

# Appendix H: Glossary

## **Allowable Slack in the Case**

Additional space added to the inside dimensions of a shipcase to make loading easier. Many designers provide a minimum of 0.125" of slack in the length and width of a shipcase to allow for manufacturing tolerances. In most cases, designers specify zero slack in the shipcase depth so the flaps close directly on the cartons.

## **Amount of Printing**

The stacking strength of a shipcase is affected by the amount of printing on the shipcase. The printing operation not only crushes the combined board, but also saturates the fibers of the shipcase enough to reduce the amount of stacking strength.

## **Area Efficiency Percentage**

TOPS Pro calculates the area efficiency of a pallet pattern by multiplying the number of cases per layer times the area of the shipcase face bearing against the pallet surface. TOPS Pro divides this value by the area of the pallet. The resulting value is a percentage.

## **Calculation Method**

TOPS Pro uses the widely accepted McKee formula to calculate stacking strength. For the ring crush factor (RCF) method, TOPS Pro modifies the McKee formula slightly to transpose from RCF values to edge crush factor (ECF) values. If you need the exact formula, please contact TOPS Technical Support. It's relatively easy to insert other formulas in order to customize your specific application.

## **Carton Arrangement**

The carton arrangement is displayed in the graphic output. For example, "2D 3L 3W" is interpreted as follows:

- ❖ In the length of the shipcase, there are two depths of the carton.
- ❖ In the width of the shipcase, there are three lengths of the carton.
- ❖ In the depth of the shipcase, there are three widths of the carton.

### **Cartons per Load**

Main solution reports are ranked by the cartons (primary package) per load (pallet load). This value is calculated by multiplying the case count by the best number of cases per pallet load found in the analysis for the particular arrangement and carton size.

### **Case Cube**

TOPS Pro calculates the shipcase cube – in cubic feet or cubic meters – and uses this value in output reports for warehouse/transit needs. Case cube is based on outside shipcase dimensions.

### **Case Depth**

The opening-to-opening dimension of the shipcase.

### **Case Dimensions**

This field allows you to specify which shipcase dimension is the vertical dimension for loading onto a pallet. For maximum stacking strength, the shipcase depth is usually the dimension used as the vertical dimension. If you select more than one dimension as the vertical dimension, TOPS Pro will allow you to perform a multi-dimensional pallet loading analysis.

### **Case Largest Allowable**

This value allows you to filter out shipcase sizes that are not reasonable in shape; for example, case length is four times its width. As a rule of thumb, enter the largest allowable dimension. If in doubt, use a very large number.

### **Case Length**

The longer of the two non-depth dimensions of the shipcase. See Case Depth.

### **Case Smallest Allowable**

This value allows you to filter out shipcase sizes that are not reasonable in shape; for example, case length is four times its width. As a rule of thumb, enter the smallest allowable dimension. If in doubt, use a very small number.

### **Case Stacking Strength**

The previously calculated at-lab-compression value for the shipcase is further adjusted for humidity, palletizing, storage and miscellaneous construction factors. This value is the predicted amount of stacking strength for the shipcase. Under the conditions specified, the shipcase will fail at or near this value.

### **Case Style**

The shipcase style dictates how TOPS Pro calculates the conversion from inside case dimensions to outside case dimensions. The specific case style selected dictates how many corrugated wall thicknesses to add to the shipcase length, width and depth dimensions.

### **Case Weight**

The actual weight of the shipcase – either pounds or kilograms – after it's loaded with product.

### **Case Width**

The shorter of the two non-depth dimensions of the shipcase. (See Case Depth.)

### **Cases per Layer**

The number of cases on a single layer of the pallet. Layers are sometimes referred to as "tiers" on a pallet load.

### **Clampable**

Many pallet loads are squeezed from the sides of the load for handling within the transit system. TOPS Pro automatically calculates whether a pallet load is clampable by reviewing the pallet pattern voids. The amount of void cannot exceed 0.5 inches. Printed reports also indicate if the load is clampable in the unit load length or unit load width dimensions.

**Note:** All loads are subject to in-the-field verification.

## Conditions

You can specify the conditions to which a shipcase is exposed. The value selected – average or severe – correlates directly with the safety factor selected – calculated or predetermined. If TOPS Pro calculates the safety factor, which is usually the case, TOPS Pro will ignore any manual conditions entries when it calculates stacking strength.

## Cubic Efficiency Percentage

TOPS Pro calculates cubic efficiency by multiplying the individual case cube by the number of shipcases per unit load, then divides this value by the available cube of the unit load. The available cube of the unit load is the pallet length times the pallet width times the usable unit load height (unit load height minus the pallet height itself).

