glass bottle etc.

Secondary: Intermediate or point of sale container, eg. box around toothpaste tube, gift box for glass bottle.

Tertiary: Shipping carton, eg carton containing multiple boxes of toothpaste or boxed bottles. Sometimes called transport packaging.

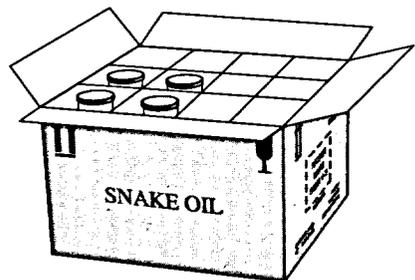
Primary



Secondary



Tertiary



It is the latter type of container and its selection with which this booklet is primarily concerned. However, for certain items, the shipping carton may be both primary and secondary container eg: a carton for a ceramic vase, or a TV set.

A package thus has many functions, some of which may not be entirely compatible with each other.

What does a package do?

It Must	➔ contain
	➔ protect
	➔ preserve
	➔ aid distribution
It Should	➔ communicate and create a positive image
It May	➔ measure or dispense product

Remember all the skill and quality built into your product during development and production will be wasted, unless care is taken to see that it reaches the customer in perfect condition. Packaging is the means used to protect and contain goods and is essentially any system that will ensure the protection of a product during distribution to the consumer, at minimum overall cost.

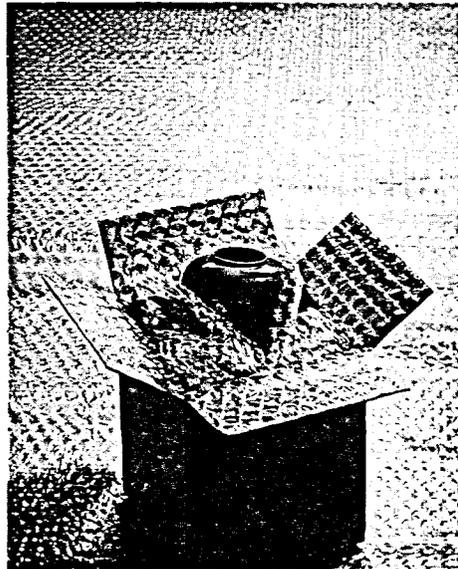


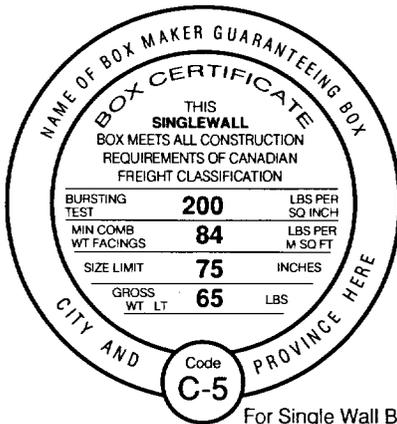
Photo courtesy of Poly-Air

Vase in bubble wrap box

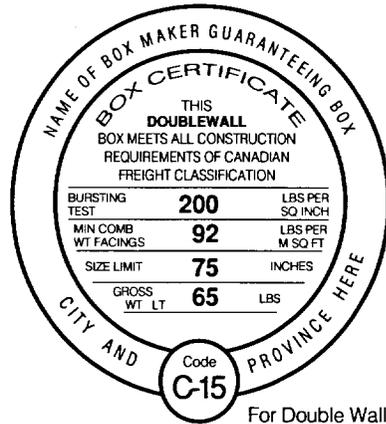
PACKAGING MATERIALS AND THEIR USE

Corrugated Boxes

Corrugated boxes are one of the most common packaging methods used and there are well established government and industry standards and regulations in place designed to protect their users. These boxes must be certified by the manufacturer. Weight, paper content and puncture and bursting certificates must be displayed, usually on the bottom. See figure 3-1. The tests for corrugated board involves subjecting it to the same conditions that may prevail during normal handling. See Annex 1 for a description of cardboard boxes and their application.



For Single Wall Boxes



For Double Wall Boxes

Fig 3-1 Information on Box Strength

Never overload a box

Other Packaging Materials

The shipper must determine whether or not a corrugated box offers suitable containment for the particular product to be shipped, bearing in mind the product's weight, size, fragility and transportation hazards to be encountered. If there is some doubt, then other packaging methods must be considered.

Boxboard

Boxboard, or solid fibreboard, is not really suitable as a shipping carton. It does not have the strength, except with considerable weight, of corrugated board, and it does not have the same rigidity.

Boxboard is most usually used as a secondary, or point of sale carton. It is also used in mailer tubes because the tubes are spirally wound and this is not possible for corrugated material.

Wood Boxes

The nailed wood box is one of the most satisfactory containers for overseas shipments for products of moderate weight.

However there are regulations in many countries relative to which woods may be used, and their treatment. See **Introduction to Foreign Packaging Regulations** for more information.

Boxes should be made of seasoned lumber (not recently cut or green) with moisture content between 12% and 19%. A knot should not cover more than one third the width of a single board.

Use blocking and bracing to secure the product within the container. If the load must be kept upright, equip the box with lift handles.

Reinforce the boxes with adequate metal tension 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 $\frac{5}{8}$ of an inch in thickness or greater.

It is not advisable to economise through the use of second hand wood boxes. They may be deficient in strength and would not permit easy detection of pilferage.

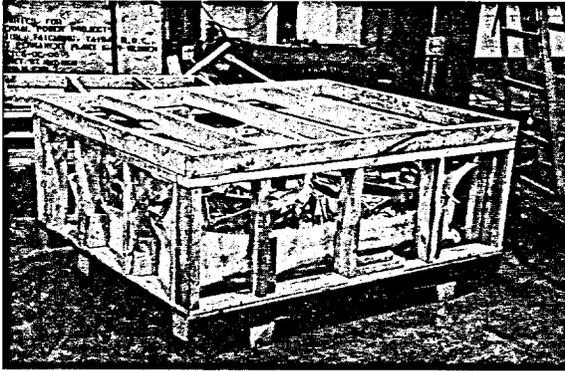
Plywood is the best material for use over a basic frame. Wafer board or particle board should not be used; they are much less resistant to puncture impacts.

Crates

There are two kinds of crates - the open or skeletal crate and the fully covered crate. Both types depend upon a solid framework, with the base being the most important structural element. Covering protects against exposure to the elements and should not be considered integral to the structural strength of the crate. The open crate can be used where contents are virtually indestructible, and crating will facilitate handling and stowage.

Consider these points in crate construction:

1. Provide a **SUBSTANTIAL** framework. Use corner posts or vertical end struts, intermediate struts and diagonal braces. Reinforce the base at load bearing points.
2. Choose unused well seasoned wood, free of loose knots and decay. Nails should be spiralled and cement coated.
3. If wooden covering is to be used, end the covering at the floor of the crate, not the ground, so as to permit entry of fork-lifts and to prevent tearing of the covering when the crate is moved sideways.



Crate - Showing construction to ensure safe transit.



Wire crate filled with unprotected electronic items.

If at all possible use a crating specialist for construction of wood export boxes or crates. Their knowledge and ability can produce a suitable container at a very competitive cost compared with in house activities. Their guarantees relative to containment quality and packing of the goods in the crate or box may reduce insurance costs, and will be beneficial if a claim should be made against the carrier for loss or damage.

Wire Crates

Usually used by high volume shippers as reusable containers for items in the auto trades. Not usually used in export trades unless with a liner, as the goods are not protected and are very easy to pilfer.

Barrels, Casks or kegs

Not usually used today, except in specialized trades involving spirits or contents in brine. Carriage of dry powders and the like is now usually in Flexible Intermediate Bulk Containers (FIBC's)

Multiwall Shipping Sacks

These should only be shipped palletized; the specification and preparation of sacks for each product (eg cement, flour, grains) is very important, and must be undertaken in conjunction with the supplier.

Bales

Bales, like barrels and casks, can still be used for shipment, but could be subject to damage by water, handling hooks and pilferage.

Flexible Intermediate Bulk Carriers

FIBC's come in several types and may be designed for single or multiple use. Typically used for dry bulk commodities in single units of 1-3 tonne capacity. Like multi-wall sacks, they should be specified in conjunction with the manufacturer and designed for both the product and the use.

