	Title:	Doc. No.
Falcon Engineering CORPORATION	**Packaging**	**WI-01**
CAGE: 7FKV8		Rev: -

Revision Record

Issue	Date	ECO#	Revision Record	Author
ORIG	12/10/2021	--	Initial Release	E. Doedderlein

Part Cleanliness, FOD and Protection

Inadequate or improper packaging coupled with unclean movement of containers or fixtures can allow the introduction of FOD (**Foreign Object Debris QMS-20)** into products during normal movement and inspection of an assembly through an area or between areas or sites. FOD barriers such as product connector covers should be installed, as reasonable, on all open cavities during product moves. Products are to be adequately packaged and appropriate packing materials chosen to ensure that these materials do not migrate into recesses or cavities within the product.

All parts will be clean prior to packaging. Cleanliness of the part is not to be degraded by any of the packaging materials used to pack and ship. All parts being packaged must be free of dirt, rust, scratches, etc.

WRAPPING

A sheet of flexible material shall be applied around the Product item or package to prevent contamination, protect critical surfaces and barrier material from rupture, and preserve the Products. The wrapping must be of sufficient size to completely enclose the Product(s) and must be secured in place.

Protect all parts that are susceptible to damage due to dents, scratches, and scuffing by using an appropriate amount of cushioning material and placing in a sturdy shipping container.

Painted/Finished/Bare/threads and/or machined gasket surfaces must be protected against rust, abrasions, nicks, scratches, dents, etc. Surface protection should be provided to any part which requires the need, by using an appropriate protective material. Pad, cap or cover precision-machined areas of parts, such as threads, fittings and surfaces.

When preparing irregular-shaped parts for shipment, tape or shrink wrap cushioning material securely to help prevent removal during the handling process. Pad all sharp edges, corners, and burrs of parts such as sheet metal or bare metal.

Bags and envelopes may be used as interior containers to protect Products from dust, water or water-vapor, as required. Closure of bags and envelopes (i.e, tape, heat seal, self closing, etc.) shall be sufficient to ensure adequate Product restraint. Do not use staples to close envelopes or bags they can come loose and become FOD.

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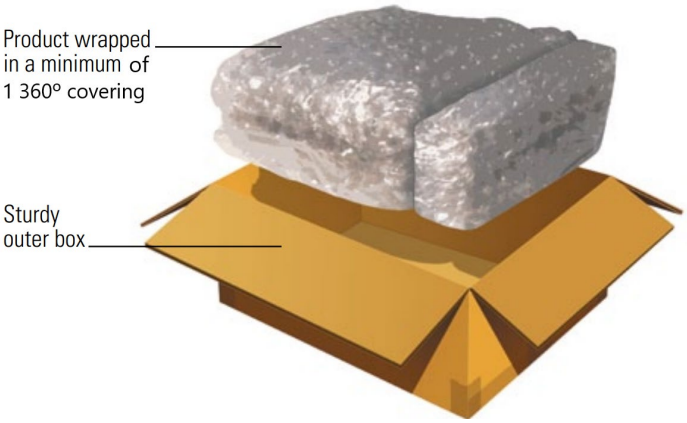
Single Box With Wrapped Item



Box in Box With Air Cellular Cushioning

CUSHIONING, DUNNAGE AND BRACING

Parts should be wrapped, separated or protected from surface to surface contact with each other also and from movement that could damage the finish or cosmetic appearance of the finish.

Cushioning, dunnage, and/or bracing shall be used as required to protect the Products from physical

and mechanical damage during shipping and handling.

A. Cushioning shall meet the following requirements:

(1) Protect the Products from shock, vibration and abrasion.

(2) Control the free movement of the Products within the container when packaging parts, use adequate dunnage such as foam, bubble wrap, paper or other padding material to fill void spaces and prevent movement inside the box.

(3) Convert irregular shaped Products to a configuration which may be supported within a container.

