

Second Edition

EXPORT

PACKAGING

A GUIDE FOR EXPORTERS

 THE CANADIAN
TRADE COMMISSIONER
SERVICE



Department of Foreign Affairs
and International Trade

Ministère des Affaires étrangères
et du Commerce international

Canada 

A GUIDE FOR EXPORTERS

Third Edition

Department of Foreign Affairs and International Trade

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Damage due to improper packaging constitutes between 10%-15% of claims according to 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, rail car or freight container. Handling and stowage losses constitute a highly significant 43% of causes of loss — this figure has not changed appreciably in the last 15 years.

PERCENTAGE OF ALL DAMAGE ATTRIBUTABLE TO PACKAGING
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 the 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 to understand the basic principles of cost-effective packaging.

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

Understanding the Handling and Shipping Process



PROTECTING YOUR PRODUCT FROM TRANSPORT HAZARDS

When you design the export package for your product, consider its fragilities – how can it be damaged?

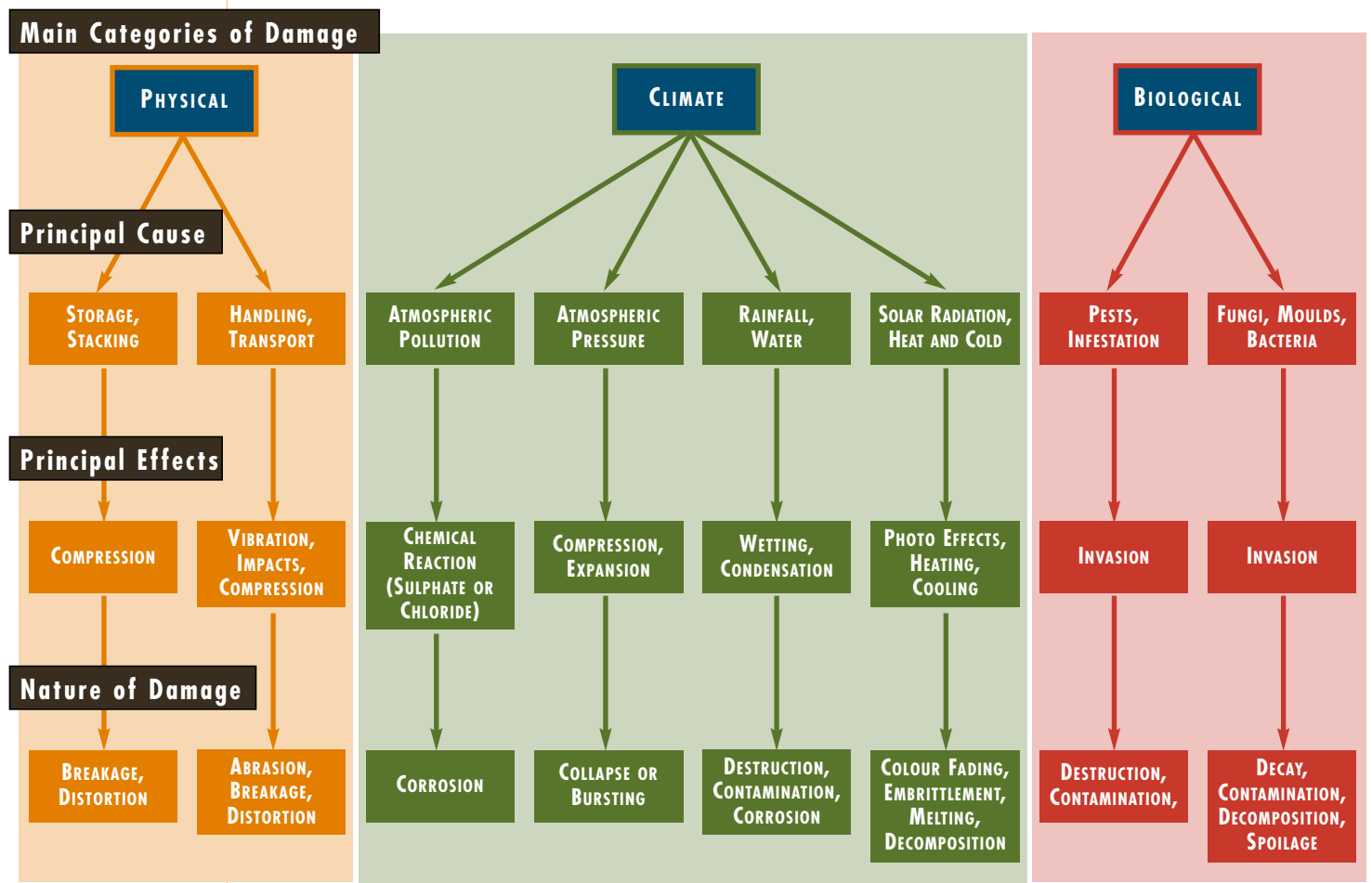
From the standpoint of physical distribution, packaging must contain and protect the product from point of manufacture to point of consumption or use. Handling along the transportation chain may require a very wide range of characteristics and performance from the package. During an export move, all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