Alternative Systems

A number of companies, pressured in part by the growing cost of disposal for conventional packaging materials, have moved to alternative systems using blankets, and cushioning material that can be readily recycled or returned. These systems are often used for items like chairs, auto components and the like, where handling is limited, and full truckload lots are involved. They could be used for full container shipments door to door in export trades where there is only a need to provide superficial protection because intermediate handling is limited.

PACKING MATERIALS

Packing materials need to cushion the product in the carton, or crate from the rigours of the journey between shipper and customer. They should also, if going to a retail customer, support the image of the product and its manufacturer. For example, a high value piece of jewellery should not be shipped in crumpled, or shredded newspaper.

Properties of Packing Materials:

The following table summarizes properties of packing materials. An appropriate general purpose packing material should be selected, unless sufficient overall

Summary Properties of Packaging Materials

Material	Density	Shock Absorption			Resiliency	Dampening ¹	Cleanliness	Corrosivity	Liquid Absorbency
		Light	Medium	Heavy					
Non-Cellular									
Cellulose wadding	Medium	Good	Fair	Poor	Fair	Good	Fair	Low	Low-High
Excelsior fill ²	Medium	Fair	Fair	Fair	Poor	Fair	Poor	High	Medium
Excelsior pads ²	Medium	Fair	Fair	Fair	Poor	Fair	Fair	Low	Medium
Fibreboard									
Corrugated inserts	Medium	Poor	Fair	Fair	Poor	Poor	Fair	Low	Medium
Single face corrugate	Medium	Poor	Fair	Fair	Poor	Fair	Fair	Low	Medium
Crumpled or shredded Newsprint	Medium	Fair	Poor	Poor	Poor	Good	Poor	High	Medium
Indented kraft (multilayered)	Medium	Good	Good	Fair	Poor	Fair	Good	Low	Medium
Macerated pads	Medium	Good	Good	Good	Good	Good	Fair	Low	Medium
Cellular									
Air bubble sheet	Low	Good	Good	Good	Good	Good	Good	None	None
Polyethylene foam ³	Low	Fair	Good	Good	Good	Good	Good	None	None
	Medium	Poor	Fair	Good	Good	Good	Good	None	None
Polypropylene foam	Low	Good	Good	Poor	Good	Good	Good	None	None
Polystyrene, expanded molded sheets	Low	Poor	Fair	Fair	Poor	Poor	Good	None	None
Polystyrene Loose fill	Low	Fair	Good	Good	Fair	Fair	Fair	None	Low
Flexible Polyurethane foam ⁴	Low	Good	Fair	Poor	Good	Good	Good	None	None
Foam-in-place polyurethane ⁴	Low								
	Medium	Good	Good	Good	Good	Good	Fair	Low	Low

Cellular: Materials with air pockets, or voids as part of their structure.

Non-Cellular: Solid materials that may entrain air or voids through fabrication.

1. Relates to the ability of the material to reduce the impact of vibration on the product.
2. Fine woven strips of wood.
3. Available with anti-static and/or fire retardant properties.
4. Specification can be varied to meet needs.

volume justifies selective choice of specific materials for different products. However also keep in mind that two types, or grades, may be needed. A product may need an initial wrap of paper, or sealing in a plastic bag with a desiccant (a drying agent). For example when using air bubble sheet, a 3/8 in. grade should be used to wrap the products - then a 1/2 in. grade used as actual packing in the carton. Pre-molded shells or shapes made out of cellular material can be excellent packing, but the cost of permanent molds generally restricts their use to high volume production. Bubble pads and cellulose wadding or indented kraft are usually cost effective for intermediate and low volume products. Expanded foam-in-place urethane is particularly useful for low volume, irregularly shaped products, but may lose its advantage as production volume rises. Its appearance may also be incompatible with point of sale needs relative to the product.

Shock absorption - The properties of shock absorption vary for specific materials. One material may be an excellent cushion when used to protect small, light fragile items, but this same material may be unsatisfactory when used to protect small, heavy, fragile items. The cushioning material must be able to absorb a series of shocks and must have the ability to return to its original size and shape after each deformation. Cushioning material that "settles" so that looseness develops is not entirely satisfactory.

Resiliency - Soft plastic foam will "bottom out" if a heavy load is placed on it, unless a large area is used to distribute the weight or alternately, a thick cushion is used. Conversely, a fairly stiff plastic foam will not deflect and provide a cushion for a very light object.

Texture and workability - The ability of cushioning materials to protect finished surfaces against abrasion is dependent on the texture of the materials. Generally, materials supplied in roll form are soft textured and can be placed in contact with easily marred surfaces. Rolled cushioning materials are sufficiently pliable to be used without difficulty to cushion irregularly shaped items. They can be used to bulk out irregular surfaces and may be used for wrapping small miscellaneous parts.

Cleanliness - Small particles become detached, during use, from most cushioning materials. Items having operational functions that can be harmed by dust particles should be wrapped or protected against exposure to dust. Conversely, items that will not be protected from dust by the end user need not be protected against dust particles when packaged for shipment.

Corrosivity - Many paper based materials are corrosive and could not be used with highly finished metal parts. Other materials may become corrosive with chemical treatment, eg. fungus-resistance treatment.

Liquid absorbency - Soft cushioning materials will have less protective or cushioning value at high moisture content than at low moisture content. Also, most cushioning, when wet, will cause corrosion of metal surfaces. For this reason, absorbent materials must be protected from long exposures to high humidities with a sealed vapour proof barrier.

Other considerations:

- Many cushioning materials can be made fungus-resistant by means of chemicals introduced during the manufacturing process. Treated materials, however, are often very corrosive to metal surfaces and need to be isolated from them.
- Loose fills are difficult to get around a product's irregular overhangs.
- Fibreboard braces are abrasive and can scuff polished surfaces.
- Cushioning characteristics of some plastic materials can change dramatically with temperature drops.
- Humidity affects all wood cellulose products, changing both the cushioning characteristics and increasing the possibility of corrosion.
- All plastic materials can contribute to static problems, unless specially treated.
- Some materials have a resiliency that is recovered even after major shocks (they bounce back). Other materials, such as corrugated, or rigid foam, provide protection by collapsing themselves, but their effectiveness thereafter is reduced.

SECURING THE CARTON

Closing of the carton must be secure enough to withstand transport and handling activities. There are four ways in which a carton can be closed, these are;

- Adhesive
- Tape
- Stitching or Stapling, or
- Strapping

Comparative Securing Systems

Closure System	Material	Dust Proof	Quick Sealing	Cost	Sensitive to Humidity	Adhesion to All Surfaces
Adhesive	Cold Glue	No	No	Low	Yes	No
	Hot Glue	No	Yes	High	No	Yes
Tape	Gummed kraft	Yes	Yes	Low	Yes	No
	Reinforced Gummed kraft	Yes	Yes	Med	Yes	No
	Pressure sensitive	Yes	Yes	High	No	Yes
Stitching or Stapling	Metal	No	Yes	High	No	Yes
Strapping	Metal	No	Yes	Med	No	Yes
	Plastic	No	Yes	Low	No	Yes

Note that tape is only dust proof if all edges are sealed. Reinforced Kraft and Pressure Sensitive tapes are strong enough to permit only a single tape, top and bottom, to close the box, but the box is not then dust proof.

If using glue, cold glues must cover at least 50% of the flaps. Hot melts require at least 25% coverage, usually in eight strips per flap. Hot melt glues may not be environmentally acceptable, but cold glues may be acceptable.

Tapes for Carton Closure

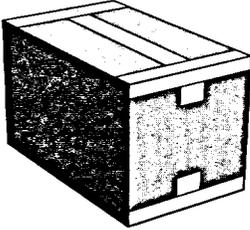
Although gluing a carton is the most secure method of closing the flaps and ensuring safe delivery, speed of packaging and flexibility may require tapes.

When choosing a tape for a particular shipment consider the following:

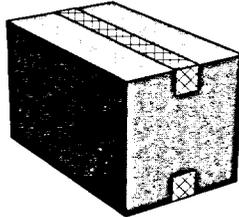
1. **Surface to which tape is to be adhered.** The tape must stick under all anticipated conditions of handling and transportation.
2. **Removability.** Tape must be removable without disturbing the product in the box.