(4) Protect barriers and containers from ruptures by sharp edges or projections.

B. Loose-fill cushioning materials (i.e., Styrofoam peanuts, shredded paper, popcorn, etc.) are prohibited as they can be considered FOD.

C. Newspaper and rags are unacceptable cushioning or dunnage materials.

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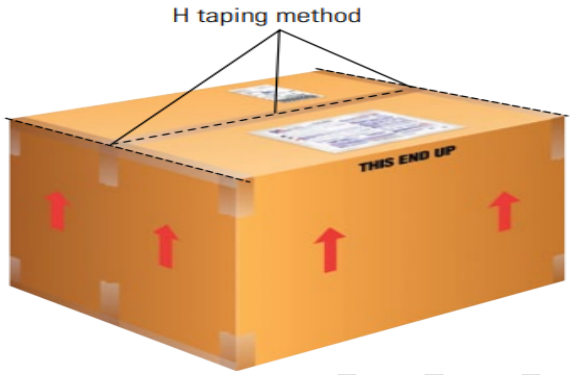
Sealing the Package

- Use pressure-sensitive plastic tape, water-activated paper tape (minimum 27-kg [60-lb.] grade) or water-activated reinforced tape that is at least 5 cm (2") wide.
- Apply tape evenly across flaps and seams to both the top and bottom of the outer box. Use the H taping method.
- Do not use cellophane tape, duct tape, masking tape, string, or rope to seal packages.



Unit Load Containment & Palletization

Metallic Strapping

Use of plastic strapping is encouraged; however, steel strapping is to be used in the case of very heavy components or metal castings with sharp edges.

Plastic Strapping

– Three commonly used plastic strappings are:

Polypropylene which has low break strength, high elongation and good elongation recovery over short periods of time.

Polyester which has high break strength, low elongation and high retained tension over time.

Nylon which is the most expensive plastic strapping with high break strength, high elongation and high elongation recovery.

– Friction sealing is recommended for all non-metallic strapping to effectively allow recycling without potential of metal contamination.

Application Techniques

– Size cartons modularly to the pallet to eliminate voids and minimize shifting of packages on pallets.

– Strapping should be used only in vertical alignment. The use of horizontal banding is a poor packaging practice and may require an upgrade of the corrugated paperboard and/or the addition of corner supports.

– Plastic and metal banding must be applied using proper tension settings. Excessive tension can lead to container failure and poor load containment as well as pallet failure.

– When banding to corrugated cartons, use of corner or edge protectors is recommended to prevent the collapse of carton edges.

Use of Plastic (Stretch) Film for Unitization (techniques Exhibits 18, 19 & 20).

– Use clear (non-tinted), Linear Low-Density Polyethylene (LLDPE) stretch film.

Use of Shrink Film

– Shrink film offers some unique advantages for specific packaging applications and is considered an acceptable material if it provides the essential packaging functions required for the commodity handled.

Proper Alignment and Compression Strength of Corrugated Fiberboard Cartons:

– Pyramid loading of cartons on a pallet is discouraged (Exhibits 21 & 22).

Exhibit 18.

STABILIZATION
TOP BANDING

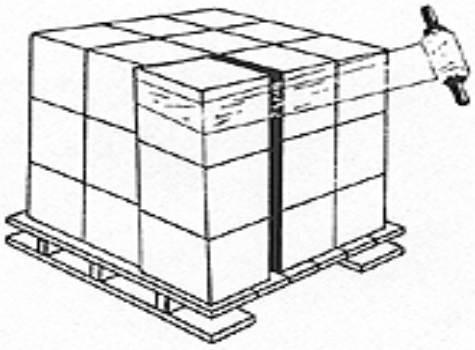


Diagram 1: Slip film between boxes.