## Double Stack

A diagram of two pallets stacked on top of one another. TOPS Pro provides this view to show where the bottom boards of the second pallet bear against the top surface of the bottom pallet load. This view also graphically shows how to correctly place a top load.

## End-to-End

The predicted stacking strength of a shipcase with the length of the case vertical to pallet surface. This value is expressed in pounds or kilograms.

## Flap Gaps

Early laboratory analysis determined that the amount of "squareness" of a shipcase affects its stacking strength. When the shipcase is closed, you can specify the amount of differential between the minor flaps and major flaps of the shipcase.

## Flute Construction

TOPS Pro uses this value to apply the actual corrugated wall thickness to the case style selected in calculating inside-to-outside shipcase dimensions. TOPS Pro uses the following flute construction values:

- ❖ A flute: 0.188 inch
- ❖ B flute: 0.125 inch
- ❖ C flute: 0.157 inch
- ❖ BC flute: 0.267 inch
- ❖ CA flute: 0.267 inch
- ❖ E flute: 0.072 inch

### **Front View**

The view of the pallet load from the side with the length of the unit load being left to right.

### **General Case Size**

The arrangement report shows this value to indicate the approximate shipcase size that results if a specific carton arrangement is selected.

### **Humidity Percentage RH**

Exposure to relative humidity is one of the most damaging factors to the stacking strength of a shipcase. Enter the maximum amount of relative humidity a shipcase is expected to experience during its transit and storage.

### **I.D.**

The inside dimensions of the shipcase or carton.

### **Interior Partition Code**

Stacking strength calculations include 31 various partition styles that influence the overall strength of the system. You can enter a code that will automatically adjust the stacking strength of the overall system (shipcase).

### **Interlocking Layers**

Many times, TOPS Pro rotates alternating layers of a unit load 180 degrees – the axis rotation varies – to produce a unit load that ties together better. While this produces a more easily transportable load, it does reduce the stacking strength of the load.

### **Lab Compression**

The lab compression value for stacking strength is the calculated failure point of a shipcase at ideal conditions. This value is derived from ECT or RCF values, box perimeter and caliper of the combined board. TOPS Pro then adjusts this raw number for the flute direction, print, shape and length-to-width factors. The final calculation becomes the basis of further calculations that involve user-specified environmental factors.

### **Layers per Pallet**

In combination with the calculation of maximum number of cases per layer (tier), TOPS Pro calculates the most number of layers (tiers) that the load can dimensionally support given the maximum usable load height and weight of the unit load.

### **Length Flip**

The rotation of the pallet pattern with the length axis of the pallet; for example, 48 inches. The successive layers are mirror images of the previous layer's pattern across the length axis of the pallet.

### **Length and Width Flip**

This double combination flip of successive layers is a length flip and width flip pattern executed simultaneously.

**Note:** A double flip of a symmetrical pinwheel pattern reverts to a columnar stack.

### **Maximum Case Weight**

TOPS Pro uses this value to specify a maximum filled case weight, which enables the system to find the best arrangement solution without creating a design that is too heavy to lift.

### **Maximum Dimension**

The maximum dimension that TOPS Pro will consider when it calculates solutions for an analysis. TOPS Pro uses this value as the ending dimension in the varying of the primary carton size. TOPS Pro automatically increments this value by 1/32 inch (1 millimeter) until it reaches the maximum dimension in the analysis. You can control this increment; call TOPS Technical Support for details.

### **Maximum Loads High**

The break-even point for how many pallet loads can be stacked in the warehouse without causing a safety problem regarding stacking strength. This value determines the number of pallet loads that can be safely stacked in the warehouse.

**Note:** The bottom pallet is counted as the first pallet.

### **Minimum Dimension**

The minimum dimension that TOPS Pro will consider when it calculates solutions for an analysis. TOPS Pro uses this value as the starting dimension in the varying of the primary carton size. TOPS Pro automatically increments this value by 1/32 inch (1 millimeter) until it reaches the minimum dimension in the analysis. You can control this increment; call TOPS Technical Support for details.

### **Mullen Burst**

A measure of tearing resistance.

### **Normal Loading Analysis**

Most pallet loads fall under this description. "Normal loading" means that the same shipcase dimension is vertical to the loading surface. Therefore, TOPS Pro calculates solutions in which the shipcase depth (or width or length) is vertical to loading in all layers. If the vertical dimension of the shipcase varies, there would be no mixing of different layers.