3. **Application conditions.** These include temperature and humidity. These factors are important in as much as they change the ability of the tape to adhere to the carton surface.
4. **Weight & size of package.** Determines strength required of tape

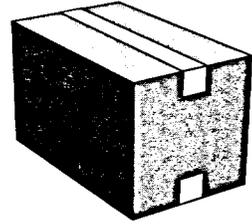
Tape Sealing Patterns



Paper Sealing Tape
Full length of all outer seams securely sealed with strips not less than 5cm wide.



Reinforced Tape
Centre seam only. Seal securely with strip not less than 7cm wide. Strip must extend over ends not less than 5cm.

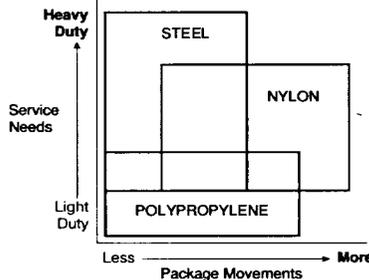


Pressure Sensitive Tape
Centre seam only securely sealed with strip not less than 5cm wide. Strip must extend over ends not less than 5cm, and must not be less than 2mm thick.

Strapping

Strapping should be used as a reinforcement for bracing a group of packages or securing an individual large carton, crate or box. For example steel strapping should be used for wood crates, while nylon or polypropylene will be better for cartons or pallet stabilization.

Strapping Characteristics



1. All straps must be applied at right angles to the edges of the base over which they pass.
2. Apply sufficient tension so that straps sink into edges of the container but do not over tension to the point where strapping is weakened or the box is crushed. Conversely, the straps must not be so loose as to get caught on another box and interfere with handling.

CHAPTER 4 PREPARING FOR THE SHIPMENT

It is very important to take time, and make an informed decision about the way in which your goods will be shipped to their destination. Remember that quoted rates, delivery times, and quality of service vary considerably between different carriers.

CHECKLIST FOR CARRIER/MODE SELECTION

Service Characteristics

- ✓ Does the carrier offer different levels of service?
- ✓ What are their characteristics? (price, transit time, guarantees, quality)

Pricing

- ✓ What is the rate for the package to the destination?
- ✓ Where is the nearest rate break?
- ✓ Does the rate include pick-up and delivery?
- ✓ Are there extra costs for customs brokerage, local handling, documentation pick-up, delivery etc.?
- ✓ If shipping C.O.D., are there extra charges?
- ✓ Are there any discounts available? (Frequency of shipment, etc.)
- ✓ Is insurance included in the rate?
- ✓ What is the maximum value, and are there limits imposed by the package destination?
- ✓ What is the cost of extra insurance?

Size Limits

- ✓ What dimensions are the maximum permitted?
- ✓ What is the maximum weight?
- ✓ How do these vary by destination?

Transit Time

- ✓ How long will the package take to get to its destination?
- ✓ Will a guaranteed delivery date be given?

Packaging

- ✓ Does the carrier require a specific packaging system to be used?
- ✓ Can they provide any guidance relative to packaging?

Service Quality

- ✓ What guidance can the carrier give you about export packaging?
- ✓ How frequently does the carrier lose or damage goods in transit?
- ✓ If goods are lost or damaged what is the insurance claims process?
- ✓ Does the carrier track changes in foreign regulations that might affect your goods? (documentation, packaging regulations etc.)

Other points to check:

- Does the carrier offer additional services, such as distribution of consolidated shipments to different destinations within the same country or market?
- Will the carrier review the complete handling and shipment process with you?
- What are the rate categories within their tariff. What are the weight & measurement limits that apply?
- How do these categories and maxima differ between countries?
- How does the carrier track foreign regulations regarding documentation, packaging regulations? Is this done regularly and will they keep you advised of changes?
- If the carrier is consolidating different consignments with yours, can you observe their warehousing, palletizing or stowing process? What industry standards do they follow?
- Are they an ISO 9000 accredited company? (ISO 9000 is the International Quality Management accreditation, and requires a company to submit to a rigorous quality audit in all their departments).

The fundamental criterion for packaging is to pack for the toughest leg, or event, in the journey. Also pack in the knowledge that handling equipment, techniques and persons will range from highly professional to the completely unskilled.

CHECKLIST FOR EXPORT PACKAGING

Preparatory

- ✓ Has a decision been made as to the export mode? (road, rail, air, marine.)
- ✓ If not being shipped directly via a specific mode, has a decision been made as to the carrier (postal service, courier, air freight forwarder.)
- ✓ Are the likely conditions of carriage throughout the transportation route known? (temperature, humidity, shock, pilferage.)
- ✓ Are goods to be shipped direct to the consumer, or will a distributor or warehousing facility be involved?

Package Design

- ✓ Does the product need crating?
- ✓ Can a standard cardboard carton be used?
- ✓ Are special coatings or treatments needed?
- ✓ Will the carton be stacked, and if so to what height?
- ✓ Is internal cushioning needed in the package?
- ✓ Can advantages be taken of modal differences to reduce the package specification?

Metal casting, weight 500kg, C shape with flanges and machined face.

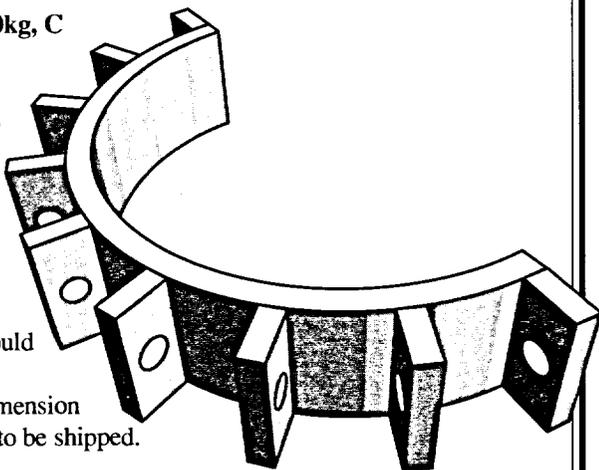
Approximate dimensions

1m diameter, 50 cm high thick wall with flanges. Treat with a preservative to protect

from humidity and ship to crating and box specialist.

Note that a pair of units could be nested on a single base

within a standard pallet dimension if more than one unit was to be shipped.



Packing Selection

- ✓ Does the product need secondary protection?
- ✓ What packing material would best suit the product?
- ✓ Is the product heavy and thus likely to compress conventional packing materials?
- ✓ Are special corner moldings or shells needed to contain the product in the shipping carton?
- ✓ Are anti-corrosive or humidity control devices needed?
- ✓ Are anti-static control materials needed?

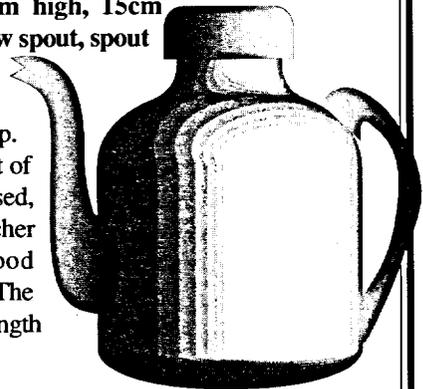
Package Markings

- ✓ Have the appropriate handling marks been applied?
- ✓ Have the proper languages been used?
- ✓ Have the following markings been applied, as may be required by destination authorities:
 - port of destination
 - transit instructions
 - name, and address and phone of consignee
 - country of origin
 - name, and address and phone of sender
 - package dimensions/weight
 - package serial and number
 - invoice and/or order number

Package Indicators

- ✓ Are shock indicators needed for the shipment?
- ✓ Are tilt indicators needed for the shipment?

A pottery pitcher. Weight 2 kg, 25cm high, 15cm diameter at base, 5cm immediately below spout, spout is very long (10cm) and fragile. The preferred packing would be foam in place, with the pitcher protected by a plastic wrap. However this is not compatible with point of sale needs. A polystyrene shell can be used, or two grades of bubble wrap. The pitcher should be packed upright, with good separation between it and the carton. The carton should be AB Flute with a burst strength of 275 psi.



