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# Critical properties to consider when unitizing

## Scope

The corrugated industry, their customers, and the end use consumer of packaged products have sought a listing of unitizing techniques which will reduce damage to corrugated containers.

## Safety precautions

There are no safety precautions.

## Content

The purpose of this Technical Information Paper is to outline the critical variables to consider when designing a unit load in a box plant for shipment to a given customer. It's a good idea to design the load ahead of time and review it with the customer so both can agree on the specification which should be developed, used and consistently conformed to. This document is not intended to specify exact configurations and tolerances, but to be used as a checklist of what should be considered when developing mutually agreed to plan for unitizing corrugated.

A listing of variables to consider follows:

- **Unit Size:** It should be arranged such that it can fit in any slot, rack, truck, or pallet and be handled in “normal” manner through a customer’s distribution system. Size is typically 40 x 48 x 50 inches + or - 2 inches. This may vary due to order quantity, customer requirements or blank size.
- **Blank Orientation within Unit:** Should be done such as to promote ease of use by customer, unit stability and minimization of damage to the corrugated blank. (Typically, the blanks may be orientated same way in a columnar, but may be alternated by length and width or inverting bundles to increase column stability.)
- **Bundle Configuration:** When bundles are used for a given carton they are typically strapped. Care must be taken to avoid placing strap across the fully folded body scores of the box as this practice can damage up to 10-30% of cases in bundle.
- **Tie Sheets:** Should be used to stabilize tall narrow stacks which may be unstable. The tie sheets actually tie one stack to another to reduce likelihood of unit falling apart during shipment to customer. The number of tie sheets used will depend on configuration of stacks and ultimately the unit load. Tie sheets may be constructed of old corrugated, slip sheets or Kraft paper sheets.
- **Top / Bottom Caps:** May be used to protect the unit load from straps, pallet deck boards or other cubes placed above it. They may be custom made to fit the unit load or generic to fit a variety of loads. When used in conjunction with Corner Posts, they both provide protection and significantly aid in stabilizing the unit load.
- **Straps:** Typical means used to hold unit load together until customer needs to consume it. Usually strap is either polyethylene or steel. Closure is accomplished by heat sealing poly strap or clamping steel with a separate clip. Size of strap is variable depending on type of strap application equipment. The application of strap through automated equipment can make or break the integrity of the unit and have a significant effect on the level of damage to the corrugated boxes in it. Too much pressure and tension and can damage corrugated , reduce combined board caliper, and top-to-bottom compression strength Too little pressure and tension will render the unit integrity unstable and difficult to handle.

*TIP Category: Automatically Periodically Reviewed (Ten-year review)*

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- **Dunnage:** Pieces of scrap corrugated which may be used in place of Corner Posts, Top/Bottom Caps, and to fill void(s) in unit loading. They will provide protection and aid in stabilizing the unit load. It is essential that double and in some cases, triple thicknesses of dunnage are utilized between corrugated blanks and the strap(s). If not, the pressure on the strap under tension will damage a number of blanks both at the top and bottom edges of the unit load.

**Keywords**

Unitized handling, Boxes, Corrugated boards, Strapping

**Additional information**

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