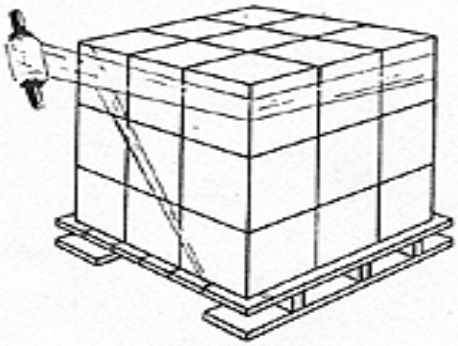


Diagram 2: Tie to pallet and pull film up diagonally.

Method: To anchor the narrow widths either slide the end of the film between two boxes (Diagram 1) or tie it to the pallet and pull the film up diagonally to start top banding (Diagram 2).

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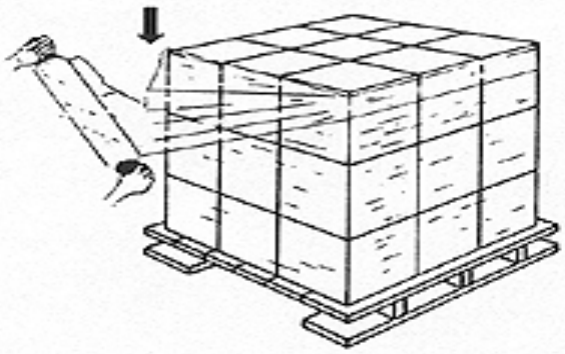


Diagram 3: Squeeze hand brakes when catching film on corner, pull top brake towards floor.

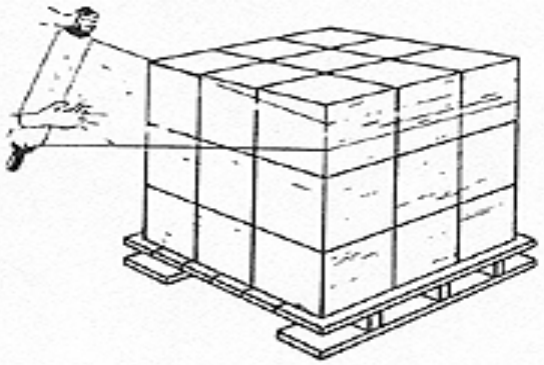
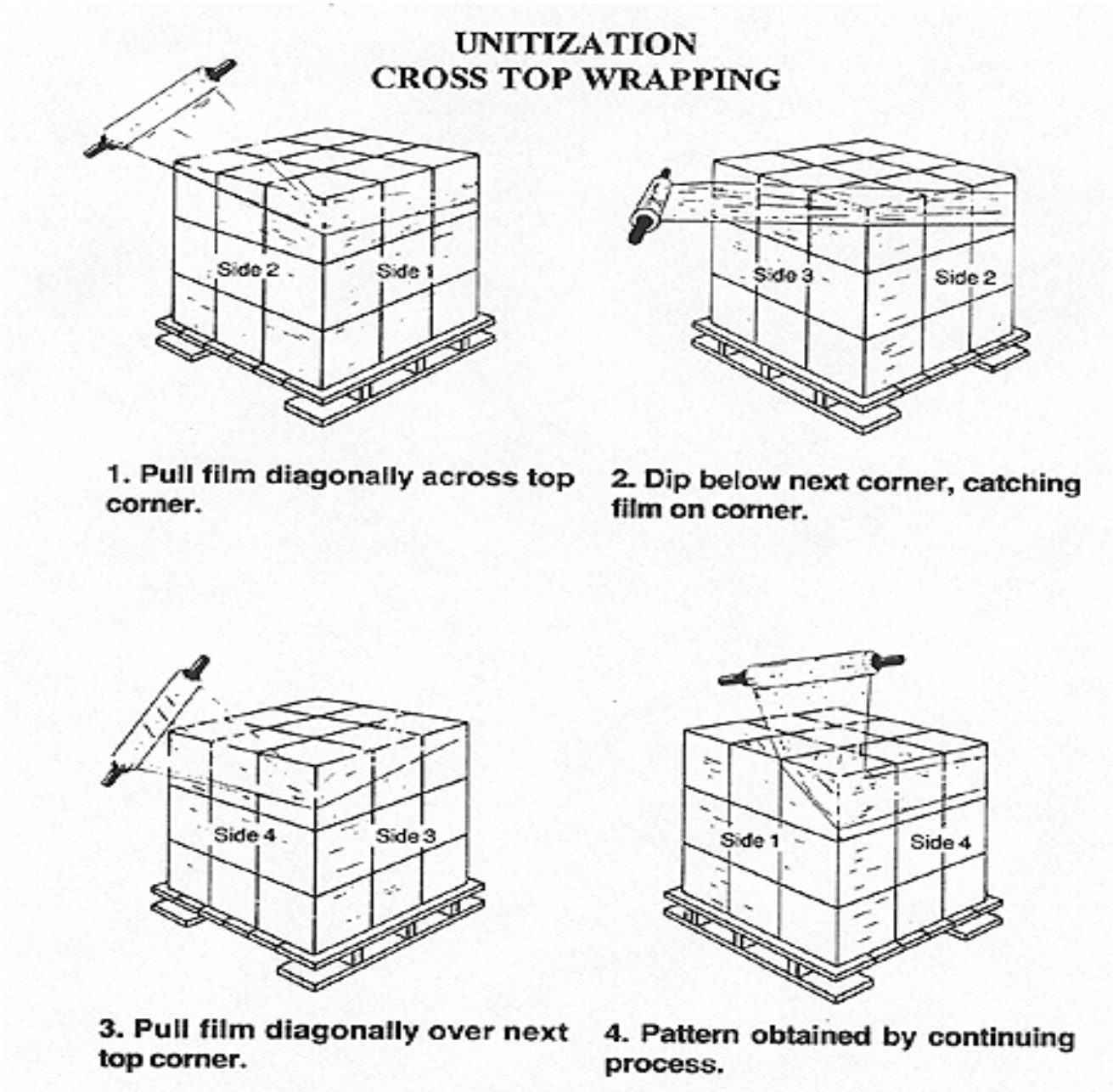