PACKAGING CONSIDERATIONS

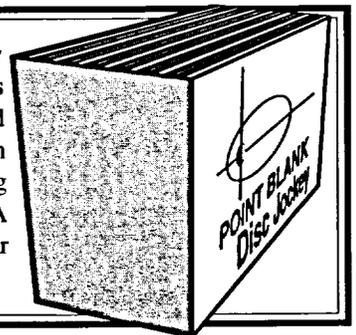
When starting the packaging process consider the possibilities of damage to the product. Damage could occur due to such factors as fragility, surface finish, rigidity, weight, size and quantity to be packed. You should establish a product's susceptibility to water, water vapour, oxygen, heat and cold. By examining the product in this way, you can determine the hazards from which it must be protected during distribution. It is also easy to forget that the condition of the product itself may cause damage. No amount of impermeable packaging will protect a damp product from the effects of humidity. It may therefore be necessary to clean, or otherwise prepare a product before it is packed. Such preparation can include:

- Cleaning of all surfaces.
- Draining and drying to remove liquids.
- Removal, or special protection, of particularly fragile items or parts.
- Dismantling or re-positioning of parts and sub-assemblies to reduce the total pack volume.
- Bolting down or otherwise securing movable parts which could be damaged or cause damage during handling.
- Locking or otherwise sealing packs containing high value items.

Can it Be Disassembled?

The degree of disassembly an item can undergo will affect the overall package dimensions, the degree of protection required and, through cube reduction will also reduce storage and shipping costs. Disassembly may also offer a reduction or simplification of protection needed against physical damage. Before disassembly, the complete unit may have required cushioning to the level of the most fragile parts; after disassembly, each part will require cushioning only to its own level of fragility.

A box of vinyl record albums for Disc Jockey use, weight 15kg, 12 inch diameter, 40 records each shipment. Pack in a triple wall fibreboard container. Place records vertically or on edge in container with a minimum of 3cm cushioning (bonded fibre hair). Records should be snug. A label should be used to warn against storage near heat and to store in a cool place.



Is the product fragile?

You should also consider the product's inherent fragilities. Can it withstand shock, even when well cushioned within the carton. Shock is usually measured as a force. A force of 10G for example means that the product momentarily behaves as if it weighs 10 times its actual weight. If this could present a problem G force indicators should be applied to, or contained within, the package. These can be acquired, preset to the critical G force, or recording units can be purchased or rented to insert in the package. Such equipment or devices will enable the consignee to determine if excessive force has been applied to the package during transit and thus whether a claim should be made against the carrier for damage.

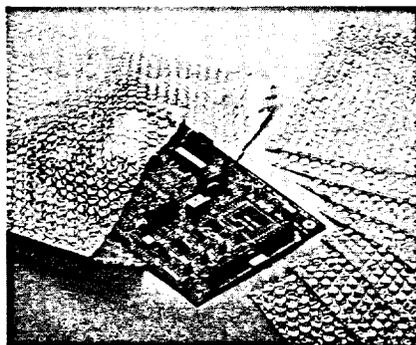
Does it need to be shipped right side up?

Frequently products will need to be shipped one way up, and will be damaged or rendered useless if tipped or inverted. Again special measuring devices can be applied to the outside, or inside of the package. These will permit the consignee to determine the degree of tilt to which the package was subjected in any axis, and/or whether it was actually inverted.

Is the product sensitive to field forces?

Many products can be ruined or degraded by exposure to various field forces - electrostatic, electromagnetic, magnetic, or radioactive. These include electronics, magnetic tape, high speed film, diskettes etc. Proper shielding and precautionary markings are necessary to protect such articles - both alone and as part of assemblies. Special bags are available to protect against electrostatic and electromagnetic hazards. Some bags offer protection against both. Projections, sharp edges or other features of the product which may damage the protective bag should be cushioned.

A personal computer circuit board, 8cm by 12cm, weight 75 grams. Pack in anti-static and anti-magnetic bag, sealed and labelled "anti-static". Place in a fast-pack, (a cardboard box bought with soft foam attached to inside) that is 1 inch longer and 1 inch wider than the circuit card. Foam should be 3cm thick inside the fast pack. Package should be sealed and labelled anti-static.



Is the product temperature sensitive?

Some shipments are sensitive to extremes of temperature if incorrectly stored or stowed during transit. For example, vinyl records will be affected by high temperatures and computer diskettes by extremely low temperatures. Again, equipment is available to permit the consignee to check maximum or minimum temperatures to which a shipment has been exposed.

Can the product be crushed?

When packaging assume that the carton will end up at the bottom of a pile of goods, or may be stacked with similar cartons up to 8 feet high. A hand stow in a freight container will utilize the full 9' or 9'6" height if a high cube unit is being used. Road trailers are typically 110" or 9'2" high. Excess package wall strength will also be needed to accommodate loss of strength due to humidity.

Typically, containers should be designed to have 3 to 7 times the stacking strength anticipated during warehousing. For export situations, the allowance may need to be even greater. For example, a product distributed across North America that will be stored up to 9 months before use, and with at least half of the volume stored in the high humidities of the eastern seaboard, would require a stacking strength of 6 or 7.

Extra space in a carton will greatly affect the hazards of stacking. With 1cm of oversize in carton depth, sidewalls could bulge out approximately 5cm.

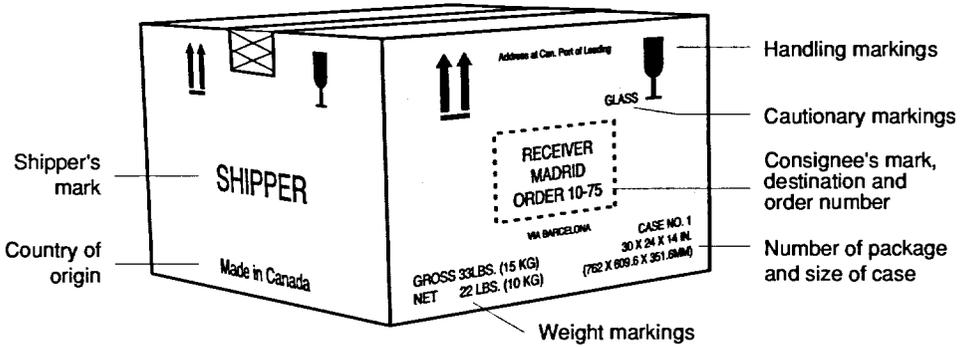
A piece of custom jewellery: A silver pendant, weight 250 grams, 5cm diameter, scratches very easily. Wrap in a non-abrasive and acid free material. Pack in a bag that is water and vapour proof enclosed with a V.C.I. (volatile corrosion inhibitor) capsule. Bag should be heat sealed. It can be packed individually in a box or packed with cushioning to accommodate the quantity per carton.



HOW TO LABEL YOUR PACKAGE

The primary purpose of marking is the identification of the shipment, enabling the carrier to forward it to the ultimate consignee. Old marks, advertising and other extraneous information only serve to confuse this primary function for shipment handlers and carriers. All markings should be large, clear and in waterproof ink. Stencils should be used if possible.

Example of Labelled Box

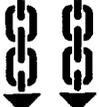
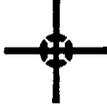


It is recommended that packages should have markings on at least three sides.

1. Unless local regulations prohibit their use, employ coded marks relative to contents. This is particularly important if goods are valuable, and thus subject to pilferage. Change these marks periodically and avoid trade names.
2. Consignee and (air) port marks showing destination and transfer points should be applied on three faces of the package. This is preferably side and/or ends or top.
3. When using the shipping carton for point of sale, one face should contain the customer data, while the other three should contain shipping and handling information. If regular corrugated boxes are being used, then point of sale graphics should be kept simple and bold in limited colours to avoid printing problems.
4. If using Canada Post the above instructions do not apply. Only provide consignee address and shipper address, preferably on at least 2 sides of the carton.

Self adhesive labels can be purchased with all the standard cautionary symbols, and special labels can be printed with the appropriate shipping information. However quantities of 500 or more will usually have to be ordered for non-standard labels.

International Carriage Symbols

 Fragile	 Handle With Care	 Keep Dry	 Do Not Roll	 Do Not Tumble	 Photographic Materials
 Protect From Heat	 Use no Hooks	 Perishable	 Keep Frozen	 Clamp Here	
 Sling Here	 Lift Cart Here	 Do Not Stack	 Do Not Freeze	 Centre of Gravity	 LIVE ANIMALS ABC AIR LINES

Unless shipping direct to the consumer, or in large quantities in pallet loads, the shipping container should not be the container that goes onto the shelf. Packaging graphics, used to catch the customer's attention are not usually compatible with shipping instructions.

