WHITE PAPER

RACK SYSTEMS DONE RIGHT:

A Hands-On Guide to Reaping Maximum Benefit from Design Review

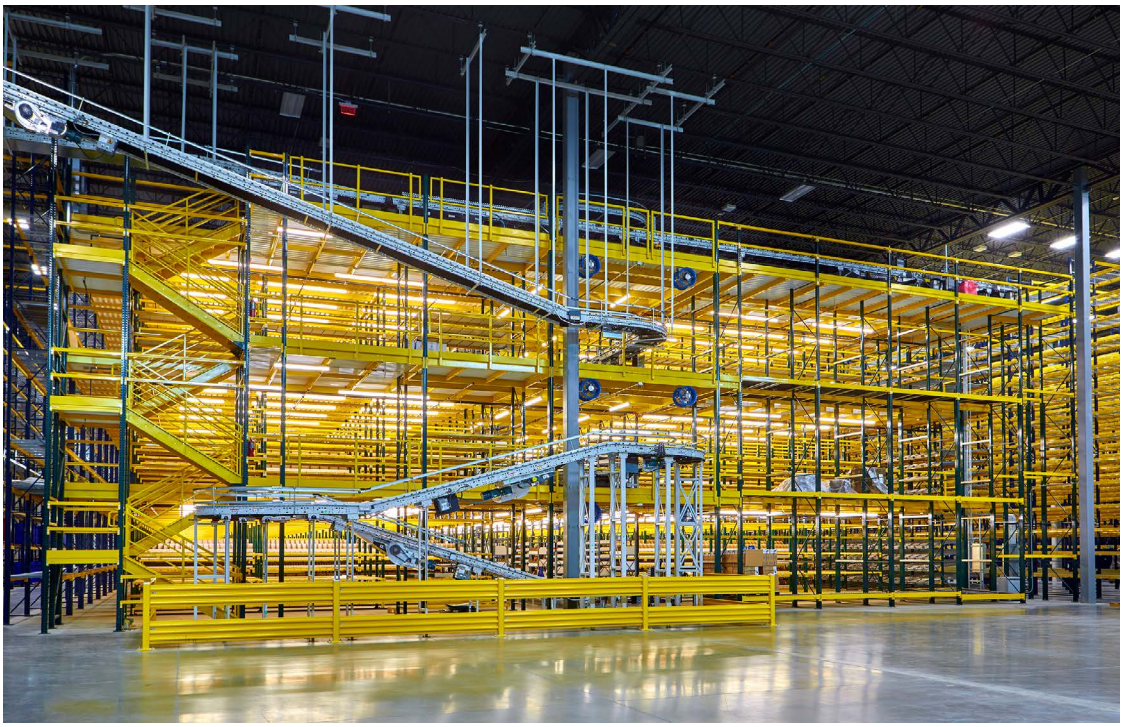
PEERLESS
CONTENT CREATION

STEEL KING
BUILT TO DELIVER

RACK SYSTEMS DONE RIGHT:

A Hands-On Guide to Reaping Maximum Benefit from Design Review

Efficiency and success of your racking project, and ultimately your material handling operation, depends on thorough planning and review.



The rapid expansion of e-commerce and a growing economy means more order fulfillment work in warehouses. This reality in turn drives the need for more rack storage and material handling infrastructure in warehouses and distribution centers (DCs).

The growing need for storage and material handling systems can be seen in some recent research:

- **According to the CBRE Group,** which studies industrial real estate trends, following a record year in the U.S. industrial real estate market in 2021, market conditions carried over into the first quarter of 2022, with strong demand for space remaining the common theme. The group reported an overall Q1 vacancy rate of 3.1%, showing how tight market conditions lowered absorption compared to Q1 2021.

- **According to research from Peerless Media's "2021 Warehouse & DC Operations Study,"** 35% said they plan to increase square footage, an 11% increase over previous year. Clearly, shippers need more warehouse capacity. A key part of DC expansion is the need for racking systems, including pick modules, along with ancillary steel infrastructure such as work platforms and protective barriers.

In 2021, global e-commerce growth rates hit 16.3 percent, so this stat is solid. When companies need infrastructure such as racking systems, they need it installed quickly and they need it to meet their functional needs from day one.

