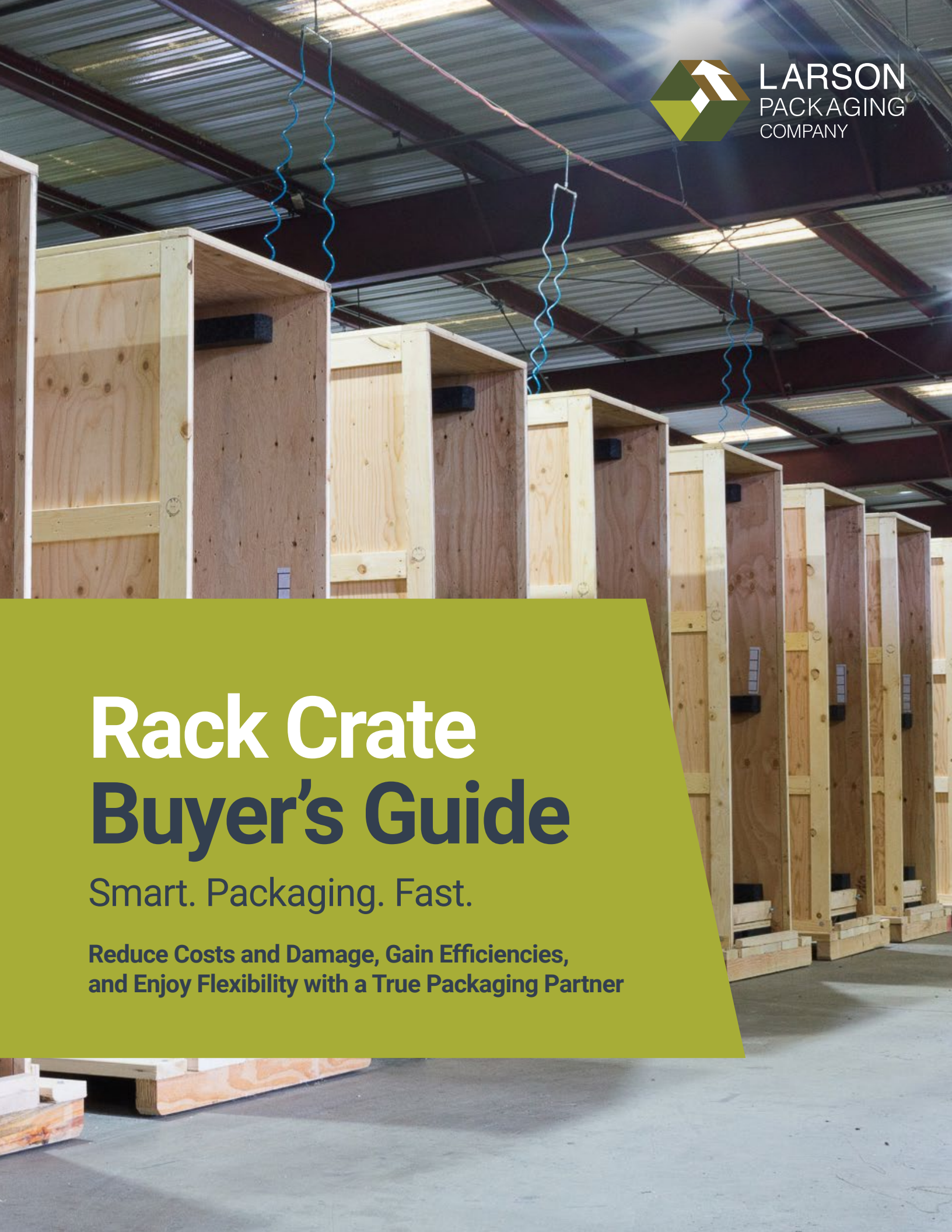


LARSON PACKAGING COMPANY

Rack Crate Buyer's Guide

Smart. Packaging. Fast.

Reduce Costs and Damage, Gain Efficiencies, and Enjoy Flexibility with a True Packaging Partner

Introduction

Transporting large, expensive, and sensitive IT server and storage racks, especially complete systems, involves many concerns compared to shipping individual components for on-site integration at the data center.