Do not use old cartons unless they are undamaged and have all old labelling removed.

Typical Cautionary Phrases in Different Languages

English	French	German	Italian	Spanish	Portuguese	Swedish
Handle with Care	Attention	Vorsicht	Manneggiare con Cura	Manéjese con Cuedado	Tratar Con Cuidado	Versamt
Glass	Verre	Glas	Vetro	Vidrio	Vidro	Glas
Use No Hooks	Manier Sans Crampons	Ohne Haken handhaben	Non Usare Ganci	No Se Usen Ganchos	Nao Empregue Grachos	Begagna inga kroka
This Side Up	Cette Face En Haut	Diese Seite oben	Alto	Este Labo Arriba	Este Lado Para Encima	Denna sida upp
Fragile	Fragile	Zerbrechlich	Fragile	Frágil	Fragil	Omtaligt
Keep In Cool Place	Garder En Lieu Frais	Kuehl aufbewahren	Conservare in luogo fresco	Manténgase En Lugar Fresco	Deve Ser Guatdado Em Lugar Fresco	Forvaras kallt
Keep Dry	Proteger Contre Humidté	Vor Naesse schuetzen	Preservare dall umidita	Manténgase Seco	Nao Deve Ser Molhado	Forvaras torrt
Open Here	Ouvrir Ici	Hier offnen	Lato da Aprire	Abrase Aqui	Abra Aqui	Oppnas har

Courtesy of CIGNA Insurance Companies

PACKAGING EXAMPLES



The components shown in Fig 4-1 were, rightly, rejected for shipment. They require crating in order to ensure safe overseas shipment.

Figure 4.1 Machined sub-assemblies shrink wrapped & banded to pallet.

The sequence of photographs on pages 35-38 show typical packaging examples using readily available materials. Fig 4.2 shows the product as shipped from China in secondary packaging and minimal internal packing. No separation was provided for component lids. This product was shipped in cartons on pallets, with little expectation of significant movement and thus damage. However, if the product was to be prepared for individual shipment by a Canadian craft shop then the process would have to be very different.

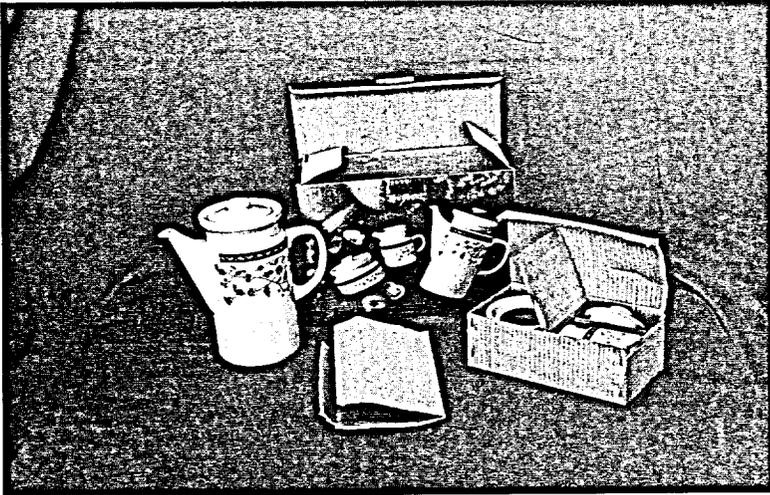


Figure 4.2 Sample product in secondary, or point of sale, packaging.

If large numbers were to be shipped individually, then an expanded polystyrene shell system may be used. See Fig 4.3 for typical system components for a bubble-jet printer. Alternatively the system by which the sample product was shipped to Canada could be used. The probable packaging cost would be under \$1.00, depending on volume.

Foam in place polystyrene could also be used, but this would not be compatible with the craft image and would be difficult to apply with multiple items. However, as a system, it is quite effective, provided specialized equipment is acquired and the user is trained in the application.

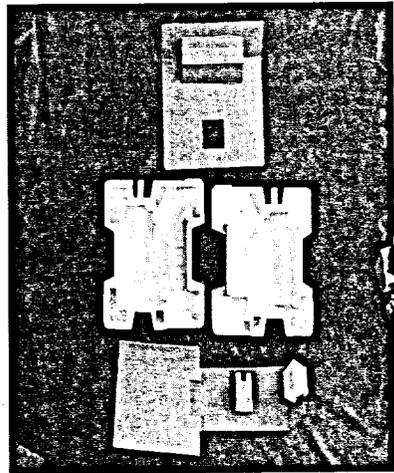


Figure 4.3 Typical polystyrene shell system.

Recycled Quilted Material

Fig 4.4a shows the sample product and packing material ready for use. Fig 4.4b shows the product packed and ready for closure. Material costs, retail, in early 1994 were \$7-8.00 excluding labour.

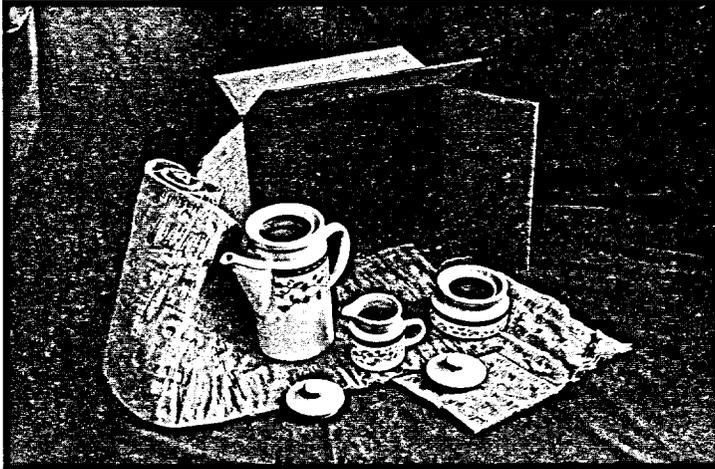


Figure 4.4a

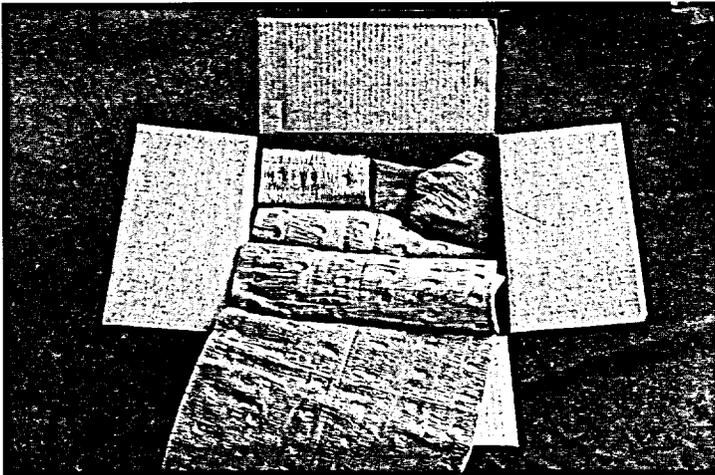


Figure 4.4b

Do not use string, or rope, to secure a carton. Use good quality gummed or self adhesive tape.

Bubble Wrap Sheet

Note that with bubble wrap two grades will be needed, a small bubble next to the products and a larger bubble for packing. With bubble wrap the bubble should face away from the product and away from the carton. Fig 4.5a shows the product ready for packaging, Fig 4.5b shows the products packed and ready for carton closure. Retail cost in early 1994 using 2 grades of recycled material was \$6-7.00 excluding labels and labour.