### **Number of Safe Loads**

The break-even point where the fractional number of pallet loads high equals the resulting maximum load that can be experienced by a shipcase on the bottom pallet, bottom layer.

### **O.D.**

The outside dimensions of the shipcase or carton.

### **Pallet Overhang**

The differential between the finished unit load dimensions and the respective pallet dimension. For example, after TOPS Pro calculates a solution, if the unit load dimensions are 49.5 inches and respective pallet dimension is 48 inches, then the pallet overhang is 1.5 inches (total) or 0.75 inch on each side of the pallet (with a centered load).

### **Pallets per Warehouse**

When TOPS Pro calculates stacking strength for a shipcase, the system uses this user-specified value as the basis to calculate how much weight is above the bottom case, bottom layer of the bottom pallet in the specified warehouse stack. This value rarely exceeds four pallet loads high.

**Pallet Size – Height**

The height of the pallet itself. For example, a common pallet in the U.S. market is the standard Grocery Manufacturers Association (GMA) pallet at five to six inches in height.

**Pallet Size – Length**

The length of the pallet itself. For example, a common pallet in the U.S. market is the standard Grocery Manufacturers Association (GMA) pallet at 48 inches in length.

**Pallet Size – Weight**

The weight of the pallet itself. For example, a common pallet in the U.S. market is the standard Grocery Manufacturers Association (GMA) pallet at 65 pounds.

**Pallet Size – Width**

The width of the pallet itself. For example, a common pallet in the U.S. market is the standard Grocery Manufacturers Association (GMA) pallet at 40 inches in width.

**Pallet Type**

Many styles of pallets are used around the world. For the purpose of calculating stacking strength, TOPS Pro makes several pallet types available. You can specify the "full surface" pallet, which is similar to slipsheets or plywood pallets. For medium pallet board spacing, specify the GMA pallet. For wide board spacing, specify the non-standard GMA pallet.

**Pattern Number**

When TOPS Pro calculates solutions to find pallet patterns, the system assigns an order to the answers it finds. These answers are ranked by efficiency. This number is also used to specify which pattern is to be displayed.

## **Pattern Type**

TOPS Pro assigns a name to pallet pattern types to assist in visualizing the basic pattern. TOPS Pro assigns the following pattern names:

- ❖ C: 1-block or column
- ❖ B: 2-block, interblock or bi-block
- ❖ T: 3-block or tri-block
- ❖ W: 4-block or pinwheel
- ❖ P: 5-block or pentablock
- ❖ Q: 5-block plus or pentablock
- ❖ D: Diagonal
- ❖ Z: Multi-layer or multi-dimension
- ❖ O: Multi-surface
- ❖ R: Repeater
- ❖ S: Soldiered
- ❖ N: Staggered

## **Percentage of Required Strength**

The comparison of calculated stacking strength of the shipcase, under the conditions specified, to the weight above the bottom case, bottom layer, bottom pallet load of the warehouse stack. Look for values greater than 100 percent to assure a strong, stable pallet load/warehouse stack.

## **Primary Package**

Usually the carton or packaging material that comes into contact with the product itself. Other names for a primary package are bottle, tray, packer, etc.

## **Printing Type**

The type of printing – Flexo or Quickset/Oil – has an effect on the stacking strength of a shipcase. TOPS Pro allows you to specify the type of printing. This correction factor is usually minor to overall stacking strength.

## **Product Code**

This field allows you to enter specific product code information or any other information that will appear on selected printouts. This field will accept up to 35 characters.

### **Product Support per Case**

The added strength provided by a product packaged inside the shipcase. This value is entered as the total weight that the product inside the shipcase (on the whole case basis) can handle. The value is added to the total stacking strength of the shipcase and is not reduced by factors such as humidity, storage, overhang, etc.

### **Range of Case Counts**

This field indicates a minimum and maximum shipcase count to be reviewed. For example, if a minimum of 12 case count and maximum of 24 case count is selected as the range, TOPS Pro will review all case counts between 12 and 24; that is, 12, 13, 14 ... 22, 23, 24.

### **Required Strength**

This value represents the comparison of the shipcase stacking strength to the actual load that a shipcase will experience on the bottom layer of the bottom pallet load. A value greater than 100 percent means the shipcase stacking strength is greater than the actual load it is experiencing.

### **Reversed Plan View**

The pallet pattern viewed from the perspective of being directly above the pallet load, but with the layer rotated to represent the next layer arrangement to be used for good stability.