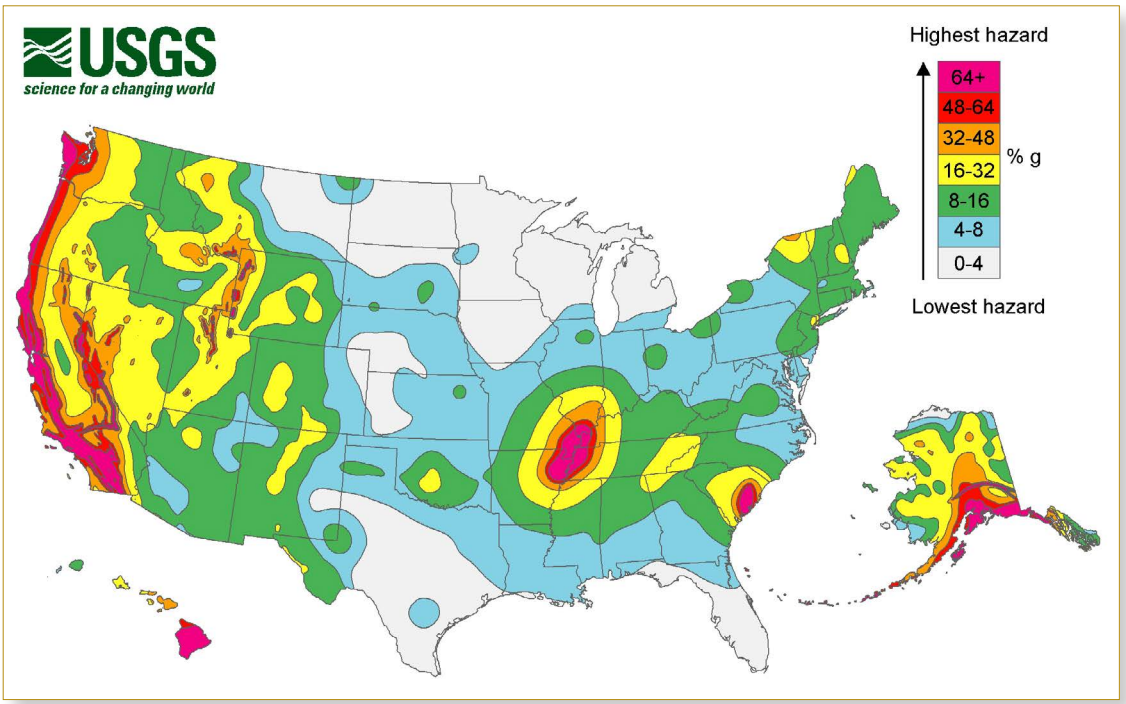
To ensure a good outcome, racking systems must be delivered on schedule, on budget, and with proper application and environmental fit—and that is the focus of this paper.

Fortunately, speed and fit can be streamlined by conducting a solid review process. The success of the process involves leadership and best practices from the rack manufacturer, expertise from racking distributors, dealers, and integrators, as well as collaborative engagement from the end user.

Footnotes:
"Q4 2016 U.S. Industrial & Logistics MarketView Snapshot," CBRE Group. *http://www.cbre.us/research/2016-U-S-Reports/Pages/Q4-2016-US-Industrial-Logistics-MarketView-Snapshot.aspx*

"2016 Warehouse/DC Operations Survey: Ready to Confront Complexity," article in Supply Chain Management Review, Nov., 2016 *http://www.scmr.com/article/2016_warehouse_dc_operations_survey_ready_to_confront_complexity*

An increasing number of areas across the United States are demonstrating geological stresses that lead to seismic events. It is essential to consider the precise latitude & longitude of your facility when planning a rack system.



Steel King Industries, a manufacturer of selective and dynamic racking, engineered rack systems, pick modules, work platforms (i.e., mezzanines), and other products, has found that this review process, including the application details, ensures greater satisfaction with a racking project.

According to Arlin Keck, Corporate R&D Engineer with Steel King Industries, "The review process should be viewed as an opportunity to work collaboratively so that all the information that can impact the project is gathered as early and as orderly as possible. Through this collaborative process, we gather as much pertinent information as possible, while understanding that parts of a DC project may yet be evolving."