- ▶ **shock (e.g. from dropping, side impacts),**
- ▶ **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, spillage),**
- ▶ **oxidation,**
- ▶ **extreme temperature (hot or cold),**
- ▶ **electrostatic 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 much time will elapse between packing the product and receipt by the customer.

Loading and unloading hazards arise not only at pick-up and delivery, but also at any intermediate transshipment point. 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 intermediate distribution hub, then trucked to another distribution hub, then delivered to your customer or distributor by small van. The main hazards are drops and impacts.

SCHEMATIC OF PACKAGE TRANSPORT HAZARDS



The preferred size of individual packages is between 15 and 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 cars. 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 settling 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 road conditions, speed travelled and suspension conditions of the truck. Exports to developing countries are particularly exposed to these hazards. Load crushing by ropes, shifting of the load, and impacts from other goods are also significant 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 given serious consideration. 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.

AIR

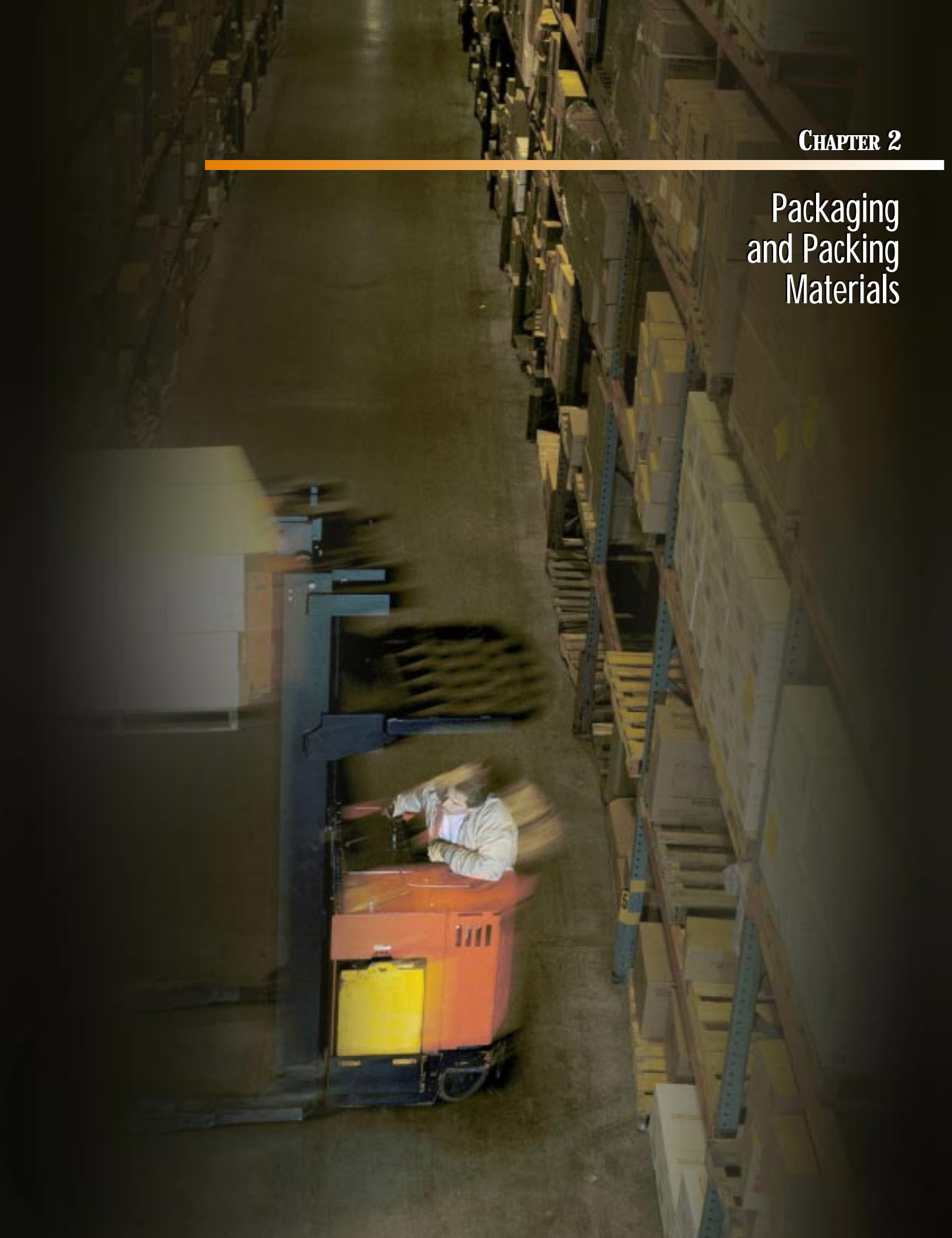
Minimizing package weight to save on air freight costs may expose the product to unacceptable damage risks, not so much in the air as during ground transportation to and from airports. Most cargo is delivered to both carrier and consignee by truck. Often air cargo is stored in warehouses or on transfer 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 temperatures 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, 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.

