PDS VERSION 5.3

MAJOR ENHANCEMENTS IN VERSION 5.3

The release of Pallet Design System™ V5.3© provides the most **advanced structural analysis** for **wood pallets** in its 33-year history. Below are some major advancements in V5.3 with more details inside:

- Safe Maximum Loads in all support conditions now consider strength of **Connections**.
- Safe Maximum Loads now consider **Compression** strength.
- Remanufactured pallets with **Recycled Notched Stringers** can now be analyzed.
- Pallets with **Strapping Slots** can now be analyzed.
- An advanced Quantitative Analysis for **Lateral Collapse Resistance** during transit.
- Automated calculation of stacking patterns OR **custom positioning of individual containers** by User.

PALLET DESIGN HELP 24/7

A comprehensive **PDS User's Guide** is built into the software program to help answer questions 24/7 regarding pallet design. It is readily available and accessible from the **Opening Window Start Dialog,** through the **Help** menu, and at the **bottom left of every window** within the design wizard. PDS Users can also search this valuable resource to learn more about pallet design from a variety of topics.

PDS GOES GLOBAL IN 2018

Taking steps to expand the global reach of the Pallet Design System™, the NWPCA staff is now working on additional language capabilities for PDS. In early 2018, PDS Users can expect to see **"PDS Printouts"** (Pallet Specification Sheet, Analysis Results, Unit Load Specification, Production Order, and Drawings) in any of 5 languages: English, Spanish, French, Italian and German.

By late 2018, the entire "PDS software" will convert into any of the 5 languages. The PDS User will have the ability to select which of the 5 languages should be used for the User Interface, and a version of PDS in that language will be installed. Until the full conversion is complete, English remains the primary language for the **User Interface**. Regardless of which language is preferred and selected by the User for the User Interface, the "PDS Printouts" will be available in any of 5 languages (at the click of a button).

National Wooden Pallet & Container Association
Pallets Move the World®

Pallet Design System™
with LoadSync

ADVANCES IN STRUCTURAL ANALYSIS MODELING

PDS V5.3 provides the most advanced structural analysis for wood pallets in the 33-year history of PDS.

The NWPCA's engineering staff has significantly advanced the "finite element analysis" (FEA) models previously developed for PDS V5.0 (released in February 2012). A new "mathematical solution", which is much faster and more efficient than used in previous versions, now allows a far more complex analysis of the behavior of wood pallet structures under any load and support condition. This includes conducting iterative analyses – as appropriate - to more accurately evaluate the stiffness and change in deflected shape – and thus forces on pallet components and connections under load.

Safe Maximum Loads in all support conditions now consider the strength of each and every connection in the pallet.

PDS has always considered the exact fastener specifications and number of fasteners per connection. The resulting stiffness of the connections and the effect on pallet performance when racked or stacked or handled by forklift were always part of the **PDS structural analysis**. A significant advancement is that V5.3 will now identify when the stress on a connection exceeds either the fastener **withdrawal** or **lateral** resistance.

The **Critical Member** column in the **Pallet Structural Analysis** is now labeled **Critical Member or Connection**. If a particular connection is what limits the predicted **Safe Maximum Load** for a particular **Support Condition**, it will be identified here. This information enables the pallet designer to increase the safe load for the pallet design, if desired, by increasing the number of fasteners in that connection, or using a fastener with greater withdrawal and/or lateral resistance.