Modern servers are now heavier, denser and expensive than ever before. A breakage during transit can easily cost, tens of thousands--if not hundreds of thousands of dollars--in fix costs and lost server up time.

Shipping Complete Racks Presents a Number of Unique Challenges:

Ensuring your equipment arrives safely

Knowing it will work once it arrives and is installed at the data center

Moving it efficiently without spending a fortune

That's why choosing the right packaging for your rack systems is such an important decision.

This decision is not just about finding a seemingly well-constructed wooden box. It's about finding a provider who offers custom packaging solutions that will protect your valuable equipment, be simple and efficient to use, and fit your budget.

This guide was designed to help companies understand the top considerations when selecting a crating and shipping solution that works for them.

In-transit Damage Resulting in Financial Lost is a Serious Threat. Make Sure Your Rack Crate is Designed and Built for the Job.

When moving servers, storage racks or entire data centers from point A to point B, the journey can be filled with risk. Whether you own and manage a data center or work with someone who does, you know that the potential for extreme financial loss—from catastrophic product damage to the cost of labor and technicians to fix non-working racks—is a serious threat.

Protect Your Investment with the Right Crate Built for the Job

It's critical to ensure your rack crate is built to withstand the harsh realities of the shipping environment. Precisely engineered foam shock absorption and vibration dampening on the base protects it from overwhelming shipping forces and collisions, and custom blocking and bracing keeps your product from shifting during transit.

Loading and unloading mechanisms should be built with performance and durability in mind. If the overall shipping weight is more than 1500-1750 lbs. before loading, ramps and floater bases should be reinforced with metal runners and tips to facilitate loading and unloading and prevent wood failure (and damage to the crate from casters and vibration).

In order to ensure product safety, it's imperative to guarantee your crate is built to withstand the pressures and forces of moving an object that weighs in excess of a ton.

Reinforced Ramps

These kinds of heavy-duty ramps may be shipped separately, or be fixtures in the data center, but if you are using a crate with built-in ramps, check to make sure they are not hinged to the floater base and locked to the crate, which will render a portion of the shock/vibration protection system ineffective.

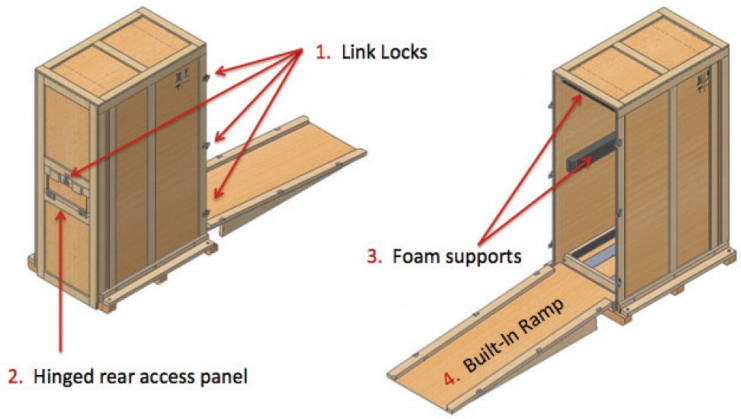
Getting the Product There is Only Half the Battle

There are other concerns when delivering rack systems, not just related to product safety. The realities of receiving departments in most data centers—limited personnel on hand, and very little time to waste—often indicate a need for simple and efficient unloading mechanisms.

Make Sure Your Crate is Easy to Use

When your product arrives at a data center, it should be ready to unpack with minimal difficulty in order to increase efficiencies on the receiving end. If your shipment requires special tools to open, or if it's not designed with an intuitive unloading procedure, more time may be lost just getting the server out of the crate itself, and there's a higher risk of personal injury to inexperienced staff members.

Crates that are designed for simple, efficient and tool-less access and unloading are less risky and will save time and money. And you never have to worry about losing critical tools to open them up. Good design also ensures loose parts won't get lost or misplaced.