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 used are as follows.

PACKAGING

The process of selecting materials to ensure 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.



Primary

PACKAGING

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

PRIMARY

Closest to the product, e.g., toothpaste tube, glass bottle

SECONDARY

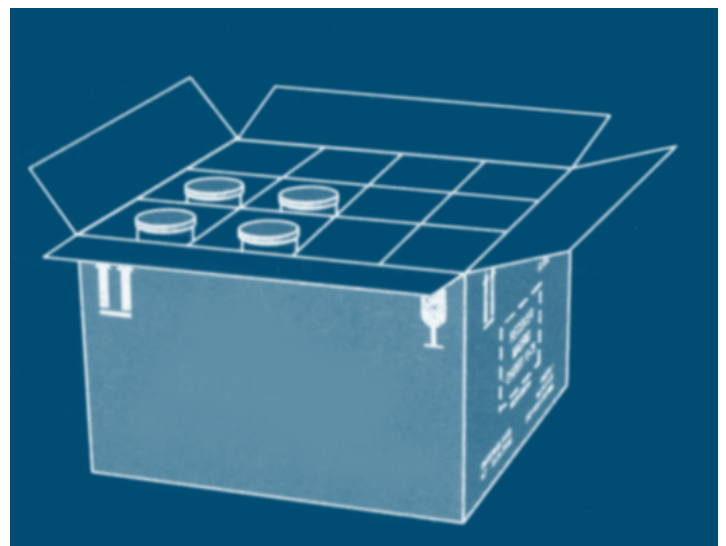
Intermediate or point-of-sale container, e.g., box around toothpaste tube, gift box for glass bottle

TERTIARY

Shipping carton, e.g., carton containing multiple boxes of toothpaste or boxed bottles. Sometimes called transport packaging.



Secondary



Tertiary

This booklet is primarily concerned with the tertiary type of container and its selection. However, for certain items, the shipping carton may be both primary and secondary container, e.g., a carton for a ceramic vase, or a TV set.

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 that 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 your goods.