### **Safety Factor (Calculated)**

This value is calculated by dividing the at lab compression strength by the actual weight experienced by the bottom shipcase, bottom layer, bottom pallet load. The resulting value has no dimension in nature, but is used throughout the corrugated industry as a good rule of thumb to predict the integrity of a shipcase.

### **Safety Factor (Data Input)**

An early method of predicting shipcase performance was to specify a safety factor. Simply stated, the safety factor is the ideal compressive strength of a shipcase (at ideal conditions of humidity, storage, etc.) divided by the actual load to which the shipcase will be exposed during its life. TOPS Pro can be configured to accept a predetermined safety factor or actually calculate the resulting safety factor for each board grade combination.

### **Secondary Package**

Usually refers to the shipcase. It generally applies that a secondary package is the item used to overwrap/package the primary package.

### **Select Carton Style**

The carton style is used in an analysis so that the carton blank size can be calculated and related to total material costs for the particular solution.

### **Select Measure Unit**

The unit measure (English or metric) to be used for input and output values in the TOPS Pro software.

### **Side View**

The view of the pallet load from the perspective of the viewer who sees the load from the side, with the width of the unit load being left to right.

### **Side-to-Side**

The predicted stacking strength of a shipcase with the width of the case vertical to pallet surface. This value is expressed in pounds or kilograms.

### **Single Stack**

A diagram of only one pallet load standing by itself.

### **Single/Double Wall**

When you select "S" or "D," TOPS Pro converts inside-to-outside case dimensions based on single- or double-wall board construction.

### **Soldiering Analysis**

A highly specialized type of pallet loading. A soldiered load occurs only when the shipcase length and width are exactly equal; that is, a square footprint. The loading procedure attempts to find the most cubic-efficient pallet load where the shipcase can be slipped down between the pallet seams on its edge to provide a better pattern. Not all cases with a square footprint can be soldiered.

### **Specific Case Counts**

This question allows you to select specific case counts desired. You can enter up to three specific case counts to be reviewed. If three values are already entered, simply type over the existing case counts requested or type in zero (0) to void a case count to be reviewed.

### **Storage Time**

An estimate of the total time the shipcase will be stored in the distribution network. A storage time of 60 days is usually a good value.

### **Tiers per Flat Stack**

The number of upright layers in the pallet pattern. This value appears only in the soldiering calculations. These cases are loaded on the pallet with the case depth dimension vertical.

### **Tiers per Soldiers**

The number of soldiered layers in the pallet pattern. This value appears only in the soldiering calculations. These cases are loaded on the pallet with the case width/length dimension vertical.

### **Top Plan View**

The pallet pattern viewed from the perspective of being directly above the pallet load with the length of the unit load left to right.

### **Top-to-Bottom**

The predicted stacking strength of a shipcase with the depth of the shipcase vertical to the pallet surface. This value is expressed in pounds or kilograms.

### **Truck Width (in/m)**

The inside clearance dimensions of the transit vehicle's width. This value is expressed in inches or meters.

### **Unit Load Cube**

A complex calculation of finished load dimensions. Basically, the unit load cube (cubic feet or cubic meters) is the pallet load dimension (length by width) times the finished load height. If the pallet load does not exceed the pallet dimensions, then the pallet dimensions are used in the calculation instead of the unit load dimensions.

### **Unit Load Height**

The overall height that a unit load can reach. For example, most transit vehicles allow for approximately 108-110 inches of vertical clearance height. Therefore, a good unit load height would not exceed 54 inches (for a double stack in the trailer).

### **Unit Load Length**

The length of the pallet plus any allowable overhang. For example, if the pallet length is 48 inches and there is one inch of overhang allowed on each side of the pallet, the unit load length would be 50 inches.

### **Unit Load Loading**

A type of trailer loading allowed in the TOPS Pro software. The algorithm will find the best patterns available for loading a pallet/unit load into a rectangular space (the transit vehicle, sea container, etc.).

### **Unit Load Statistics**

After calculating the pallet patterns, TOPS Pro shows the finished unit load dimensions. These values are the maximum values of the unit load length, width, height (including the pallet itself) and weight.

### **Unit Load Weight**

The maximum allowed weight (pounds or kilograms) of a completely loaded pallet. TOPS Pro will filter out all solutions that exceed the maximum allowed weight.

### **Unit Load Width**

The width of the pallet plus any allowable overhang. For example, if the pallet width is 40 inches and there is one inch of overhang allowed on each side of the pallet, the unit load width would be 42 inches.

### **Width Flip**

The rotation of the pallet pattern with the width axis of the pallet; for example, 40 inches. The successive layers are mirror images of the previous layer's pattern across the width axis of the pallet.