PALLET DESIGN SYSTEM Version 5.3
Pallet Structural Analysis

Pallet ID: Critical Connections Example

| Support Condition		Safe Maximum Load	Deflection at Maximum Load	Critical Member or Connection
Side View	End View			
Racked Across Length 2 Beam Support — Span = 44.00		1106 lbs.	0.51 in.	Butted Board to Block (Lateral)
Forklift Support Enter and Lift from Pallet End — 42.00, 4.00, 23.00		436 lbs.	0.06 in.	TD Interiorbd to Stringerboard (Withdrawal)

Shank Withdrawal Resistance, **Head Pull-thru Resistance**, and **Lateral Load at Yield** are calculated using the equations detailed in Annex F of the *Uniform Standard for Wood Pallets.* Users are reminded that in 2014, NWPCA released FastenerSync™: *Software for Fastener Suppliers, Integrated with the Pallet Design System™.* FastenerSync™ allows complete specification of a fastener, and then computes the withdrawal resistance and lateral resistance of the fastener in a pallet connection. FastenerSync™ can also be used to create fastener specification data files directly readable by PDS – allowing fastener suppliers to easily provide specifications for their fasteners to customers that use PDS. Complete information on use of and obtaining FastenerSync™ is available at PalletCentral.com/PDSFastenersync.

PDS Safe Maximum Loads now consider **Compression** strength (as well as **Bending** strength, **Shear** strength, and **Connection** strength). While compression stress is rarely what limits the safe load for pallets under typical load and support conditions, it absolutely does for some designs and loads. This safety check on compression stress will become much more important in future versions of PDS that will allow specification and analysis of very heavy, rigid loads (such as steel coils).

The advances in the V5.3 structural analysis are the next step forward in NWPCA's multi-year plan for research and development, and the continuing evolution of PDS from a pallet design tool to a design and engineering tool for the entire unit load.