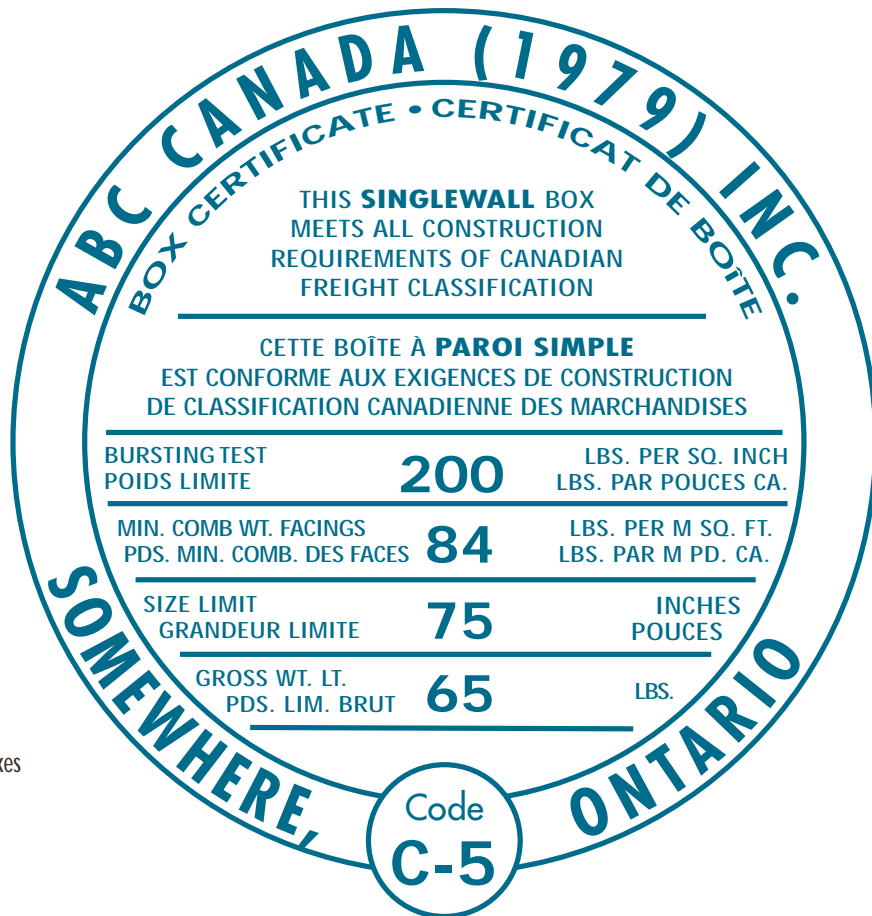
PACKAGING MATERIALS AND THEIR USE

CORRUGATED BOXES

The corrugated box is the most common packaging method 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 2.1) The tests for corrugated board involve subjecting it to the same conditions that may prevail during normal handling. The **Appendix** describes types of cardboard boxes and their application.

Never overload a box.

FIGURE 2.1
Information on Box
Strength



For Singlewall Boxes

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, and fragility, as well as any transportation hazard to be encountered. If there is some doubt, then other packaging methods must be considered.

BOXBOARD

Boxboard, or solid fibreboard, is not suitable as a shipping carton. It does not have the strength 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.

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 of 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 1.2 m in length or more than 120 kg. Then three or more straps should be used, with one for each additional .6 m of length. Staples should be used to hold strapping in place when boards are 15 mm in thickness or greater.

It is not advisable to economize 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. A covering protects against exposure to the elements but it should not be considered

integral to the structural strength of the crate. The open crate can be used where contents are virtually indestructible, and where crating will facilitate handling and stowage.



FIGURE 2.2
A well-constructed
crate ensures
safe transit

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 used, end the covering at the floor of the crate, not the ground, to permit entry of forklifts and to prevent tearing of the covering when the crate is moved sideways.

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.

FIGURE 2.3
Wire crate filled
with unprotected
electronic items)

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**

These are 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 (FIBCs).

MULTI-WALL SHIPPING SACKS

These should only be shipped palletised; the specification and preparation of sacks for each product (e.g. cement, flour, grains) are very important.

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

FIBCs come in several types and may be designed for single or multiple use: they are typically used for dry bulk commodities in single units of 1-3 tonne capacity. FIBCs should be designed for both the product and its method of handling before its ultimate use.

ALTERNATIVE SYSTEMS

Some companies, pressured in part by the growing cost of disposal for conventional packaging materials, have moved to alternative systems, using blankets, and other cushioning material that can be readily recycled or returned. These systems are often used for items (e.g. for chairs and auto components) where handling is limited and full truckload lots are involved, they could also be used for door-to-door, full-container shipments 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.

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
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.

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.

An appropriate general purpose packing material should be selected, unless sufficient overall volume justifies selective choice of specific materials for different products. However, 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 sheets, a 10 mm grade should be used to wrap the products, then a 25 mm grade should be used as actual packing in the carton. Pre-moulded shells or shapes made out of cellular material can be excellent packing, but the cost of permanent moulds 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 therefore provide an adequate 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 operation functions that can be harmed by dust particles should be wrapped or protected against exposure to dust.

CORROSIVITY. Many paper-based materials are corrosive and must not be used with highly finished metal parts. Other materials may become corrosive following chemical treatment, e.g., 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 products, 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:

- ▶ **Adhesive**
- ▶ **Stitching or Stapling**
- ▶ **Tape**
- ▶ **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	Medium	Yes	No
	Pressure sensitive	Yes	Yes	High	No	Yes
Stitching or Stapling	Metal	No	Yes	High	No	Yes
Strapping	Metal	No	Yes	Medium	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.