CASE STUDY

When a Quality Investment Pays Off

A server manufacturer recently purchased rack crates for transportation but did not realize the importance of seeing that their mover properly strapped them into the delivery truck. Due to some rough driving the crates came crashing down into each other and sustained significant damages. But thanks to superior engineering and state-of-the-art foam cushioning, most of the servers were protected and eventually arrived with little or no damage.

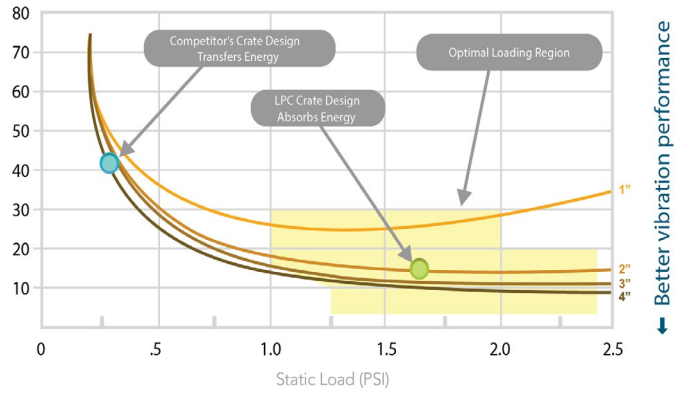
That's the kind of difference sturdy design and engineering can make. There is no replacement for quality crating when moving high value merchandise.

Quality Crates Mean Quality Results

The cheapest rack crate option might be tempting, but is often not the best. Crates built to a lower price point are typically designed poorly and use inferior materials and construction methods. One minor flaw in packaging can result in damaged hardware. Suddenly the initial savings balloon with expensive back-end costs: server replacement, rack replacement, data replacement, labor and delays.

If your crate isn't built using the right type and quantity of foam cushioning, something as inconspicuous as a pothole in the road could lead to thousands of dollars in damages. Quality crates offer major benefits over seemingly less-expensive ones.

- Quality crates are more durable, as they are made with better quality lumber, plywood, foam and hardware
- Custom-engineered for the job and not just one-size fits all
- Built to last longer and can be can be refurbished and reused



The Science of Foam Cushioning in Rack Crates

Crate designers utilize a foam cushion curve to determine how much protective cushioning is needed for a product (given the product's fragility and resonant frequency), based on the loading condition, and type and thickness of foam. Too much foam can be too stiff, transferring energy from outside vibrations to the equipment inside the crate. Too little will not support the product. Getting the precise amount of foam cushioning to balance shock and vibration is important, as well as selecting the right type of foam and thickness. Often times too much foam can be worse than too little.

CASE STUDY

New Server Rack Crate Design Eliminates Confusion and Saves Money

The customer had four different configurations for the server racks, and each configuration required a different placement of the stabilizer brackets. This meant that they had to use four different crates, which was inefficient and costly.

Solution

LPC designed and built a custom wooden crate that could accommodate all four configurations of the server racks. The crate included two removable lumber blocks that could be used to support the stabilizer brackets in the correct position. We also included a dedicated storage space for the lumber blocks when they were not needed, so as to not lose them.

This saved them money on packaging costs and simplified the process of transporting the server racks.

A Higher Quality Investment Pays for Itself

Crates built for a minimum price point are often not built to last for more than one or two trips. Plus, these kinds of crates offer less protection, which leaves you vulnerable to the added cost of repairing broken equipment when things go wrong.

Higher quality crates constructed from more durable materials may cost more up front, but they are safer and they last longer. Over time, the initial investment in a higher quality crate pays for itself.

Don't be caught off guard when you have to pay for disposal/recycling (better for the environment) at the end of your product's life. Once you factor in this expense, the short-term solution makes even less sense from a cost perspective.

Paying for disposal after every couple of trips becomes a significant financial burden over time. Make sure you budget for the cost of getting rid of your worn out crates.