## ADVANCED MODELING OF LATERAL COLLAPSE RESISTANCE

An advanced "**Transit G-force** Analysis" for **Lateral Collapse Resistance** (**LCR**) is now available (for stringer-class pallets). This is provided as an option: the previous "General Analysis" (which indicates Low, Medium, Good, or Excellent resistance) is still available. Users can select which **LCR** analysis option they prefer on the **Service Environment** dialog.
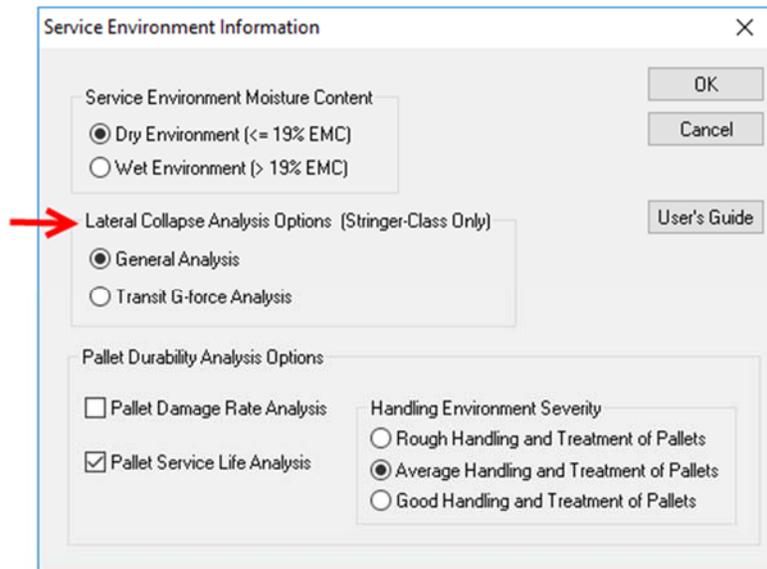
Both analysis options use a new, advanced **FEA** model to evaluate **Lateral Collapse Resistance**. This model better evaluates the effect of top deck stiffness on the **lateral** and **withdrawal** loads on connections, and thus resistance to lateral collapse. While Users will likely see relatively small changes in the **General Analysis** results for most pallets, designs with low stiffness top decks and minimal fastener specs or number of fasteners may see a significant decrease in predicted resistance.
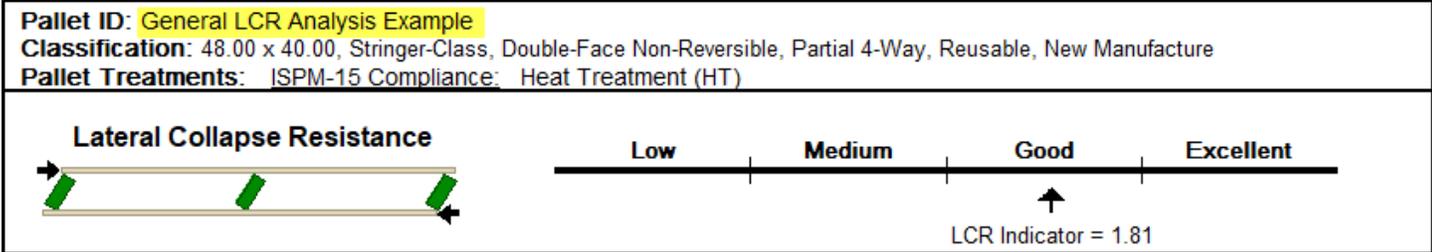
The "**Transit G-force** Analysis" *explicitly* considers the particular load specified by the User (Full Uniform Load, Partial Uniform Load, Line Loads, or Concentrated Loads) and how that load affects the top deck and stress on connections when a **horizontal force** is simultaneously applied. The analysis provides a scale comparing **Horizontal Acceleration** (in units of G-force) vs. the **Vertical Load** supported by the pallet.
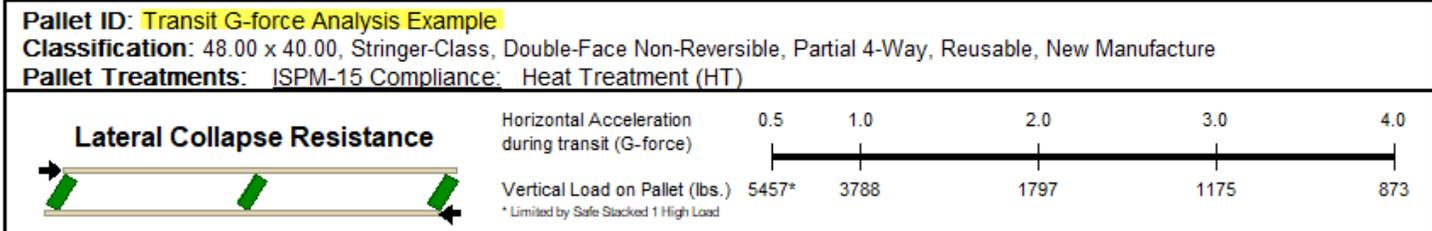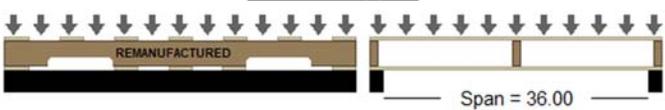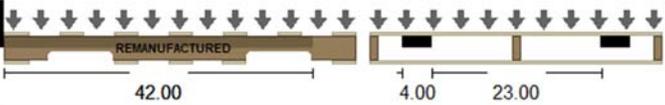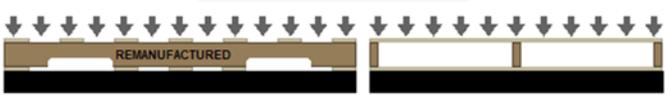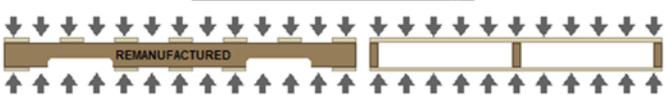

More information and recommendations are provided in the **PDS User's Guide** (under the topic **Lateral Collapse Resistance**).

ANALYSIS OF PALLETS WITH RECYCLED NOTCHED STRINGERS

Remanufactured pallets with **Recycled Notched Stringers** can now be analyzed in PDS. Safe Maximum Loads when Stacked, Racked Across Width, and handled by forklift are now provided (all except Racked Across Length and 4 Corner support).