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.

▶ SURFACE TO WHICH TAPE IS TO BE ADHERED

The tape must stick under all anticipated conditions of handling and transportation.

▶ REMOVABILITY

Tape must be removable without disturbing the product in the box.

▶ APPLICATION CONDITIONS

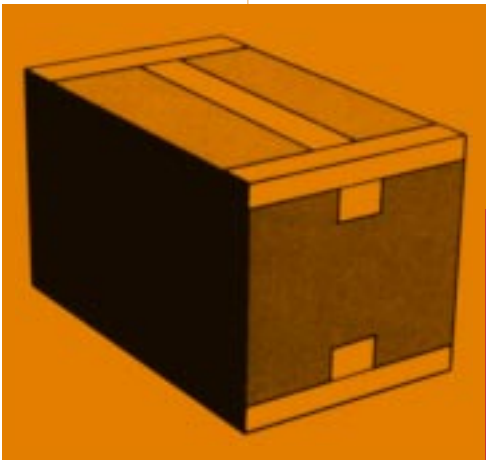
These include temperature and humidity. These factors are important in as much as they change the ability of the tape to adhere to the carton surface.

▶ WEIGHT AND SIZE OF PACKAGE

These determine the strength of tape required.

PAPER SEALING TAPE

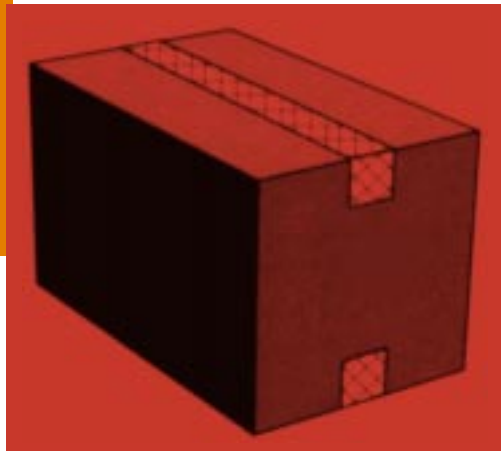
Full length of all outer seams securely sealed with strips not less than 5cm wide.



TAPE SEALING PATTERNS

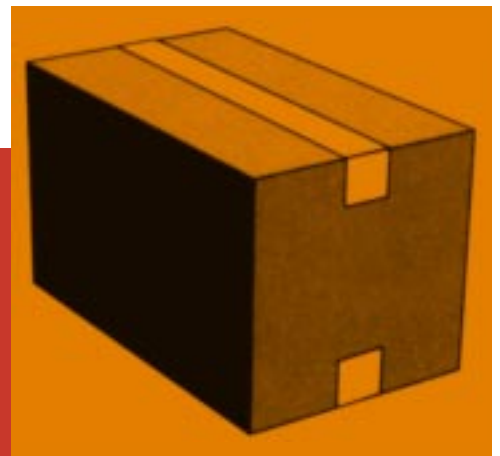
REINFORCED TAPE

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.