Longer-Term Investments are More Reliable

A well-built crate can be used multiple times and refurbished for extended life, which is why it makes sense to think not in terms of price-per-crate, but rather cost-per-trip. If you can get multiple trips out of one quality crate, it will likely be a much better mid- to longer-term investment to pay more for durability.

Crate Type	Price	Lasts How Many Trips	Cost Per Trip
Bargain	$400	✓ ✓	$200
High Quality	$750	✓ ✓ ✓ ✓ ✓	$150

Here are the three things you should look for when purchasing rack server crates:

CASE STUDY

Our New 42U Server Rack Crates must be Reusable with no Performance Degradation and Cut the Cost-Per-Trip to under $200 vs Over $1000+ per Crate it's Currently Costing Us

The customer wanted a crate that was easy to pack and unpack without tools, that would provide adequate protection during shipping and could be reused multiple times without performance degradation, cutting the cost-per-trip to under $200 vs over $1000+ per crate.

Solution

We designed and manufactured a reusable custom rack crate that met all of the customer's specific needs. High-performance foam was used for the floater base to eliminate creep and protect the server from shock and vibration. The toolless rack crate design meant no tools were needed for loading and unloading saving considerable time and labor costs.

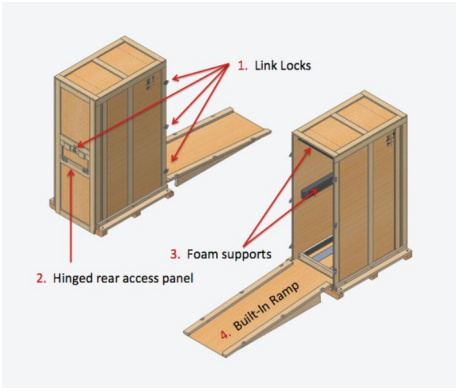
We made the crate more cost-effective by using lighter-weight materials, and we also added a 48U version of the crate to meet customers' needs with larger server racks.

The crates were well-received by the customer, who reported they were easy to use and provided excellent protection for their server racks.

Special Considerations for Rack Crates used for High Performance Computing & Sensitive Equipment

Crates for server and storage racks and medical devices are typically used to transport very expensive equipment and frequently used multiple times. They must be designed for performance, and the realities of the receiving departments in data centers, hospitals and doctors' offices. This dictates the need for tool-less rack crate designs that simplify loading and unloading. Below we've highlighted three of our most popular tool-less rack crate designs. All of these types of crates are custom-engineered and the options are many. Below we've listed a few of the most popular considerations and options that we've recently innovated.

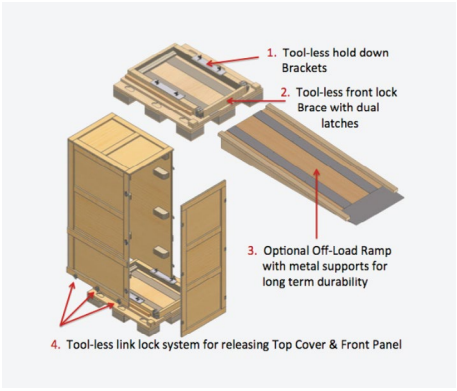
Toolless Rack Crate w/Built-In Ramp



Design Options

1. Heavy Duty Link Locks for secure toolless access (Klimps can be used for savings but may require tools for removal)
2. Optional rear access panel to facilitate rack removal
3. Top and Side foam for added stability and protection
4. Heavy Duty ramp incorporated into the front panel for loading/ unloading capabilities

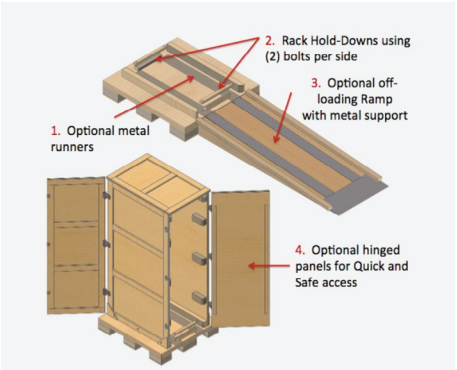
Toolless Rack Crate w/removable cover



Design Options

1. Metal hold-down brackets with toolless knobs
2. Heavy-Duty front brace with dual link locks for added shipping security
3. Heavy-Duty ramp shipped separately for off-loading racks
4. (6) Link Locks for quick and easy removal of Top Cover

