

## ABS C-LASH

Securing containers safely is becoming a more complex endeavor given the challenges introduced by larger ships, higher container stacks, flexible bridges and increased stack weights.

To address these complexities, ABS has developed a new, nonlinear analysis procedure that is based on rigorous analytical models and represents a significant improvement to the current formulas for container securing.

ABS C-LASH™ is a software program that offers a step-change in container lashing calculations, incorporating a fully nonlinear approach to accommodate nonlinear effects introduced by lashing rods, twist-lock gaps, container racking deflections and container stack displacements.

The formulas that create the foundation of ABS C-LASH represent a significant upgrade from the equations used in traditional linear analysis.

These new formulas are designed to evaluate mixed, external and internal lashings at multiple tiers and multiple lashing points, twist-lock gaps in both vertical and horizontal directions and the effect of lashing bridge flexibility.

### HELPING SOLVE NEW CHALLENGES

ABS C-LASH software helps users better understand the distribution of loads in a complex system. The new set of nonlinear equations help to solve a container stack problem while accounting for variables that include:

- Multiple lashing arrangements at any tier and point
- Mixed, internal and external lashing configurations
- Nonlinear lashing rod characteristics
- Vertical and horizontal twist-lock gaps
- Nonlinear geometric effects due to racking deformations and twist-lock gaps

### PROVIDING MAXIMUM FLEXIBILITY TO USERS

ABS C-LASH uses the latest rule acceleration values to calculate the stack loads, or allows the user to manually specify loads.

Users can define the container stack size and location, container racking stiffness, vertical and horizontal twist-lock gaps, lashing rod properties and connections at container corners and lashing bridge stiffness or displacement. Inputs are specified separately for each tier, providing the user with maximum flexibility in the analysis.

### USER-FRIENDLY INTERFACE AND DISPLAYS

ABS C-LASH results are displayed in a graphical, tabular and textual manner. Graphical displays will show stacks in their un-deformed state with container weights, as well as their deformed state with lashing rod and other forces after maximum external loads are applied.



Special color-coded displays help visualize the status of twist-lock gaps. Force results also are color-coded in the results table, to show whether they exceed allowable values.

Results from several analyses can be selected and summarized in a single table, helping users to make informed decisions based on these new nonlinear calculations.

### LASHING ANALYSIS SERVICE

ABS offers a service to analyze existing lashing systems utilizing its ABS C-LASH software. By modeling an existing lashing arrangement using the most modern nonlinear analysis methodologies, we have the opportunity to identify any possibilities for improvements in the cargo securing system.

The ABS Lashing Analysis Service supports owners and operators in developing and maintaining smarter lashing systems that reduce risk and increase efficiency and safety.