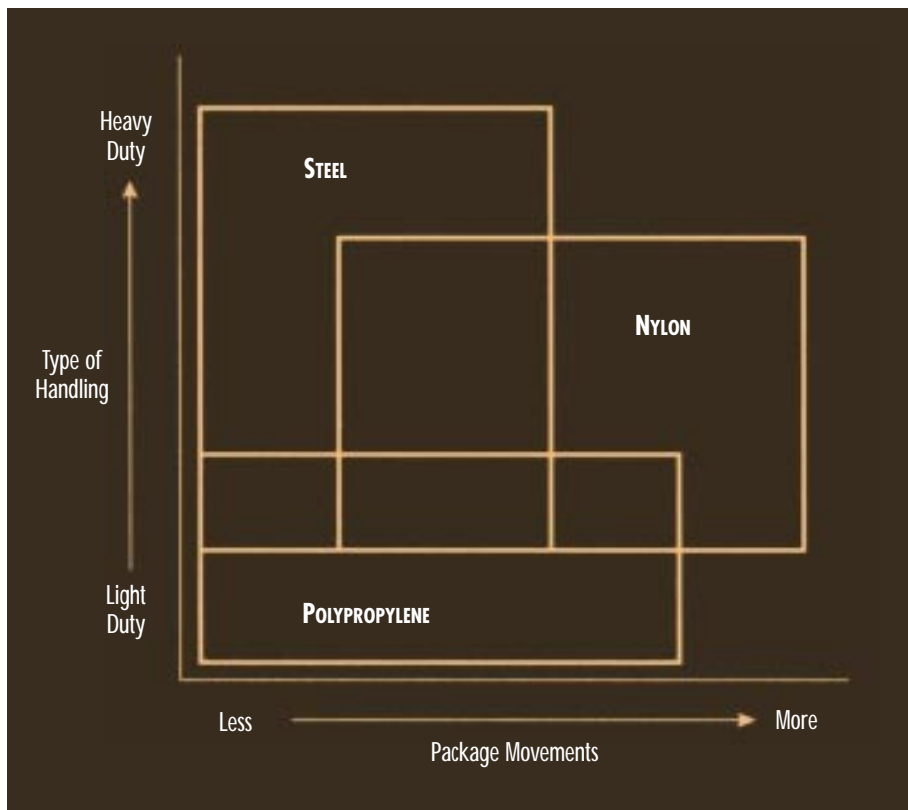


STRAPPING

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 strapping will be better for cartons or pallet stabilization.

STRAPPING CHARACTERISTICS

- ▶ All straps must be applied at right angles to the edges of the base over which they pass.
- ▶ 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.



GUIDELINES FOR PACKAGING EXPORT GOODS

<i>PRODUCT</i>	<i>EXAMPLES</i>	<i>FACTORS TO CONSIDERATION IN PACKAGING</i>
Textiles	Linen, table cloth, embroidery, printed cotton, carpeting, dolls	<ul style="list-style-type: none"> ▶ Protection from mould and insect damage ▶ Protection from discoloration by light ▶ Keeping out dust ▶ Transparency
Wood	Carvings, turnings, some painted products	<ul style="list-style-type: none"> ▶ 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	<ul style="list-style-type: none"> ▶ Similar to wood, especially protection of surface luster
Stone carvings	Soapstone	<ul style="list-style-type: none"> ▶ Stone articles are often fragile and heavy ▶ Some are very valuable
Jade and bone carvings	Carvings, personal ornaments	<ul style="list-style-type: none"> ▶ Fragile and very valuable
Fashion ornaments and jewellery	Personal ornaments, gems	<ul style="list-style-type: none"> ▶ Require presentation packaging for sales promotion as well as transport packaging to protect fragile contents ▶ Protection from pilferage
Metal	Bronze sculpture, silverware, pewter	<ul style="list-style-type: none"> ▶ Protection from tarnishing and corrosion (air, moisture and salt water) for some products ▶ Protection from pressure causing distortion
Glass, porcelain, stoneware	Flower vases, decorations	<ul style="list-style-type: none"> ▶ Fragile ▶ Impact between articles as damaging as impact from outside
Woven goods	Baskets	<ul style="list-style-type: none"> ▶ Soft, easily squashed ▶ Protection from moisture
Leather	Handbags, luggage, purses, wallets	<ul style="list-style-type: none"> ▶ Regulation of in-pack moisture levels to keep products flexible ▶ Protection from discolouration and staining
Paper	Lamp covers	<ul style="list-style-type: none"> ▶ Soft, easily squashed ▶ Protection from light and water
Electronics	PC boards	<ul style="list-style-type: none"> ▶ Fragile ▶ Protect from moisture, electrostatic discharge

Preparing for
the Shipment



It is essential 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.

Remember that your package will be subject to shock and movement during transit.

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 the highly professional to the completely unskilled.

FIRST STEPS IN SELECTING YOUR PACKAGING

PREPARATORY

- ▶ Has a decision been made as to the export mode (road, rail, air, marine)?
- ▶ Are goods to be shipped directly to the consumer, or will a distributor or warehousing facility be involved?
- ▶ Are the likely conditions of carriage throughout the transportation route known (temperature, humidity, shock, pilferage)?

PACKAGE DESIGN

- ▶ 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?
- ▶ Have you considered the types of movements, stresses and shocks affecting the package during transit? Remember that there are differences between modes: consequently, your choice of mode might require more durable packaging.

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?
- ▶ Does the product need crating?
- ▶ Are special corner mouldings 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 all markings been applied, including:
 - *port of destination,*
 - *transit instructions,*
 - *name, address and phone number of consignee,*
 - *package dimensions/weight,*
 - *package number*
 - *invoice and/or order number?*

PACKAGE INDICATORS

- ▶ Are shock indicators or recorders needed for the shipment?
- ▶ Are tilt indicators needed for the shipment?