Bolt Down Rack Crate w/Hinged Doors



Design Options

1. Metal Runners recommended for weights over 1,750 lbs.
2. (4) Hold-down bolts to attach rack to floater base (ratchet required)
3. Heavy Duty ramp shipped separately for off-loading racks
4. Hinged front and back panels with link locks for quick and safe access (doors can also be attached with link locks or klimps for cost savings)

Why use Toolless?

A toolless rack crate operates like a standard crate but with a significant advantage: no special tools are needed for loading, securing, or unloading equipment. Quick-release latches replace nails and screws, and tie-downs and side panels can be easily removed without tools. While crating a data rack usually takes 20 minutes, our toolless solution cuts that down to just 3 minutes. It requires no tools or brackets and can be reused up to 10 times.

The Importance of Smart Crate Design

Some crates include a hinged door or rear-access panel for quick and safe access to help guide the heavy cargo out of the crate. This usually works better than the alternative use of pulling straps. Heavy-duty twist locks can be used to secure the crate cap and door in transit, allowing for tool-less access on site.

Alternatively, spring clips may be used for cost-savings, but they require tools for removal—which can easily be lost.

Similarly, correct foam design and placement or specialty hold down brackets or blocking can hold the rack in place during shipping and ease its removal. Keeping track of ways to prevent hardware, straps and blocking from being discarded or lost is imperative.

The Larson Packaging Company Difference

Choose from traditional, tool-less and re-usable crates.

We offer built-in ramps to make loading and unloading easy and fast.

We use Mil-Spec and ASTM standards as the starting point for our crates and engineer to meet your shock and vibration requirements.

We can manufacture crates of any size, from smaller format chassis in box and foam to 8-foot-tall, 4,000 lbs 48Ut units for high-performance computing.

Consider a rack pallet if warehouse space is at a premium

A rack pallet, also known as a shock pallet, is a specialized type of pallet with shock absorbing foam placed between the bottom runners and the deck of the pallet. This cushioning foam helps to absorb and distribute shock forces during transportation and handling of goods.

Although not as protective as wood rack crates, they provide better protection than standard pallets without cushioning.

The key benefit of a shock pallet is its smaller footprint. Unlike rack crates, rack pallets take up less space as they can be stacked (palletized) for storage and shipping. This typically delivers transport and logistics savings of 40% to 45%, though it can be as low as 25% or as high as 80%.

A rack pallet is also cheaper to manufacture than a traditional rack crate as it uses less materials and labor. The downside is less materials means less total protection so its important to always perform a cost-benefit analysis before making a final decision.

Customizable with different options for outer packaging

A rack pallet can be designed in a variety of configurations and sizes to suit your specific unit load size, handling environment, and shipping requirements. Rack pallets can be designed to be one-off or reusable. They can accommodate racks of various heights as there is no fixed cap. It is even possible to ship a rack several weighing 1,000 lbs or more with the right selection of cushioning foam.

Many different outer packaging options are available for a rack pallet. These include corrugated shrouds, foam bumpers, stretch wrap plastic, and corrugated wood / foam hybrid caps.

Internal and External Foam Floater Bases

Products sensitive to shock and vibration require additional protection, both to secure it in place while in-transit, and to mitigate the damaging effects of supply chain handling, warehousing, and transportation via truck, rail, and air.

Foam floater bases are specialized shock-absorbing support structures used in crate packaging to create a buffer zone that absorbs impacts and vibrations to protect and stabilize goods during shipping and handling.

There are two types of floater bases: external and internal.

External Foam Floater Base

An external foam floater base affixes to the outside underside of the crate. Its purpose is to elevate the crate off the ground, creating a buffer zone that absorbs impacts and vibrations during handling and transit. The elevation offered by the foam base also improves air circulation around stored crates and protects the bottom of the crate from moisture and damage from chemicals, temperature fluctuations and other environmental factors.