PDS does not attempt to predict a Safe Maximum Load if a recycled notched stringer is the **Critical Member**. This is because notch geometry is so influential on notched stringer strength, and it is not practical to sort recycled notched stringers based on specific notch geometry.
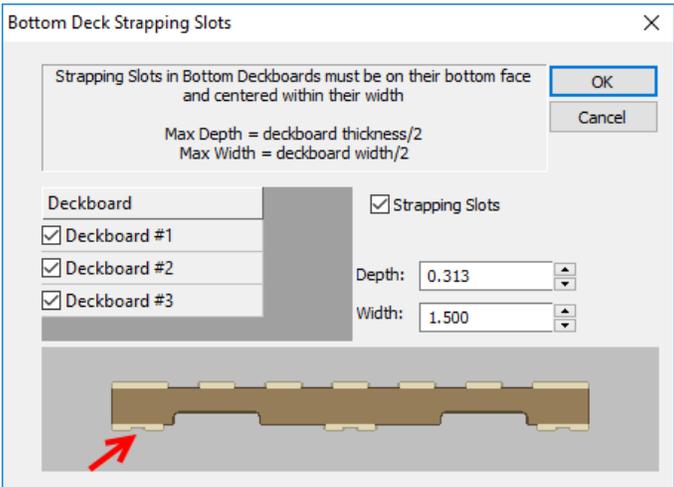
PALLET DESIGN SYSTEM Version 5.3
Pallet Structural Analysis

Support Condition Side View End View	Safe Maximum Load	Deflection at Maximum Load	Critical Member or Connection
Racked Across Width **2 Beam Support** REMANUFACTURED Span = 36.00	825 lbs.	0.46 in.	Interior Bottom Deckboard
Forklift Support **Enter and Lift from Pallet End** REMANUFACTURED 42.00 4.00 23.00	1386 lbs.	0.28 in.	Interior Top Deckboard
Warehouse Storage **Stacked 1 Unit Load High** REMANUFACTURED	2564 lbs.	0.13 in.	Interior Top Deckboard
Stacked 3 Unit Loads High REMANUFACTURED	1315 lbs. per pallet	0.13 in.	Interior Top Deckboard

ANALYSIS OF PALLETS WITH STRAPPING SLOTS

Pallets with **Strapping Slots** (which could previously be specified and included on drawings) can now be analyzed. The effect of the slot on component strength is considered in the structural analysis and thus Safe Maximum Load for any load and support condition.

Special Manufacturing Features ▶
- Strapping Slots - Bottom Deckboards
- Strapping Slots - Stringers
- Strapping Slots - Top Deckboards
- Strapping Slots - Top Stringerboards

Bottom Deck Strapping Slots ✕

Strapping Slots in Bottom Deckboards must be on their bottom face and centered within their width

Max Depth = deckboard thickness/2
Max Width = deckboard width/2

OK   Cancel

Deckboard   ☑ Strapping Slots
- ☑ Deckboard #1
- ☑ Deckboard #2   Depth: 0.313
- ☑ Deckboard #3   Width: 1.500

CUSTOMIZED STACKING PATTERNS FOR CONTAINERS

PDS Users have the option to completely specify the entire **Unit Load** (pallet, containers on pallet, and load stabilizers). Based on the pallet footprint and container size, PDS automatically calculates most of the potential stacking patterns for a layer of containers on pallet.