STARTING THE PACKAGING PROCESS

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.

- ▶ Clean all surfaces
- ▶ Drain and dry product to remove liquids
- ▶ Remove, or use special protection for particularly fragile items or parts
- ▶ Dismantle or reposition parts and sub-assemblies to reduce the total pack volume
- ▶ Bolt down or otherwise secure movable parts, which could be damaged or cause damage during handling
- ▶ Lock or otherwise seal 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 require cushioning to the level of the most fragile parts; after disassembly, each part will require cushioning only to its own level of fragility.

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 weights 10 times its actual weight. If this could present a problem, gravitational 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. Such products include electronics, magnetic tape, high-speed film, and diskettes. 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/or electromagnetic hazards. Projections, sharp edges or other features of the product, that may damage the protective bag should be cushioned.

IS THE PRODUCT TEMPERATURE SENSITIVE?

Some shipments are sensitive to extremes of temperature. For example, chocolate candy 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' high. A hand stow in a freight container will utilize the full 9' or 9'6" height if a high cube container 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.

Containers should be designed to have up to seven times the stacking strength anticipated during warehousing. For example, a product distributed across North America may be stored up to nine months before use, and with at least half of the volume stored in the high humidities of the eastern seaboard, an increased stacking strength of six or seven times would be required.

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

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 have markings on at least three sides.

Shipper's mark

Country of origin

Weight Markings

Handling Markings

Cautionary Markings

Consignee's Mark, destination and order number

Number of package and size of case

- ▶ 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.
- ▶ Consignee and (air) port marks showing destination and transfer points should be applied on three faces of the package, preferably side and/or ends or top.
- ▶ 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.
- ▶ If using Canada Post, provide only the consignee and shipper addresses, preferably on at least two sides of the carton. Confirm shipping requirements with Canada Post.

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



Unless shipping directly 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	Maneggiare 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 Guatddado Em Lugar Fresco	Forvaras kallt
Keep Dry	Protéger Contre Humidité	Vor Naesse schuetzen	Preservare dall umidita	Manténgase Seco	Nao Deve Ser Molhado	Forvaras torrt
Open Here	Ouvrir Ici	Hier öffnen	Lato da Aprire	Abrase Aqui	Abra Aqui	Oppnas har



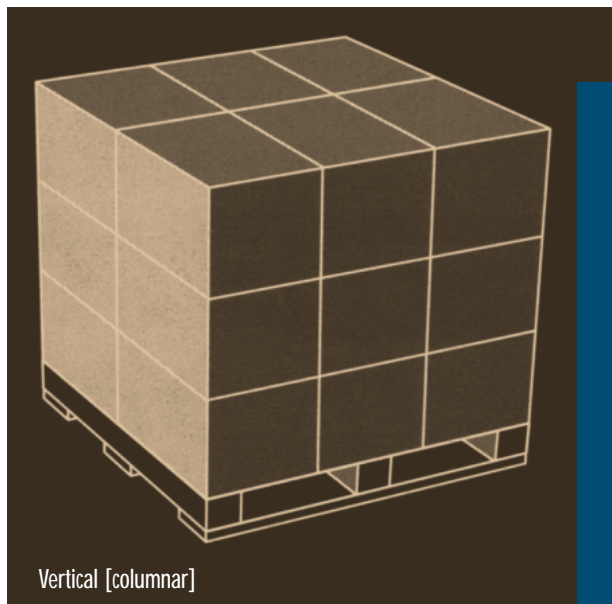
While shrink-wrapped and banded to the pallets, this packaging was rejected for shipment. The product also required crating in order to ensure safe overseas shipment.