Design Interdependencies

While racking systems are used in nearly every warehouse and many people in industry know what selective rack looks like, the wider range of racking types and related products aren't as well known.

On top of that, fewer people understand the full range of variables that can influence a racking design: the height and weight of the loads to be stored, the seismic (earthquake) parameters for the warehouse location, the type of pallets or lift trucks to be used with the rack infrastructure, just to name a few.

Failure to properly review key details such as loads, dimensions, lift trucks, and many other factors, can lead to unexpected changes, delays, and added costs once the procurement and manufacturing processes are underway. "There can be a real 'domino effect' if the review process doesn't confirm all the appropriate details that influence design, procurement, and manufacturing," notes Keck.

To better understand the potential interdependencies between load specifications, equipment, other site-specific factors, and rack designs, it's useful to mention some rack types:

Six best practices for rack project review

- Don't assume the rack system will work with any pallet type. Some racks, such as pallet flow rack, may not work properly with different pallet types.
- Always verify the ship to address for the rack system to ensure the system meets seismic zone regulations.
- Carefully consider whether lift truck equipment to be used is compatible with the rack system design and dimensions. For instance, are your lift trucks compatible with a drive-in rack design, and for multi-level systems, can your lift trucks fully extend to handle materials from the upper level, while keeping within maximum safe beam height?
- Don't assume you can mix loads with significant variance in weights. Some types of rack might not function smoothly if load weights vary widely.
- Stop to consider likely near-term changes in pallet load weights and/or dimensions, or changes to facility layout or pick module elements like conveyor placement, and whether the rack design should incorporate features or materials that provide for more adaptability to change.
- Do make full use of supplier tools such as Excel worksheets that collect system details, and allow time to thoroughly review the final CAD drawing.

"Many clients are unaware of how rack design characteristics are interwoven."

—Buddy Chadwell, president of Kardex Storage Systems, a Steel King distributor

Selective racking: The most common type of racking, typically only one-pallet deep (there is double-deep selective rack; however, the typical counterbalance forklift does not work for a double-reach application). Selective rack provides direct access to pallets, but offers less storage density than other types due to the number of service/pick aisles required. Interior rows are often placed in a back-to-back profile to minimize the number of aisles and to offer picking on both sides of an aisle.

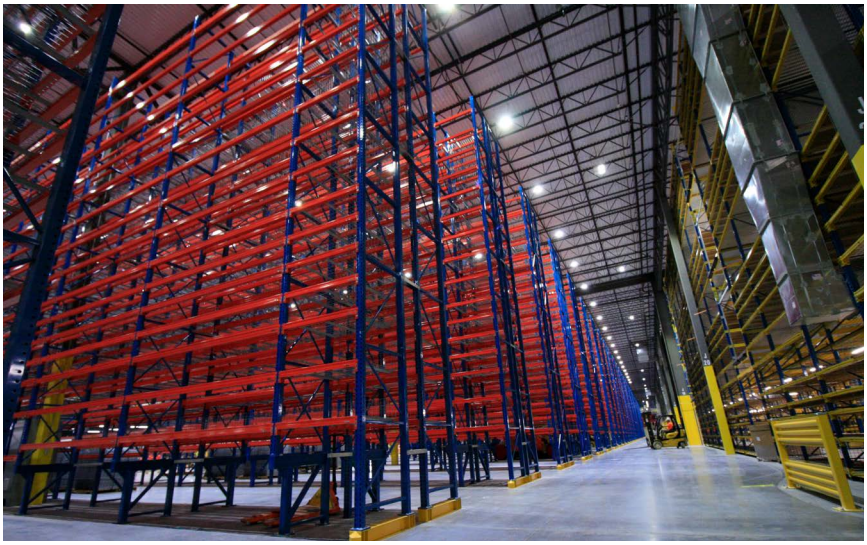
Dynamic racking: As the name suggests, dynamic pallet racks permit easy movement of pallets in deeper, denser configurations. With pushback racks, palletized loads are placed on individual carts and pushed back on slightly inclined rails until the lane is loaded. As palletized loads are removed, the carts in the back roll forward under gravity for easy access to the next palletized load. With pallet-flow racks, palletized loads are placed on the higher input end of a slightly inclined lane and roll forward under gravity to the lower discharge end of the lane.