PDS V5.3 adds the ability for custom positioning of individual containers by Users. Click on the **Customize Stacking Pattern** button, then click add (or delete) to increase (or decrease) the number of containers per layer. Individual containers can be positioned either by using the mouse or by entering the exact location in the Position grid. Users can also start by selecting one of the calculated stacking patterns, and then customize the positions. Orientation of rectangular containers can also be changed in the Position grid. PDS will check for and not allow overlapping positions of containers.
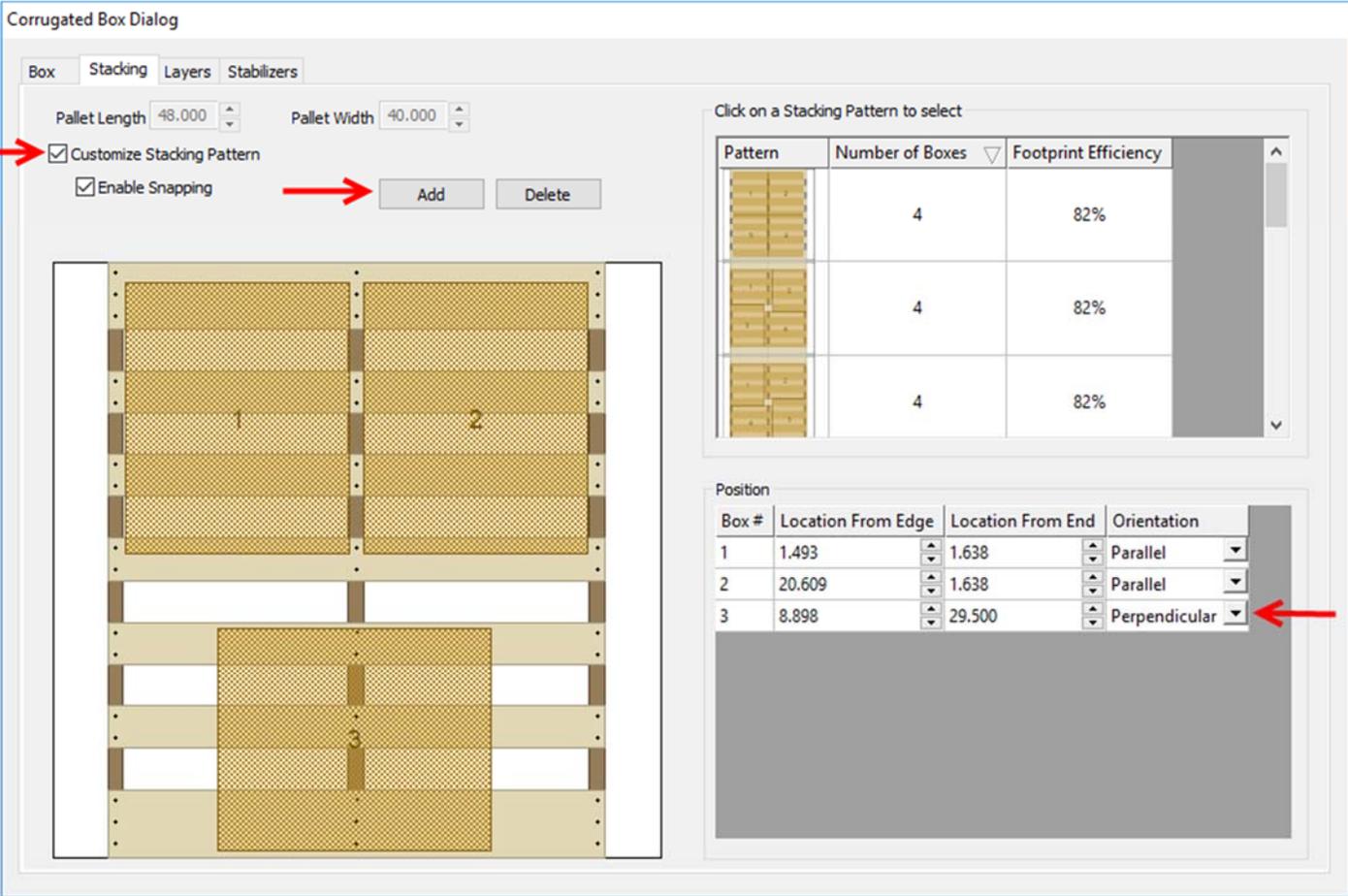
Stay updated on the Pallet Design System™ by opting-in on NWPCA email communications for *"PDS News."* If you need additional support assistance, contact 703-519-6104 or visit www.PalletDesignSystem.com.