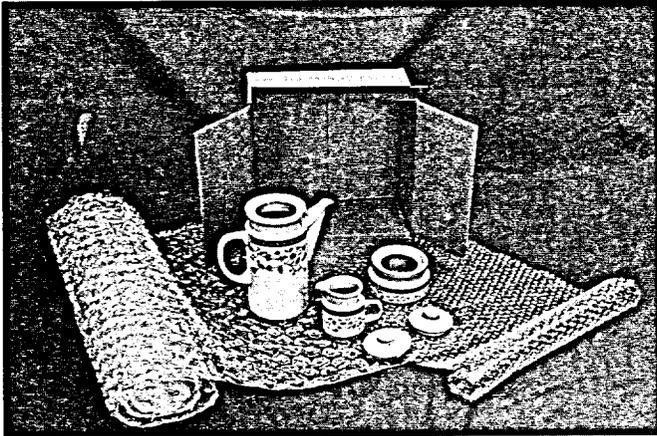


Figure 4.5a

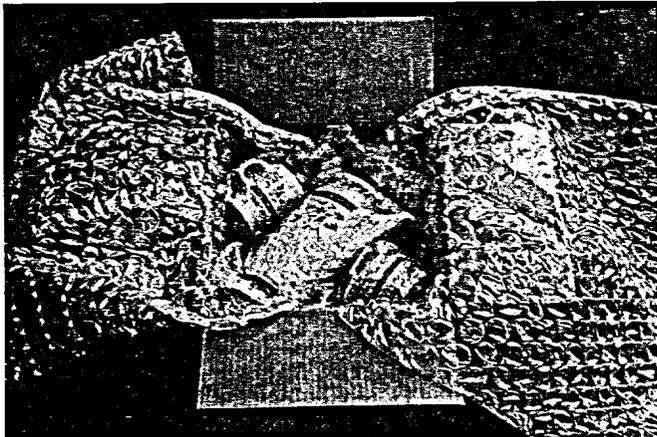


Figure 4.5b

Make sure carton contents are packed tightly and cannot move relative to each other.

Composite System

See Fig 4.6a shows the same product ready to be wrapped with bubble wrap and cushioned with plastic peanut (or popcorn) packing. Fig 4.6b shows the product packed and ready for carton filling with packing and then closure. Although retail costs are lower, at \$3-4.00, void filling and thus security would not be as good.

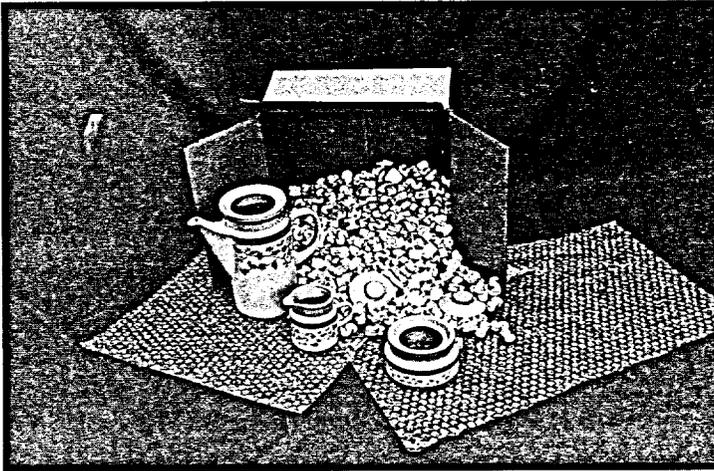


Figure 4.6a

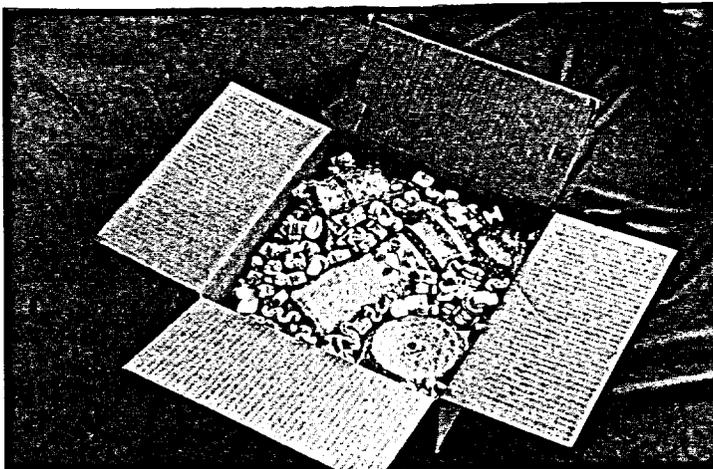


Figure 4.6b

In all cases ensure that there is at least 2-3cm space, filled with packing material, between the product and the carton wall.

Guidelines for Packaging Export Goods

Product	Examples	Factors for Consideration in Packaging
Textiles	Linen, table cloth, embroidery, printed cotton, carpet, doll.	Protection from mould and insect damage -Protection from discoloration by light -Keeping out dust -Transparency
Wood	Carvings, tumings, some painted products	-Protection from scratching -Protection from moisture, microbes and insects -Preservation of aroma -Cushioning for delicate products against compression and impact damage -Protection from discoloration by light
Lacquerware	Tableware, decorations	-Similar to wood especially protection of surface lustre
Stone carvings	Soapstone	-Stone articles are often fragile and heavy -Some are very valuable
Jade and bone carvings	Carvings, personal ornaments	-Fragile and very valuable
Fashion ornaments and jewellery	Personal ornaments, gems	-Require presentation packaging for sales promotion as well as transport packaging to protect fragile contents -Protection from pilferage
Metal	Bronze sculpture, silverware, pewter	-Protection from tarnishing and corrosion (air, moisture and salt water) for some products -Protection from pressure causing distortion
Glass, porcelain, stoneware	Flower vases, decorations	-Fragile -Impact between articles as damaging as impact from outside
Woven goods	Baskets	-Soft, easily squashed -Protection from moisture
Leather	Handbag Luggage Purse, Wallet	-Regulation of in-pack moisture levels to keep products flexible -Protection from discolouration and staining
Paper	Lamp cover	-Soft, easily squashed -Protection from light and water
Electronics	PC Boards	-Fragile -Protect from moisture, electrostatic discharge

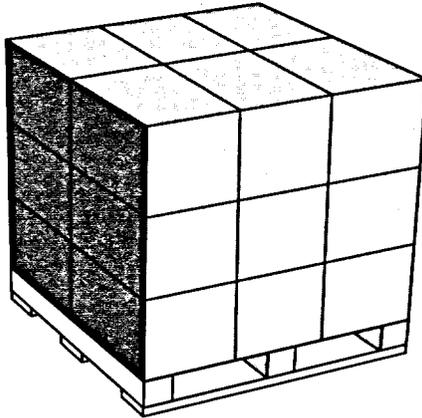
PALLETS

A pallet can be made of wood, corrugated paper, plastic, or metal. The choice of which to use is based on such criteria as weight of load, climatic environment, durability requirement, local availability, cost, and acceptability in the destination country.

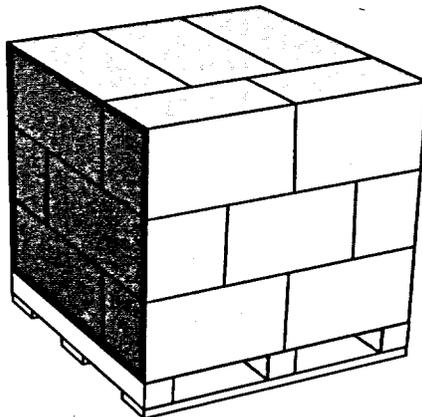
See **Safe Stowage** for details of pallet specifications, sizes, materials, stowing patterns etc.

Proper loading of pallets is essential for safe shipment of goods. If pallets are to be stacked, and they usually are, then precautions must be taken to ensure that the carton or cartons on the pallet do not collapse under the weight of superimposed pallets.

Carton Patterns on a Pallet



Vertical (columnar)



Interlocked

Do's & Dont's of Loading a Pallet

- **Do** load boxes in vertical, or columnar arrangement. This ensures that corners are directly over each other.
- **Do** use 4 sided pallets, preferably with a close boarded or solid load surface and a base where the lower boards come directly to the edge of the pallet.
- **Do** ensure that vertical stiffening of triangles of double wall corrugated board are inserted in the box corners if at all possible.
- **Do** ensure that the box, or boxes, completely fill the pallet. Adjust the box size if necessary to get a clean fill.
- **Do** ensure corners are properly aligned. Even a 1/2 " (1cm) misalignment will result in nearly 30% loss of compressive strength.
- **Do** strap, band, tension wrap, or shrink wrap cartons onto the pallet to ensure stability during handling. If strapping or banding use 4 tension straps plus one girth strap on the upper carton tier.
- **Do not** inter lock boxes, if pallets are to be stacked. Over 50% of the box strength is lost if corners are over the centre of the box below.
- **Do not** use a pallet with wide spacing between the deck boards. Unless a corner is over a deck board, there is a loss of compressive strength similar to that noted above.
- **Do not** use a carton, or stacking pattern, that either overhangs the edge of the pallet, or is short of the pallet edge. Compressive strength is lost, and/or excessive strain is placed on the upper portion of the carton by the pallet loaded on top.
- **Do not** use expanded polystyrene or any plastic foam as a structural member within the carton. This material is only suitable for spacing and internal support of the product being shipped.