Two other common types of racking systems are drive-in/drive-thru racks and cantilever racks. Drive-in/drive-thru racks allow for both density and access, while cantilever designs are often used with long or odd-shaped loads.

The type of racking involved in a project will determine the range of information that's needed. With any racking project, it's not only necessary to know the weights and dimensions of the loads to be stored on the system, but the interface between the palletized loads, the racking, the equipment that moves the loads, the strength of the floor slab on which the racking sets, and any government/Life Safety Code issues that may affect the overall design of the racking system.

Verifying the actual dimensions of the deck boards on pallets is important. The cause of pallets that fail to flow properly commonly turns out to be different deck board dimensions than what the user assumed.

"With pallet-flow systems, the type of pallet being used, its orientation with respect to the rollers, and the roller themselves will affect pallet flow and overall performance," explains Keck. "Mixing pallets with widely varying weights within the same system is also unadvisable."



When communicating your rack design requirements, include your work flow/activity levels, work zones, and loading/unloading schedule.

"Many clients are unaware of how rack design characteristics are interwoven, and a small change in a pallet load height or weight can change the capacity or performance of a rack system," explains Buddy Chadwell, president of Kardex Storage Systems, a Steel King distributor. "For example, if the weight of a load increases, it may require that the speed controllers in a pallet-flow rack be changed to a unit with more resistance to control the speed of the pallets."

EQUIPMENT: Information about the lift trucks to be used with a system, such as maximum vertical lift, turning radius, outriggers, minimum required service aisle width, need to be confirmed as part of a racking system. For drive-in/drive-thru racking, the body, guarding, and mast widths and heights are also critical.

Inadequate clearance between the palletized loads and the racking structure will reduce operating efficiencies and increase product damage. In short, it's not just the basics about weights and dimensions of the loads to be stored, but details about lift trucks, palletized loads, and racking interface that need be confirmed prior to final approval of the racking system so that the system works correctly in its intended use.

LOCATION: The seismic design parameters (ground accelerations, soil type) of the site where the racking will be installed needs to be considered, even in locations once normally considered to be a low seismic risk. During any type of seismic event, ground motion effects impact the structural performance of not only your building but also your storage rack systems and their contents.

Seismic analysis will determine the design of the upright posts, bracing, base plates and anchor bolts, along with the shelf beams and their end connectors.

CODE: Local and state fire and building code requirements, along with insurance provider requirements, will also impact a design. Things like lighting, ventilation, in-rack sprinklers, travel distance to an egress, product and personnel fall protection, location of building columns, building clear height, capacity of the existing slab-on-grade, seismic separation between the racking and the building structure, and other incidentals can, and often do, affect the layout and placement of the racks within a building.

Best practices for review

Steel King and its distributor partners work closely with customers through the quote and post-quote review process to establish application needs, match the design to the application, and verify all pertinent details regarding loads, equipment, and site specifics to avoid changes that could negatively impact a project.

Steel King and its distributor partners work closely with customers through the quote and post-quote review process to establish application needs, match the design to the application, and verify all pertinent details.

Rack Solution Fits Automotive Industry Storage Need

INDUSTRY: Automotive parts supplier
DISTRIBUTOR: Mathand Material Handling Systems
TYPE OF SOLUTION: Customized pushback installation

PROBLEM: Customer needed a non-standard design of pushback rack carts to keep tall, heavy pallets that were lightly banded from tipping into the pick aisle and injuring workers. These loads are located there to replenish the pick zone.

STEPS TO SOLUTION: The end-user was unfamiliar with pushback designs, so the distributor spent time educating the customer about their function, including accompanying the client on a visit to the Steel King factory. While the client liked the cost effectiveness of the pushback design, there was concern about safety and tipping with the loads, so the distributor, working in concert with Steel King, came up with a modified cart design that kept the loads level while still making use of slope and gravity of the rack system's rails. The addition of stop pads to the design added a further safety factor to ensure drivers would safely align loads when placing them on the rack. Early use of CAD drawing helped the customer visualize the details of the design.