PALLETS

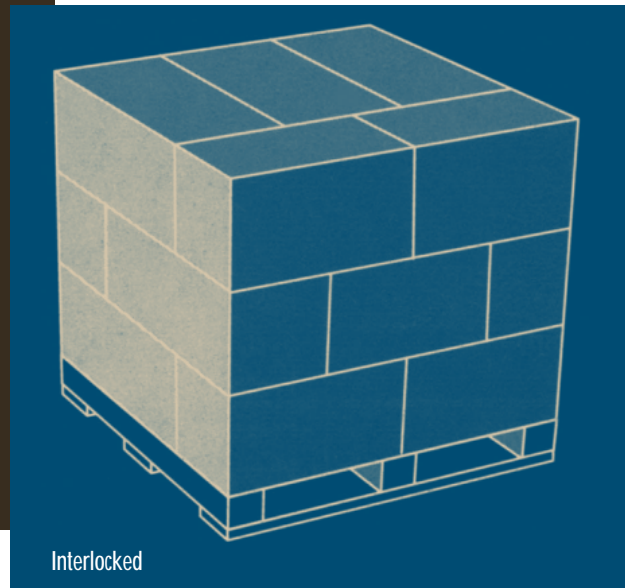
A pallet can be made of wood, corrugated paper, plastic or metal. The choice of which to use is based on such criteria as weight of load, climactic environment, durability requirement, local availability, cost and acceptability in the destination country. See **SAFE STOWAGE** for details of pallet specifications, sizes, materials, stowing patterns.

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

DOS AND DON'TS OF LOADING A PALLET

- ▶ **DO** load boxes in vertical or columnar arrangement. This ensures that corners are directly over each other.
- ▶ **DO** use four-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 made of double-wall corrugated board are inserted in the box corners when 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 seemingly small (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 four tension straps plus one girth strap on the upper carton tier.
- ▶ **DON'T** interlock boxes, if pallets are to be stacked. More than 50% of the box strength is lost if its corners are over the centre of the box below.
- ▶ **DON'T** 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.
- ▶ **DON'T** 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.
- ▶ **DON'T** 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 A and B.

1. There is only one tension band in each direction. (Figure A)
2. Marking indicates a three-high stow is permissible, but collapse has occurred with only two high. Collapse is, in part, due to the loss of compressive strength caused by the carton overhanging the pallet in one direction and being short in the other direction. (Figure A)
3. A poor pallet is shown with deck and base boards that do not come to the edge and are too narrow. (Figure A)
4. The carton is too large for the contents and has only single wall construction. It should have been at least a double wall. (Figure B)
5. Electronic components are stowed loose in the carton without any protection from damage. (Figure B)
6. Extensive and inappropriate use of expanded polystyrene for internal carton structure does not provide compressive strength. (Figure B)

FIGURE A
Improperly stowed
carton on pallets in
freight container



FIGURE B
Weak carton structure and
improperly
packaged contents



CORRUGATED BOXES

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Corrugated boxes are constructed from a wavy (fluted) sheet or sheets glued to one or more liner board layers (see Figure A). 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 or metre, and**
- ▶ **type of walls (e.g. single, double, triple).**

Wide-wave corrugated fibreboard has considerable capacity to absorb shock, but is subject to crushing in the process. Short-wave corrugated fibreboard is less able to absorb shock, but provides maximum crush resistance. Waxes and plastics can be added to a corrugated box to improve moisture resistance. The principal drawback of corrugated boxes is that compressive and burst strength is significantly reduced under conditions of high humidity (90% plus) where up to half normal strength can be lost. This loss of strength will be accelerated if the carton is subject to cyclical humidity.

FIGURE A

TYPICAL FLUTE CHARACTERISTICS OF SINGLE-WALL CORRUGATED FIBREBOARD



FLUTE CATEGORIES	CORRUGATIONS PER FOOT OR .3 METRE	APPROX. HEIGHT		EDGE APPEARANCE
		INCHES	CM	
A	33±3	.184	.467	
B	47±3	.097	.246	
C	39±3	.142	.361	
D	90±4	.062	.157	
E	96±4	.045	.114	

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

FIGURE B

COMPARATIVE PROPERTIES OF CORRUGATED FIBREBOARD

	<i>A FLUTE</i>	<i>B FLUTE</i>	<i>C FLUTE</i>	<i>E&F FLUTE</i>	<i>DOUBLE WALL</i>
Stacking Strength	Excellent	Fair	Good	Poor	Best
Printing	Fair	Excellent	Good	Best	Poor
Die Cutting	Fair	Excellent	Good	Best	Poor
Resistance to Puncture	Good	Fair	Excellent	Poor	Best
Scoring and Bending	Good	Excellent	Good	Best	Fair
Cushioning	Excellent	Fair	Good	Poor	Best

Carton strength can be significantly increased by using multi-wall corrugated fibreboard. This is most usually double wall, but triple wall may also be called for (see Figure C).

FIGURE C

TYPICAL MULTI-WALL CORRUGATED FIBREBOARD