Example of a palletized shipment wherein virtually every packaging rule was broken

Refer to figures 4.8 and 4.9 on facing page.

1. Carton too large for the contents and only single wall construction. Should have been at least double wall. (Fig 4.9) .
2. Electronic components stowed loose in the carton without any protection (Fig 4.9)
3. Extensive, and inappropriate use of expanded polystyrene for internal carton structure. This does not provide compressive strength. (Fig 4.9)
4. Only one tension band in each direction. (Fig 4.8)
5. Marking indicates 3 high stow permissible, but collapse has occurred with only 2 high. It is possible that the cartons alone, properly stacked could have gone to 3 high. (Fig 4.8)
6. Collapse is, in part, due to loss of compressive strength caused by carton overhanging pallet in one direction and being short in the other direction. (Fig 4.8)
7. Poor pallet, deck and base boards do not come to the edge and are too narrow. (Fig 4.8)

While the actual collapse, and damage caused, can be attributed to poor stowage, and lack of dunnage bags to support the load, a major contributing factor was poor choice of packaging system, and inappropriate use of pallets. The shipping company or forwarder should probably have rejected the consignment for shipment because of the high risk of damage occurring.

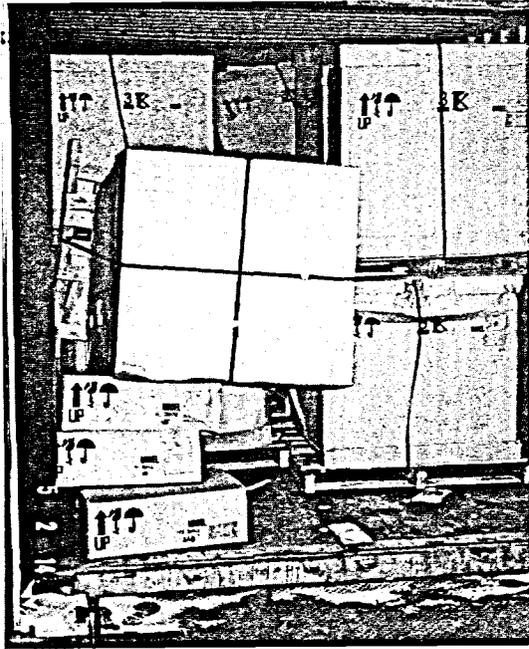


Figure 4.8 Carton stowed on pallets in freight container.



Figure 4.9 Carton structure and contents.

CHAPTER 5 HAZARDOUS GOODS

It is not the intent of this booklet to address the problem of shipping hazardous goods. There are many publications and special advisory services available. Your carrier will also be able to advise if the proposed shipment is likely to come within the various international hazard classes which are:

- Explosives
- Gases
- Flammable Materials
- Oxidizing Materials
- Poisonous and Infectious Substances
- Radioactive Materials
- Corrosive Materials
- Miscellaneous Hazardous Material

Hazardous goods symbols will be found in Annex 1 of **Safe Stowage**. All international air and ocean shipments must, as a minimum, meet United Nations performance packaging standards for hazardous goods. Increasingly US domestic and transborder movements by truck and rail are also required to meet these common standards. If in doubt ask your carrier, or contact Transport Canada, Dangerous Goods Directorate in Ottawa (613) 990-1154 or within your region for guidance.

In order to keep up to date with changes in regulations, you should subscribe to *Dangerous Goods Newsletter*. This is available free of charge in both official languages. Call (613) 990-1151 to order.

There is also an international journal dedicated to tracking activity in hazardous goods movements, regulations and specialist services. This is *Hazardous Cargo Bulletin* and is published in the United Kingdom monthly. See Annex 3 for address.

ANNEX 1

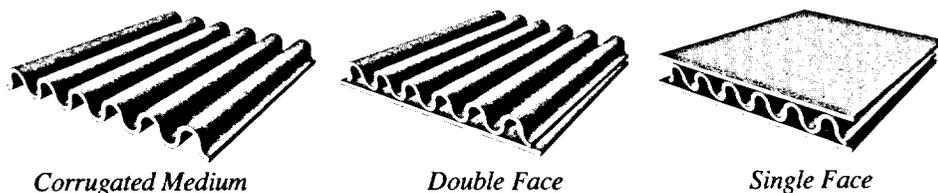
CORRUGATED BOXES

Corrugated boxes are constructed from a wavy (fluted) sheet or sheets glued to one or more liner board layers, see Fig 3.2. The structural characteristics of corrugated containers are governed by four variables:

- strength of the liners
- strength of the corrugated layer
- height and number of waves (flutes) per foot
- type of walls (single, double, triple etc.)

The wider the wave the greater the capacity to absorb shock, while a short wave provides maximum crush resistance. In addition, waxes and plastics can be added to a corrugated box to improve moisture resistance. This allows, for example, shipment of fruits, vegetables and other products otherwise shipped in more expensive wooden crates to be handled in cardboard cartons. The principal drawback of corrugated boxes is that compressive and burst strength is significantly reduced under conditions of high humidity (90% plus) and up to half normal strength can be lost. This loss of strength will be accelerated if the carton is subject to cyclical humidity.

Figure 3.2
Typical Flute Characteristics of Single Wall Corrugated Fibreboard



Flute Categories	Corrugations per foot	Approx. height		Edge Appearance
		inches	cm	
A	33 ± 3	.184	.467	
B	47 ± 3	.097	.246	
C	39 ± 3	.142	.361	
E	90 ± 4	.062	.157	
F	96 ± 4	.045	.114	

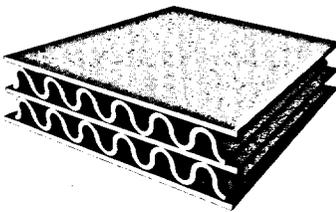
The corrugated box comes closest to the ideal shipping container, see Fig 3.3; it is light in weight, of low cost, but able to withstand normal transportation hazards. However the use of these boxes for export shipments requires added protection than for domestic shipments.

Figure 3.3
Comparative Properties of Corrugated Fibreboard

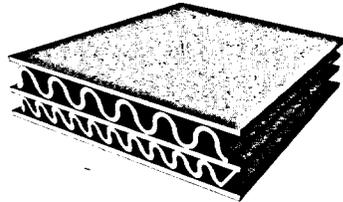
	A Flute	B Flute	C Flute	E&F Flute	Doublewall
Stacking Strength	Exc.	Fair	Good	Poor	Best
Printing	Fair	Exc.	Good	Best	Poor
Die Cutting	Fair	Exc.	Good	Best	Poor
Resistance to Puncture	Good	Fair	Exc.	Poor	Best
Scoring and Bending	Good	Exc.	Good	Best	Fair
Cushioning	Exc.	Fair	Good	Poor	Best

Carton strength can be significantly increased by using multiwall corrugated fibreboard. This is most usually double wall, but triple wall may also be called for, see Fig 3.4

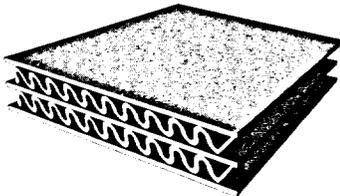
Figure 3.4
Typical Multi-Wall Corrugated Fibreboard



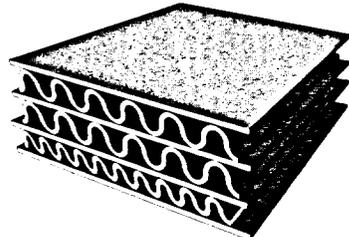
AA Flute Doublewall



AB Flute Doublewall



BB Flute Doublewall



AAC Flute Triplewall

AVAILABILITY

Cardboard cartons are widely available through both manufacturers and wholesale and retail outlets. However obtaining the right quality may reduce one's options. For example, 275 lb test cardboard cartons may be difficult to obtain in small quantities. Retail outlets specializing in mailing supplies carry a good range of single wall 170 lb cartons. Packaging supply houses carry a wide range of corrugated shipping boxes, but generally in 200 lb test, and only available in lots of 10-25. Prices on a per carton basis from the supply houses, net, are around 40% lower than retail for the single carton. If purchased quantities can be increased, the saving increases significantly. Depending on quantities, the boxes can also be imprinted with company name, logo, and basic information.