BEST PRACTICES: After the quote, the distributor made a repeat visit to the customer site to ensure there was a thorough understanding of the options, while working closely with Steel King to customize a solution and generate a detailed CAD drawing to visualize all its fine points, such as positioning of the safety/stop pads that help lift truck drivers align the loads.

RESULTS: The customer has a cost effective modified pushback system to safely store pallets holding heavy parts in totes. Since the initial order, this customer has placed in additional orders with this distributor for Steel King products.

The process for acquiring a racking system begins with end-user discussions to discover application needs and to determine which types of rack designs will ensure the best solution. Steel King's network of distributors have the expertise to assess application needs, such as the product turnover rate (i.e. product velocity), the best type of lift trucks for the application, and the site variables which might include fire and safety code considerations.

Distributors also have expertise in facility design and material flow, which is especially helpful in projects that involve pick modules that have conveyor and/or other material handling equipment designed to work closely with the racking.

Quotation processes may differ depending on each engagement. In some cases, a customer has a specific design in mind that has been used before in other DCs, while other times there is more education needed to familiarize a client with the best options. So, while some customers may come in with a firm request for quotation (RFQ), others may require an education process.

After a quote is accepted and a purchase order (PO) is made, Steel King works closely with the distributor and the end-user to verify all key details related to the system, while preparing a CAD drawing for final approval. To simplify this process, Steel King offers Excel-based worksheets that collect essential data on loads, equipment, and site specifics.

Baking Safety Into Rack Projects

While you're still in the planning stage, take it one step further by considering built-in safety measures, which may include:

- Prevent fall-through of goods with appropriate shelf decking.
- Avoid using wooden or metal slats, as these may shift during normal loading/unloading operations or during a seismic event, putting inventory at risk.
- Prevent product from toppling off the pallet rack by including pallet load stops at the back of shelf levels.
- Protect against damage from forklift impacts through features such internal rack reinforcement in vulnerable areas, or guard products at the rack base and ends of aisles.

Distributors work collaboratively with end-users and their project managers to ensure the right information gets collected. In short, Steel King and its distributors pay close attention to ironing out details in the post-quote review process, leveraging its easy-to-use forms to simplify the information gathering.

"Sometimes in a post-quote process, essential information about a new or expanding site may begin to evolve, or doesn't get captured, so it's important to lock down those details as much as possible," says Keck. "The Steel King difference is that, with the help of our distributors, we make sure to fill in any blanks in the project. We then review the completed information to create a final approval drawing. These efforts help ensure the speed and satisfaction with the project."

"Sometimes in a post-quote process, essential information about a new or expanding site may begin to evolve, or doesn't get captured, so it's important to lock down those details as much as possible."

—Buddy Chadwell, president of Kardex Storage Systems, a Steel King distributor

The speed benefit

The number one benefit from meticulously reviewing project details is to ensure the system will be delivered on time. Moving from PO to final approval in a hurried way can result in missed details that may throw off procurement, manufacturing, or installation.

The worst scenario is that a seemingly minor detail like a change in pallet type or an increase in pallet weight isn't discovered until time of delivery, necessitating a delay while the system is modified or new pallets or other equipment are obtained to ensure the system works correctly.

The old carpentry adage—measure twice, cut once—applies to the review efforts involved in a racking project. "A bit more rigor at this stage can avoid rework and delays later," explains Keck. "We understand that when a company signs a PO for a system, they want to see it installed as soon as possible, but as part of that, it is essential to get all the details ironed out, because that review represents an opportunity to ensure the project is delivered on time and works as intended."

It boils down to solid communication among all parties—aided by forms and CAD drawings to visualize design parameters—to ensure all the variables that might impact the workings of rack project are collected and built into the project. ■

About Steel King

Steel King Industries manufactures an extensive line of material handling products, including pallet racks, dynamic storage systems, rack systems for automated storage, specialty racks, along with industrial steel containers and guard railing.

Products are manufactured at 3 U.S. facilities, using only U.S. steel. Innovation, customization and design strength has earned Steel King the reputation as a leader in the material-handling marketplace.

For more information, call Steel King at (800) 826-0203 or visit them on line at **www.steelking.com**.

PEERLESS
CONTENT CREATION