Unlike traditional wooden skids, external foam floater bases are lightweight and flexible, providing an effective cushioning layer without adding significant weight. This reduces overall shipping weight and improves handling efficiency for demonstrable cost savings.

Internal Foam Floater Base

An internal foam floater in a crate is a protective packaging system designed to suspend and isolate the product inside the crate using foam supports. This method is commonly used for fragile, sensitive, or high-value items (like electronics, aerospace parts, or instruments) that require extra shock and vibration protection during transport.

An internal foam floater consists of foam blocks, inserts, or panels placed strategically around the product to "float" it within the crate, meaning:

- The item does not touch the crate walls.
- The foam absorbs shocks and isolates the item from vibrations and rough handling.

In addition to minimizing vibration during transit, an internal foam floater base prevents the item from contacting the crate's hard surfaces, protecting corners and edges from scratches and dents.

It's important that the internal floater is precisely engineered to maintain the product's exact positioning within the crate to prevent movement and stress. The choice of foam is also important as the wrong type of foam can result in compression creep, meaning the foam stops returning to its original shape causing the product to vibrate within the crate. Many foams (e.g. polyethylene or pp) are reusable and resistant to moisture or dust.

Useful Resources

Go to larsonpkg.com/resources

High Performance Computing Packaging Checklist

We've put together this checklist to give yourself the best chance of getting your valuable cloud, hyperscale, computing and networking, AI, OCP and Data Center Infrastructure equipment to where it needs to go undamaged, ready to plug in and use.

Download your Checklist ▶

Videos

Watch these videos to learn more about rack crates and how to choose the best one for your application.

Organizations rely on us for:

- Rapid industry-leading lead times and turnaround
- Toolless and re-useable options
- High-quality custom designs in standard and nonstandard sizes
- Efficient optimization for cost, weight, and performance

What to Look for in a Rack Crate Packaging Partner

We're business-to-business protective packaging experts specializing in custom shock and vibration protective packaging solutions for high-value, fragile, and sensitive industrial, military, I.T., and technical equipment. Our specialty is fragile, sensitive, and expensive equipment needing a custom solution.

Our engineers collaborate closely to assess your requirements and design a crate that caters to the size, weight, shape, fragility, sensitivity, and destination of the item to be shipped. We use mil-spec and ASTM standards as the quality baseline for all our wooden shipping crates and heavy-duty skids. All our wooden shipping crates are ISPM15 compliant, heat-treated, and appropriately marked for export.

We are a specialist protective packaging fabricator able to engineer customized foam cushioning, inserts, and assemblies designed to perfectly complement any server type or component and ensure optimal protection from shock, impact, vibration, abrasion, and even electrostatic discharge. Our people understand the physical properties and cushion curves of polyethylene, polypropylene, polyurethane, and other protective foams and how they interact with the weight, geometry, fragility, and sensitivity of the product being shipped.

We design your rack crate for free, accounting for your product's specialized material handling, loading and unloading, blocking and bracing, and shock and vibration protection requirements. This might include floater bases and foam lining or supports, specialty hardware, blocking, and ramps to facilitate reuse or loading.

We maintain an expensive on-site material inventory and employ just-in-time, lean manufacturing processes in our two state-of-the-art manufacturing facilities to allow packaging supply in days, not weeks. And we back our speed with an industry-first on-time delivery guarantee where we will pay you a penalty for every day we are late.

Speed to Market is Critical. Delays can Cost Dearly.

Customers often tell us the packaging industry rarely fulfills commitments and that promises rarely turn out to be true guarantees.

We want to change this. That's why we make the following bold guarantee:

> **We will ship your packaging on the guaranteed date. Otherwise we will pay you a penalty for every day we are late.**

Our ship dates are guaranteed at the time of order acknowledgment, and we can deliver in as little as 24 hours for some items. We promise faster turnaround times, simplified packaging admin, and a frictionless vendor experience.

LARSON PACKAGING COMPANY

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