Box manufacturers may offer to design a complete packaging system for your product. This would include both carton and packing. However they typically need a run of at least 200 units to justify the design process, although they may design and deliver a system for less than 10 items if there is a good probability of future volume business.

The telephone yellow pages are a good place to obtain company contacts and brochures. However, use the Business/Industrial Yellow Pages of major metropolitan areas in order to find the largest and most comprehensive range of suppliers and equipment. Key words to look under are Packaging Service, Packaging Materials, and Export Packaging.

ANNEX 2

REFERENCE MATERIAL

The following publications are readily available. Other reference material, to which the authors have had access in the preparation of this booklet, is not readily available.

Fibre Box Handbook

Published by the Fibre Box Association

2850 Golf Road

Rolling Meadows, Illinois

USA 6008

Tel: (708) 364-9600

Fax: (708) 364-9639

Very useful publication covering all aspects of cardboard carton use. (US \$12.00 to non-members)

CIGNA Ports of the World: A Guide for Cargo Loss

Available from

CIGNA Insurance Company of Canada

Scotia Plaza

40 King Street West, 38th Floor

Toronto, Ontario M5H 3Y2

Tel: (416) 594-2596

Fax: (416) 368-6336

Although covering the whole range of cargo loss reduction, includes useful section on packaging, air & marine shipment. (US \$25.00 cover price, but may be provided free of charge)

The Packaging Users Handbook

Ed. F.A. Paine

Published by AVI New York, 1991

Available from:

Nelson (Canada)

1120 Birchmount Road

Scarborough, Ontario M1K 5G4

Tel: (416) 752-9100

Fax: (416) 752-9646

Comprehensive textbook covering all types of packaging materials. 596 pages C \$205.00. Allow 3-4 weeks for delivery.

ANNEX 3

USEFUL CONTACTS & TRADE PUBLICATIONS

Packaging Association of Canada
2255 Sheppard Avenue East
Suite 330
Willowdale, Ontario
M2J 4Y1
Tel: (416) 490-7860
Fax: (416) 490-7844

*Runs seminars, publishes a newsletter.
Membership fee.*

Institute of Packaging Professionals
481 Carlisle Drive
Herndon, Virginia
USA 22070 - 4823
Tel: (703) 318-8970
Fax: (703) 318-0310

*Over 50 publications available.
Seminars and newsletter. Individual
membership US\$90 per year .*

International Safe Transit Association
43 East Ohio Street, Suite 914
Chicago, Illinois
USA 60611
Tel: (312) 645-0083
Fax: (312) 645-1078

*Provides a standardised programme of
preshipment testing and certification of
packaged products.*

International Corrugated Packaging
Foundation
801 North Fairfax Street, Suite 211
Alexandria, Virginia
USA 22314
Tel: (703) 836-2422
Fax: (703) 836-2795

Sells a box manufacturers directory.

TRADE PUBLICATIONS

Canadian Packaging Magazine
Publisher: Maclean Hunter
777 Bay Street
Toronto, Ontario
M5W 1A7
Tel: (416) 596-5000
Fax: (416) 596-5554

Monthly, includes annual buyers guide.

Transportation & Distribution
Penton /LPC , Inc
111 Chester Avenue
Cleveland, Ohio
USA 44114
Tel: (216) 696-7000
Fax: (216) 696-4135

Distribution Worldwide
Chilton Publishing Company
Chilton Way
Radnor, Pennsylvania
USA 19089
Tel: (610) 964-4141
Fax: (610) 964-49 78

Hazardous Cargo Bulletin
38 Tavistock Street
London WCZE 7PB
United Kingdom
Tel: 71 240 0837
Fax: 71 836 9321

The telephone yellow pages are a good place to obtain company contacts and brochures. However, use the Business/Industrial Yellow Pages of major metropolitan areas in order to find the largest and most comprehensive range of suppliers and equipment. Key words to look under are Packaging Service, Packaging Materials, and Export Packaging.

ANNEX 4

COMPLEMENTARY PUBLICATIONS

Complementary publications available from Foreign Affairs and International Trade made available through Info Ex, Department of Foreign Affairs and International Trade, Ottawa, Ontario K1A 0G2 (telephone 1-800-267-8376 Fax 1-613-996-9709).

Safe Stowage

Provides an overview of intermodal transportation and details on stowing of cargo in trucks, rail cars and freight containers.

The Exporters' Guide to Transportation

Provides an overview of different transportation modes, intermediaries within the transportation chain & documentation.

Export Documentation and Foreign Collections

Discusses and provides examples of typical documents needed by the exporter. These relate both to the export move & the means by which the exporter can obtain payment.

Export Guide: A Practical Approach

A basic guide for the novice exporter.

ANNEX 5

ACKNOWLEDGEMENTS

The Mariport Group gratefully acknowledges the assistance of the following organizations in the preparation of this booklet.

CIGNA Insurance Companies, Toronto
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Toplis & Harding, Toronto, Ontario
Pack N Rail, Burlington, Ontario
PolyAir Packaging, Toronto, Ontario
The Wilson & Winters Group, Greensboro NC
Intl. Trade Centre - UNCTAD/GATT

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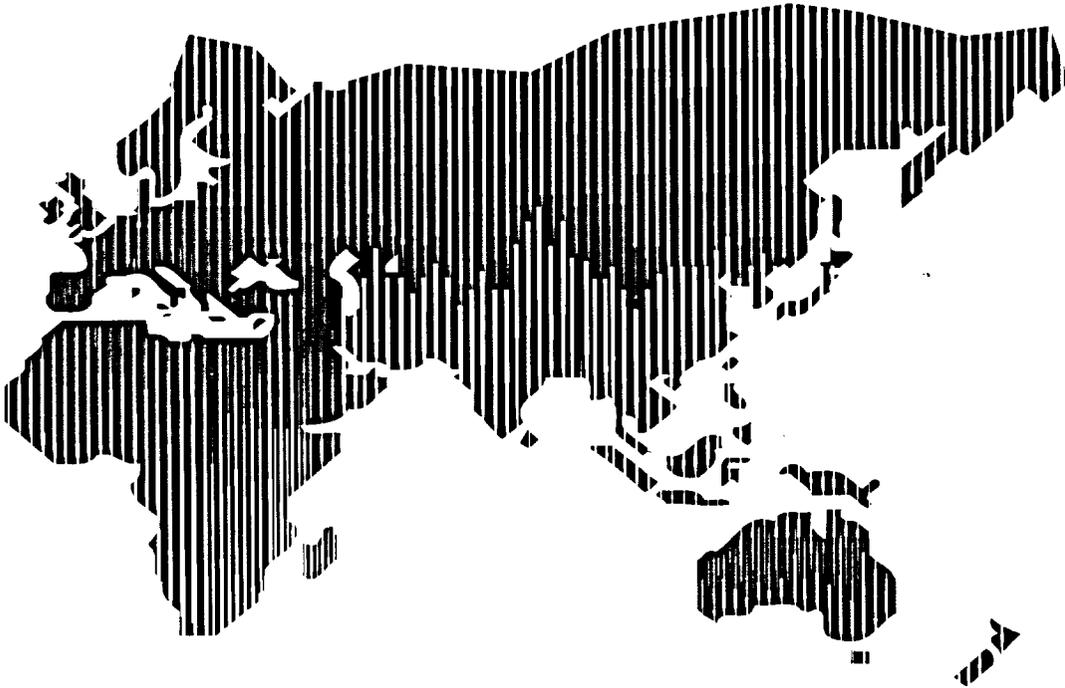
EXPORT INFORMATION

The InfoCentre provides information, referral and publications services.

FaxLink is a faxback information service operated by the InfoCentre storing trade and foreign policy-related documents and publications, accessible to the public automatically by fax on a 24-hours-a-day, 7-days-a-week basis.

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FaxLink: (613) 944-4500 (Call from fax machine)
IBB: (613) 944-1581



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