Diagram 4: Poke finger through film.

Method: Pull the film tightly around the upper portion of the pallet creating a tight, secure band of film. End the wrap by catching the film on the corner, pulling the top hand brake towards the floor (Diagram 3) or poke fingers through the film (Diagram 4).

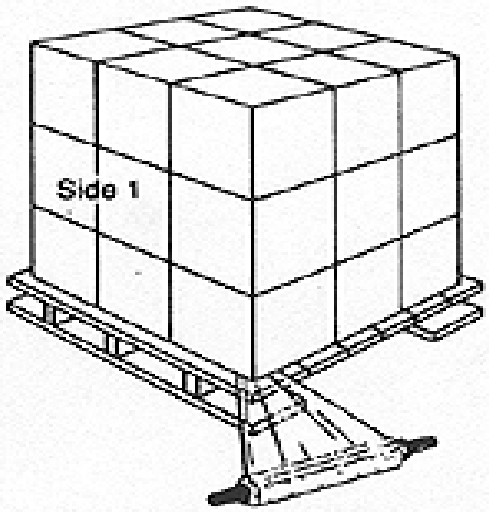
Exhibit 19.



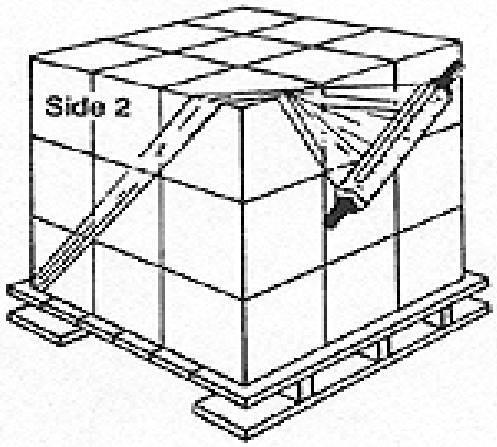
Method: Pull the stretch film diagonally across one top corner of the pallet, holding the hand brake closest to the pallet center higher than the hand brake closest to the floor (Diagram 1). Once pulled diagonally over the top corner, dip the higher hand brake below the next corner Diagram 2). Raise the roll up over the following corner (Diagram 3) and dip it below the next corner. Continue the process – each time moving towards the center of the load until the top is completely wrapped (Diagram 4).

Exhibit 20

UNITIZATION
X-WRAPPING



1. Anchor film to pallet.

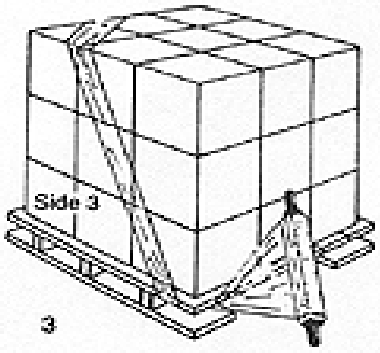


2. Pull roll diagonally up to top of load.

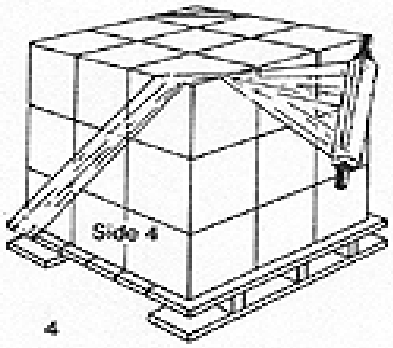
Method: Anchor the stretch film to the bottom of the pallet either by sliding the film between the load and pallet (Diagram 1) or tying it to the deck boards. Then pull the film diagonally up to the top corner of the load (Diagram 2). Double-winged pallets serve this purpose best. Bring the film down and catch it on the diagonal winged pallet corner (Diagram 3). Once the film is caught under the pallet bring it diagonally up to the top of the load (Diagram 4). Then bring the film down diagonally to the next pallet corner (Diagram 5). Repeat this as many times as necessary. To complete the X-pattern on the remaining two corners skip a top corner and take the film across the bottom of the pallet (Diagram 6). After catching the film under the winged pallet, proceed diagonally up to the next top corner (Diagram 7). Continuing this process on the remaining corners forms an X-pattern on the four sides of the pallet, securely holding the load.

Exhibit 20 (continued).

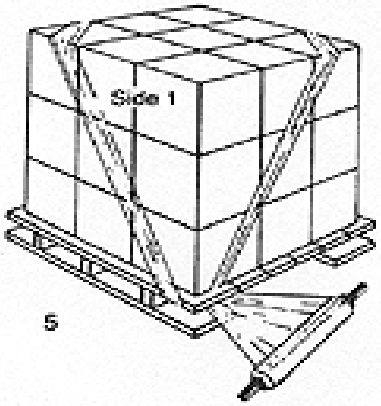
UNITIZATION
X-WRAPPING



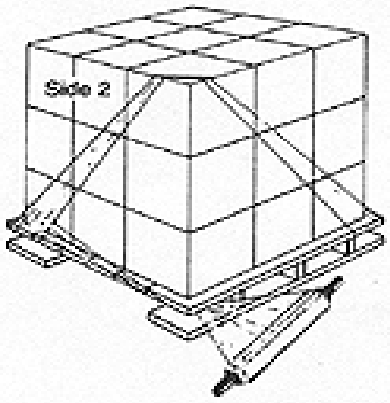
3. Pull roll down and catch on pallet.



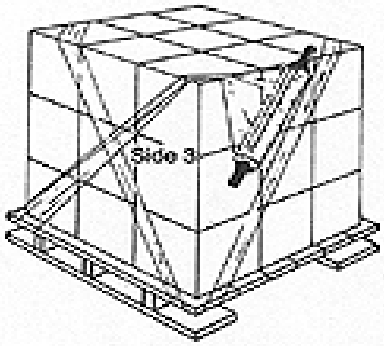
4. Pull roll diagonally up to top of load.



5. Pull roll down and catch on pallet.



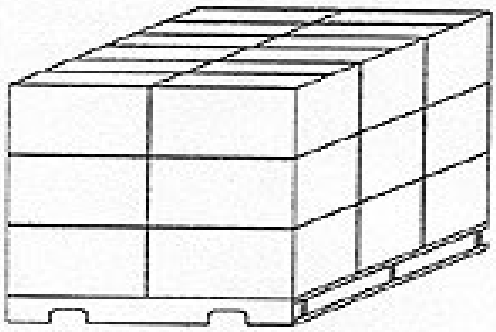
6. Skip going up to top of pallet and go across bottom, catching film on next corner.



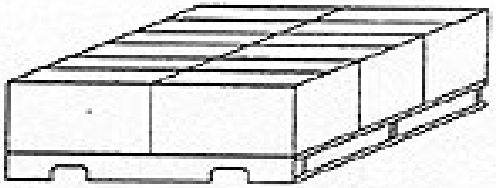
7. Continue the process.

Exhibit 21.

Examples of Properly Palletized Cartons

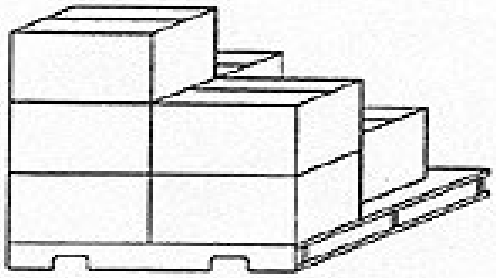


Acceptable

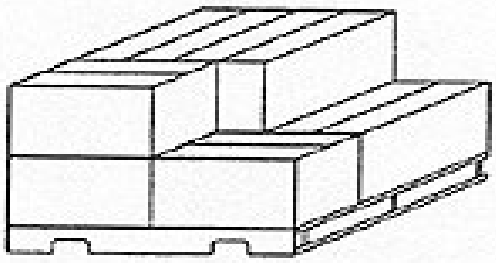


Acceptable

Examples of "Pyramided" Unit Loads



Unacceptable

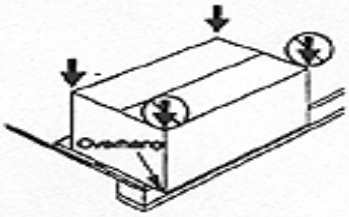


Unacceptable

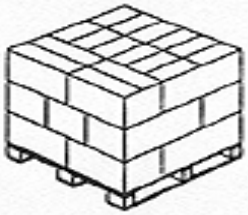
Exhibit 22.

The following examples indicate the potential loss in top to bottom compression strength when corrugated cartons are stacked improperly or under adverse conditions:

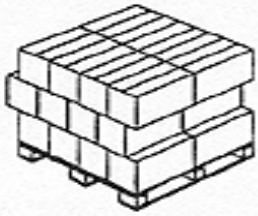
	% Loss in Compression Strength
Pallet/Carton Overhang	Up to 32%



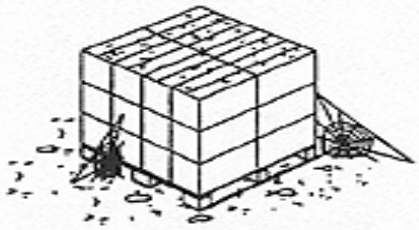
Interlocked Stacking Pattern	Up to 50%



Carton Misalignment	Up to 30%



Long-Term Storage	Up to 50%



High Humidity (90% RH)	Up to 60%